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"Non-cooperative automatic security screening with antennas for high cross-polarization discrimination"

Methods and systems for detection of threats in secure areas are disclosed. Microwaves are transmitted into high traffic areas and are reflected off or transmitted through targets within that area. The resulting signals are detected at receiving antennas which are designed to have a high cross-polarization discrimination (XPD) such that co- and cross-polarizations of the resulting signals are separable for further processing. The receiving antennas of the present invention comprise elliptical antennas with a double-ridged waveguide on the interior and a conically-shaped exterior. This particular design for the receiving antennas allows to technologically obtain an XPD of about 30 dB or more for solid angles measured from a receiving antenna's boresight (the main lobe axis) , and formed by rotating the corresponding 30-degree planar angle around the main lobe axis, the solid angles measuring approximately 0.84 sr, in a frequency range between 9.5 and 20 GHz. [A1]

"Weather data de-conflicting and correction system"

In one example, this disclosure is directed to a system configured to receive a first set of weather data from an onboard weather data system disposed on an aircraft. The system is configured to receive a second set of weather data from a remote weather data system separate from the aircraft, wherein the second set of weather data and the first set of weather data provide coverage at least in part of an overlapping volume of airspace and an overlapping time interval. The system is configured to determine whether a difference between the first set of weather data and the second set of weather data is above a nominal threshold of difference. The system is configured to generate a corrective output in response to determining that the difference between the first set of weather data and the second set of weather data is above the nominal threshold of difference [A2]

"Communication device and method in the cellular band"

A wireless communication method in a network comprising a plurality of nodes including ranging masters, broadcasting a chirp-modulated ranging requests, and ranging slaves slave, replying with thereto with chirp-modulated ranging responses, whereby mobile nodes can locate themselves passively by listening to the request/reply exchanges, based on the respective time differences of arrival. [A3]

"Systems and methods for enhanced awareness of obstacle proximity during taxi operations"

Systems and methods for predicting and displaying targets based on height in relation to the wing, wingtip or other elements of the aircraft, such as engine nacelles. The location of ground obstacles is based on radar returns (from sensors deployed on the ownship) , aircraft surveillance data, and/or an airport moving map database. [A4]

"Unmanned aerial vehicle system and method with environmental sensing"

An aerial system and method of operating an aerial system is provided. The aerial system includes a body, a lift mechanism, a processing system, a camera, and a sensor module. The lift mechanism is coupled to the body and configured to controllably provide lift and/or thrust. The processing system is configured to control the lift mechanism to provide flight to the aerial system. The camera is coupled to the body and is configured to obtain images of an environment proximate the aerial system. The sensor module is coupled to the body and includes an emitter and a receiver. The receiver is configured to sense data related to an ambient environment associated with the aerial system. The processing system controls a controllable parameter of the lift mechanism or the emitter as a function of the sensed data. [A5]

"Methods and systems for providing live weather data onboard an aircraft"

A method for presenting weather information onboard an aircraft is provided. The method obtains a first set of weather data from aircraft onboard radar system, obtains a second set of weather data from external sources including one or more external aircraft, a satellite, a remote server, and a ground-based weather station, wherein the communication device is compatible a communication protocol for the external sources, and wherein the communication protocol comprises at least one of a datalink communication protocol, a satellite communication protocol, a very high frequency (VHF) radio communication protocol, and a transponder communication protocol, and presents graphical elements comprising a first set of graphical elements associated with the first set of weather data and a second set of graphical elements associated with the second set of weather data, wherein the second set of graphical elements include visual characteristics distinguishable from the first set of graphical elements. [A6]

"Method for controlling transmission power and aircraft anti-collision system for implementing such a method"

A method and system for controlling the transmission of power of request-response messages implemented by a system to prevent collisions between a first aircraft and a second aircraft. The method comprises measuring at least the value, referred to as the quality value, of a quantity representative of the reception quality of the transponder of the second aircraft and, implemented by the anti-collision device of the first aircraft, and a control step to control the transmission power of the radio-frequency signals carrying the request-response messages according to the quality value or values contained in the response messages sent by the transponder. [A7]

"Addressing multiple time around (MTA) ambiguities, particularly for lidar systems, and particularly for autonomous aircraft"

An apparatus comprises a time-of-flight ranging sensor that scans in two or more directions relative to the apparatus over a series of scanning cycles. A processor computes, and to communicates to the time-of-flight ranging sensor, a pulse repetition rate (PRR) for the time-of-flight ranging sensor for each of the two or more directions based on information about surrounding terrain of the apparatus and a sensor pointing schedule for the time-of-flight ranging sensor that indicates directions that the time-of-flight ranging sensor is scheduled to point at time during the scanning cycles. In addition or lieu of computing the PRR, the processor (s) matches returns from pulses of the time-of-flight ranging sensor to the pulses probabilistically based on a current map of the vehicle's surroundings and scan coherence analysis for shapes in the returns. The current map can then be updated based on the matched returns for the next iteration. [A8]

"Method for the network initialization of a network for the radio location of objects within a limited space"

In a method for initializing at least one network segment of a network for the wireless location of movable locating objects arranged in a limited space using pulsed radio signals, wherein the at least one network segment in the limited space has at least two spaced apart reference nodes which form a chain-shaped communication network and which are autarkic in terms of communication, wherein a locating object arranged in the limited space is able to be located using one of the distance-based trilateration carried out by at least three reference nodes, and wherein general information is communicated by broadcast channels, the reference nodes listen to the broadcast channels in a standby position until initial information about their active participation in the communication network is received. [A9]

"Directional speed and distance sensor"

A method of using a directional sensor for the purposes of detecting the presence of a vehicle or an object within a zone of interest on a roadway or in a parking space. The method comprises the following steps: transmitting a microwave transmit pulse of less than 5 feet, radiating the transmitted pulse by a directional antenna system, receiving received pulses by an adjustable receive window, integrating or combining signals from multiple received pulses, amplifying and filtering the integrated receive signal, digitizing the combined signal, comparing the digitized signal to at least one preset or dynamically computed threshold values to determine the presence or absence of an object in the field of view of the sensor, and providing at least one pulse generator with rise and fall times of less than 3 ns each and capable of generating pulses less than 10 ns in duration. [A10]

"Method for transmitting and receiving radar signals while blocking reception of self generated signals"

A method and apparatus which enables a facility or entity such as ships, airplanes, and land based sites, that transmits and receives radar signals to receive any incoming radar signal, while blocking reception of any signals generated by the facility or entity itself. The method comprises transmitting a primary signal from an rf generator, providing a second signal which is synchronized with the primary signal matching in both phase and amplitude, but with a phase difference of 180 degrees so that the two signals sum to zero. The second signal travels through a voltage controlled attenuator and thru a voltage controlled phase shifter. Combining in a combiner the second signal with a signal radiated by a transmitting antenna and received by a receiving antenna that connects into a transmission enabling mechanism, and then transmitting the combined signal to a detector apparatus. [A11]

"Systems and methods for requesting flight plan changes onboard an aircraft during flight"

A method for generating a request onboard an aircraft, by a processor communicatively coupled to system memory and a communication device, is provided. In response to a requested change to a current flight plan, the method automatically generates, by the processor, a text-based clearance request for the requested change, the text-based clearance request comprising aircraft identification and the requested change, and the requested change comprising at least one of a new cruising level, a new cruising speed at the new cruising level, flight rules, a new route description, and revised time estimates associated with waypoints of the current flight plan, and transmits the text-based clearance request, via the communication device. [A12]

"Emergency autoload system"

Autoland systems and processes for landing an aircraft without pilot intervention are described. In implementations, the autoland system includes a memory operable to store one or more modules and at least one processor coupled to the memory. The processor is operable to execute the one or more modules to identify a plurality of potential destinations for an aircraft. The processor can also calculate a merit for each potential destination identified, select a destination based upon the merit, receive terrain data and/or obstacle data, the including terrain characteristic (s) and/or obstacle characteristic (s) , and create a route from a current position of the aircraft to an approach fix associated with the destination, the route accounting for the terrain characteristic (s) and/or obstacle characteristic (s) . The processor can also cause the aircraft to traverse the route, and cause the aircraft to land at the destination without requiring pilot intervention. [A13]

"Method and device for an aircraft for handling potential collisions in air traffic"

A method for an aircraft for handling potential collisions in air traffic includes providing by a collision avoidance system a collision avoidance maneuver to avoid a collision with one or more intruders. The collision avoidance system is configured to obtain information about these intruders. The method includes further providing flight management constraints from an onboard flight system. Further, the method includes providing flight situation data from a navigation system. The method includes generating a modified collision avoidance maneuver based on the collision avoidance maneuver provided by the collision avoidance system, the flight situation data and the flight management constraints. [A14]

"Method and apparatus for mapping and characterizing sea ice from airborne simultaneous dual frequency interferometric synthetic aperture radar (IFSAR) measurements"

X-band and P-band synthetic aperture radars are used to simultaneously gather swaths of reflected radar data over a specific area simultaneously. The P-band is used to penetrate surface clutter that may be on the top of an ice formation as well as to penetrate an ice mass. X-band is used to map surface clutter on the top of an ice formation as well as to map the top of snow that may appear on an ice formation. Digital elevation maps of the top of the snow or ice clutter, the top of the ice, and the bottom of the ice and or ice thickness are constructed. By summing these various digital elevation maps a measurement of the thickness of sea ice can be determined. Further analysis of DEM, MAG and CRV layers provides an indication of the quality of the ice, for example cracks and pressure ridges, and its weak points. [A15]

"Amplitude calibration of a stepped-chirp signal for a synthetic aperture radar"

A Radar Calibration Processor ("RCP") for calibrating the amplitude of a stepped-chirp signal utilized by a synthetic aperture radar ("SAR") is disclosed. The RCP includes a periodic amplitude error ("PAE") calibrator, first non-periodic amplitude error ("NPAE") calibrator in signal communication with the PAE calibrator, and a second NPAE calibrator in signal communication with the first NPAE calibrator. [A16]

"Enhancing engine performance to improve fuel consumption based on atmospheric ice particles"

Systems and methods for enhancing engine performance based on atmospheric ice particles are provided. for example, a method can include selecting one or more points along a flight path of an aircraft and receiving a reflectivity measurement for each of the one or more points obtained using a device located on the aircraft. The method can further include determining an estimate of ice water content for each of the one or more points based at least in part on the reflectivity measurements, and controlling at least one component of the aircraft engine (e.g., a variable bleed valve) based at least in part on the estimate of ice water content for at least one of the plurality of points. [A17]

"Method for locating, via ultra high frequency, a mobile device for "hands-free" access to an automotive vehicle and associated locating device"

A method for locating, via ultra high frequency, a mobile device (T) for "hands-free" access to a vehicle (V) , via a locating device (D') on board the vehicle (V) , the locating device (D') including an ultra high frequency transceiver (10') , an electrical power supply source (Vcc) and an antenna (A') , the locating method being noteworthy in that the transceiver (10') is disconnected from the antenna (A') , and that the transceiver (10') is connected to an attenuation module (M1, M2, M3) located at a predetermined distance (L1, L2, L3) from the transceiver (10') and including an impedance (Z1, Z2, Z3) of predetermined value connected to ground, the predetermined distance (L1, L2, L3) between the transceiver (10') and the attenuation module (M1, M2, M3) and the predetermined value of the impedance (Z1, Z2, Z3) defining an area (A1, A2, A3) for locating the mobile device (T) around the vehicle (V) . [A18]

"Systems and methods for collecting weather information for selected airspace regions"

Systems and methods for collecting weather information for selected airspace regions are provided. In one embodiment, a method for collecting weather information for selected airspace regions comprises: receiving aircraft position information for a plurality of aircraft, forming an aircraft weather group based on flight path attributes derived from the aircraft position information, selecting at least a first representative aircraft from the weather group, and receiving at a weather information ground station, weather data from one or more representative aircraft of the aircraft weather group, wherein only the one or more representative aircraft transmit weather information to the weather information ground station from the aircraft weather group. [A19]

"On-board radar apparatus and region detection method"

An on-board radar apparatus includes a transmitter/receiver that transmits a radar signal to a detection range for every frame and receives one or more reflected signals which are the radar signal reflected by one or more objects, a detector that detects, for every frame in each direction within the detection range, a position of a reflection point closest to the on-board radar apparatus as a boundary candidate position, which serves as a boundary with a region where no object exists within the detection range, among one or more reflection points detected on the basis of the one or more reflected signals, a calculator that calculates movement amount concerning an amount of movement of the on-board radar apparatus, an estimator that generates, for every frame in each direction within the detection range, an estimated boundary position by converting the boundary candidate position detected in a past frame into a boundary position in a current frame on the basis of the movement amount, and a smoother that performs, for every frame in each direction within the detection range, smoothing processing by using the boundary candidate position in the current frame and the estimated boundary position to calculate a boundary position with the region where no object exists within the detection range and outputs the calculated the boundary position to a driving support apparatus. [A20]

"Shared aviation antenna"

An Automatic Dependent Surveillance-Broadcast (ADS-B) avionics device for use in an aircraft with a transponder and an antenna comprises a first port, a second port, a transmitter, a switch, and a processing element. The first port may electrically couple to the transponder, and the second port may electrically couple to the antenna. The transmitter generates data to be transmitted over the antenna. The switch includes a first mode in which the transponder is electrically coupled to the antenna and a second mode in which the transmitter is electrically coupled to the antenna. The processing element is programmed to switch the switch from the first mode to the second mode, instruct the transmitter to transmit an ADS-B Out data packet to the second port, and switch the switch from the second mode to the first mode after the packet is transmitted. [A21]

"Power centroid radar"

A system for signal processing is provided that obviates the use of prior-knowledge, such as synthetic aperture radar (SAR) imagery, in time compressed signal processing (i.e. it can be knowledge unaided) . The knowledge-unaided power centroid (PC.sub.KU) is found by evaluating a covariance matrix R.sub.SCM for its moments m.sub.i. Because R.sub.SCM uses a sample signal, rather than SAR data, the power centroid PC.sub.KU may be found without needing SAR data. [A22]

"Multi-elevational antenna systems and methods of use"

The present disclosure provides systems and methods associated with an antenna system comprising a tension member configured to be towed by an aerial platform and/or secured to an orbiting satellite. In some embodiments, a first end of the tension member may be secured to the aerial platform and the second end may extend unsecured from the aerial platform at a different elevation than the first end. A plurality of antenna assemblies, each comprising at least one antenna, may be secured to and spaced along the length of the tension member. Each of the plurality of antennas may be adapted for use with a particular frequency or frequency bandwidth. for example, each of the plurality of antennas may be adapted or tuned for one or more frequencies useful for synthetic aperture radar (SAR) . In some embodiments, a receiving system, a communication link, and/or an antenna location system may be utilized. [A23]

"Wrap around ranging method and circuit"

A method is for estimating a distance to an object. The method may include determining, by a ranging device, a first range value based upon a time of flight of first optical pulses having a period of a first duration, and determining, by the ranging device, a second range value based upon a time of flight of second optical pulses having a period of a second duration different from the first duration. The method may include estimating the distance based upon the first and second range values. [A24]

"Operator terminal with display of zones of picture taking quality"

An operator terminal of a mission system including at least one screen for displaying environmental data of a mobile carrier of a situation analysis system including at least one image sensor and a real-time spatial position of at least one object of interest. This operator terminal includes a module for obtaining at least one piece of position information representative of the position of the carrier and at least one object of interest. A computing module providing at least two different picture taking quality zones, in a predetermined spatial perimeter centered on the position of the carrier. This operator terminal also includes a module for displaying a map of said picture taking quality zones relative to the position of the carrier. The obtaining, computing and display modules are implemented to obtain a quasi-real-time refresh of said displayed map. [A25]

"Radio-frequency localization techniques and associated systems, devices, and methods"

A device comprising: a substrate, a semiconductor die mounted on the substrate, a transmit antenna fabricated on the substrate and configured to transmit radio-frequency (RF) signals at least at a first center frequency, a receive antenna fabricated on the substrate and configured to receive RF signals at least at a second center frequency different than the first center frequency, and circuitry integrated with the semiconductor die and configured to provide RF signals to the transmit antenna and to receive RF signals from the receive antenna. [A26]

"Autonomous precision navigation"

The new invention is a method for a self-contained multifunctional navigation device. It computes 3D-Spatial velocity of the vehicle and of fluid medium surrounding the vehicle, using a movement sensor system comprising low power Transmitter and plurality of Receivers placed close to the Transmitter. The said computation measures propagation time delay of low frequency pulse envelope modulating carrier EM (radio) waves using Time to Digital Converter (TDC) . Orientation, direction, position and movement data are derived using well known mathematical formulae. Derived movement data are displayed graphically on a Visual Display Screen. A commercial computer comprising real time operating system, stored digitalized Navigation data and digitalized map facilitates data computation and control and guidance. The method and movement sensor device can be used in any type of vehicle (airborne, surface, sub-surface, marine, sub-marine or space) as a means for navigation and control guidance aid. [A27]

"Automated method for selecting training areas of sea clutter and detecting ship targets in polarimetric synthetic aperture radar imagery"

Method for selecting a sea clutter training area in polarimetric synthetic aperture radar input data. A sea clutter reference distribution for a pixel magnitude value is provided. Based on the input data, one or more parameters of the reference distribution and a global covariance matrix are computed. The pixels are grouped into blocks. A block that minimizes a cost function is pre-selected, the cost function being derived from empirical moments of the block and moments of the reference distribution. A goodness-of-fit is computed for the pre-selected block with respect to the reference distribution. If the goodness-of-fit is sufficient, the block is selected as sea clutter training area. Otherwise, the steps of preselecting and computing a goodness of fit are repeated. [A28]

"System and method to identify regions of airspace having ice crystals using an onboard weather radar system"

Systems and methods of detecting type I ice crystals using an aircraft's onboard weather radar system are disclosed. An exemplary embodiment identifies radar returns having a return level signal strength less than a radar return sensitivity threshold level, determines if at least one of a weather condition and a flight condition concurrently exists with the identified radar returns having the return level signal strength less than the radar return sensitivity threshold level, and identifies a region of airspace potentially having type I ice crystals when the at least one of the weather condition and the flight condition concurrently exists with the identified radar returns having the return level signal strength less than the radar return sensitivity threshold level. [A29]

"Integrated MIMO and SAR radar antenna architecture for self driving cars"

A radar system includes a split-block assembly unit comprising a first portion and second portion, where the first portion and the second portion form a seam. The radar system further includes a plurality of ports located on a bottom side of the second portion opposite the seam. Additionally, the radar system includes a plurality of radiating elements located on a top side of the first portion opposite the seam. The plurality of radiating elements is arranged in a plurality of arrays. The plurality of arrays includes a set of multiple-input multiple-output (MIMO) transmission arrays, a set of synthetic aperture radar (SAR) transmission arrays, and at least one reception array. Further, the radar system includes a set of waveguides configured to couple each array to a port. [A30]

"Synthetic aperture radar signal processing device and synthetic aperture radar signal processing program"

There are provided: a high-accuracy factor calculator for calculating, by a high-accuracy computation method, a distance R from a moving platform to a pixel position (a, b) within an observation target corresponding to an predicted position (x.sub.t, y.sub.t) and a phase factor A when a determination processor determines that an error is out of an allowable range, and a low-accuracy factor calculator for calculating, by a computation method with lower accuracy than that of the high-accuracy factor calculator (e.g., a computation method using an approximation algorithm) , a distance R' from the moving platform to the pixel position (a, b) corresponding to the predicted position (x.sub.t, y.sub.t) within the observation target and a phase factor A' when the determination processor determines that the error is within the allowable range. [A31]

"Missile seeker and guidance method"

In a method of guiding a missile in flight to a target (FIG. 1) , the location of the missile and the range to the target are measured at a plurality of moments during the flight of the missile (step 10) . The location of the target is calculated from the measured ranges and the measured missile locations (step 20) . A required velocity vector angle is calculated from the calculated location of the target and a guidance law (step 30) . A lateral acceleration required to provide the missile with a velocity oriented to the target at the required velocity vector angle is calculated for the missile (step 40) . The missile is caused to accelerate with the calculated lateral acceleration, so that the missile to follows a trajectory according to the guidance law (step 50) . [A32]

"Streamlined probe for guided wave radar measurement"

A guided wave radar fluid level measurement system can measure the level of product in a tank. A pulse of RF energy sent along a waveguide in the tank can be reflected where the waveguide enters the product. A time of flight measurement can indicate the product level. The product inside the tank can flow and that flow can push the waveguide and thereby torque and possibly bend the waveguide. A streamlined wave guide is torqued less when the streamlining is aligned with the direction of flow. A rotating connector can provide for the waveguide to rotate and a weathervane effect can align the streamlined waveguide with the flow. [A33]

"Determining validity of location signal combinations for securing unmanned aerial vehicle (UAV) navigation"

A navigation security module of an unmanned aerial vehicle (UAV) receives a combination of signals from a location technology, each signal comprising at least a signal identification and location data. The combination of signal identifications is processed against known identifications. If the identification is not found, or if the combination of signal identification is not possible, the signal may be a rogue signal, resulting in a quarantine protocol. [A34]

"Weather radar beam deconvolution"

A weather radar module for an aircraft is described. The weather radar module includes a weather display and a processor. The processor is configured to control a radar antenna of the aircraft to perform a radar beam sweep and to receive radar returns. The processor is further configured to perform an estimation of a weather vertical location based on the radar returns, the estimation comprising estimating an altitude error correction due to a beam shape of the radar beam and due to weather model parameters of a weather model and correcting for the altitude error correction. The processor is further configured to cause the weather display to display weather based on the received radar returns, and the estimation of the weather vertical location. [A35]

"Sparse space-time adaptive array architecture"

A sparse multichannel array includes a plurality of array elements, a receiver behind each array element, and a Doppler filter bank behind each receiver, whereby within each Doppler bin is placed spatial nulls at selected angles of undesired interference. The invention enables Doppler processing to be performed on sparse arrays, such as nested or coprime arrays, used in nonlinear adaptive beamforming to mitigate the impact of unintentional interference and hostile jamming on the received signal. [A36]

"Computer system for determining approach of aircraft and aircraft"

A computer system 20 provided in an aircraft 1 includes, as a module of a computer program to be executed, an approach determination section 31 configured to determine whether the aircraft 1 is approaching a landing site. The approach determination section 31 includes, as a condition for determination of approaching, establishment (C1) of one or both of a condition (C11) that a first absolute altitude A1 obtained by an radio altimeter 21 mounted on the aircraft 1 is low relative to a first approach altitude AA1, and a condition (C12) that a second absolute altitude A2 that is obtained by subtracting an altitude A.sub.L of the landing site from a pressure altitude Ap determined by a barometric altimeter 22 mounted on the aircraft 1 is low relative to a predetermined second approach altitude AA2. [A37]

"Cellular interferometer for continuous Earth remote observation (CICERO) satellite"

A fleet of small spacecraft ("cells") in low Earth orbit combine to form an integrated Earth observing system providing many observations previously requiring distinct sensing systems. Each cell performs a few relatively primitive functions, including emission, reception, sampling, and recording of radio and microwave signals. Each cell observes over a spherical field of view, samples the received signals independently at many small antenna elements, and stores the data from each element. Data from all cells are sent to a common location where they can be combined in diverse ways to realize a wide range of observing functions. These functions may include ionosphere and gravity field mapping, atmospheric radio occultation, ocean, ice, and land altimetry, ocean scatterometry, synthetic aperture radar (SAR) imaging, radar sensing of soil moisture, land cover, and geological surface properties, and interferometric SAR sensing of surface change. The system can also provide real-time messaging, navigation and surveillance functions. [A38]

"Single antenna altimeter system and related method"

A system and related method is disclosed for determining a range between a single antenna array and a surface. The system includes a source generator configured to generate a source signal, a coupler, a circulator, a mixer, and a digital signal processor. The source generator generates a frequency modulated continuous wave source signal. The coupler splits the source signal into a transmission signal and a coupled signal. The circulator receives the transmission signal from the coupler, outputs the transmission signal to an antenna, and receives a reception signal from the antenna, which may be a reflection of the transmission signal from the surface. The mixer mixes the reception signal from the circulator and the coupled signal from the coupler to generate a low frequency return signal. The digital signal processor determines a range between the antenna and the surface based on the low frequency return signal. [A39]

"Rotorcraft fitted with a radioaltimeter having plane antennas and a lens for modifying the field of view of the antennas"

A method of measuring the height of a rotorcraft above the ground by means of a radioaltimeter having plane antennas, and it also provides to such a radioaltimeter and a rotorcraft fitted with such a radioaltimeter. The rotorcraft is provided with sling equipment for transporting a load swinging under the rotorcraft in a given field of mobility, and a lens modifies the basic field of view of the radioaltimeter as supplied by the antennas between firstly a limited field of view for the radioaltimeter excluding the field of mobility of the load transported by the sling equipment from the field of view of the radioaltimeter, and secondly an optimum field of view of the radioaltimeter of scope that is optimized in the event that no load is being transported by the sling equipment. [A40]

"Baiting method and apparatus for pest control"

A system for carrying out pest baiting, comprises an unmanned aerial vehicle (UAV) which is controllable to record image data over a predefined flight path, the image data being captured by an image recording device. A computer processing arrangement is operable to evaluate the recorded image data to determine pest related data associated with an animal species identified as a pest, and to subsequently determine a baiting program for eradication of the animal species based on the determined pest data. [A41]

"Method and apparatus for compensating for a parameter change in a synthetic aperture imaging system"

There is described a method for processing data generated by a synthetic aperture imaging system, comprising: receiving raw data representative of electromagnetic signals reflected by a target area to be imaged, receiving a parameter change for the synthetic aperture imaging system, digitally correcting the raw data in accordance with the parameter change, thereby compensating for the parameter change in order to obtain corrected data, and generating an image of the target area using the corrected data. [A42]

"Superpixels for improved structure and terrain classification using multiple synthetic aperture radar image products"

Various embodiments presented herein relate to assigning labels to segments of a synthetic aperture radar (SAR) image, where the segments are based upon a speckle-reduced SAR image product. A plurality of SAR images of a scene are co-registered to form a registered stack of SAR images. A speckle-reduced SAR image product is generated based upon at least one registered SAR image in the registered stack of SAR images. The speckle-reduced SAR image product is segmented into a plurality of superpixels, and boundaries of the superpixels are applied to the at least one registered SAR image to form a segmented SAR image. A segment of the SAR image is then labeled as including or not including a feature, wherein the label is assigned based upon values of pixels in the segment. [A43]

"Method and apparatus for drone detection and disablement"

A preferred embodiment of a method and apparatus for detection and disablement of an unidentified aerial vehicle (UAV) includes arrays of antenna elements receiving in two modalities (for instance radio frequency (RF) and acoustic modalities, or RF and optical modalities) . Signal processing of outputs from multiple antenna arrays locates a potential UAV at specific coordinates within a volume of space under surveillance, and automatically aims video surveillance and a short-range projectile launcher at the UAV, and may automatically fire the projectile launcher to down the UAV. [A44]

"Method for coupling flight plan and flight path using ADS-B information"

The present invention relates to a method for coupling a flight plan and a flight path using ADS-B information, and more specifically to a method for coupling a flight plan and a flight path, wherein a flight data processing unit of an air traffic control system or an arrival management system separately and directly receives ADS-B information such that the received ADS-B information can be used for coupling a flight plan and a flight path of an aircraft. [A45]

"Vertical profile display including weather icons"

A vertical profile display includes weather information for an aircraft. In some examples, the vertical profile display includes one or more weather icons, each weather icon indicating a weather condition for a volume of space at a particular altitude. Each weather icon is displayed within the vertical profile display at a portion of the vertical profile display corresponding to the altitude of the weather condition indicated by the particular weather icon. [A46]

"Radio altimeter"

The present disclosure relates to a radio altimeter including a path extending unit positioned in a signal transmission path or a signal reception path of the radio altimeter, wherein the path extending unit delays a signal received from the outside to reduce a dynamic range of the radio altimeter. [A47]

"Systems and methods for using coherent noise filtering"

Systems and methods are provided for the filtering of coherent noise signals. In an illustrative embodiment, a pulsed electronic signal receives varying phase shifts for each of its pulses prior to transmission. When coherent noise interferes with the transmitted signal, received signal receives a phase shift opposite of that applied prior to transmission such that the electronic signal is restored and the coherent noise becomes non-coherent. In another embodiment, width of each transmitted pulses can be varied prior to transmission, but a constant midpoint-to-midpoint time is maintained. After receiving a signal with coherent noise interference, the midpoints of the pulses are aligned causing the coherent noise to become non-coherent. [A48]

"Automating the assessment of damage to infrastructure assets"

A computer-implemented method includes: receiving, by a computing device, sensor data associated with a geographic location, processing, by the computing device, the sensor data to identify an infrastructure asset within the geographic location, determining, by the computing device, a condition of the infrastructure asset based on processing the sensor data, and storing or outputting, by the computing device, information regarding the condition of the infrastructure asset. [A49]

"Controller for an aircraft tracker"

A method, apparatus, and aircraft tracker system for reporting state information for an aircraft. A state of the aircraft is identified using sensor data received from an aircraft sensor system in the aircraft. The state information is transmitted at a reporting rate set using the state of the aircraft identified from the sensor data, at least one of a crew command or a ground command when at least one of the crew command is received from a crew interface or the ground command is received from a ground source, and a policy defining priorities for reporting that are based on at least one of the crew command, the ground command, or the state of the aircraft identified from the sensor data. [A50]

"Method of approaching a platform"

A method having a preparation stage for preparing an approach path (25) to a theoretical position (20') of a platform (20) . During a consolidation stage, a current position (20") of said platform (20) is determined and an alert is triggered when the distance (D1) between said theoretical position (20') and said current position (20") is greater than a first threshold. During a security stage, entities provided with respective automatic identification systems and present in a predetermined monitoring zone (OCZ) are monitored, and a horizontal representation of said approach path (25) is displayed on a display screen (8) together with the following for each entity: a plot (41) representing its current position, an indication (42) of the travel direction of the entity, and a representation (43) relating to the danger level of the entity. [A51]

"Phased array tuning for interference suppression"

A system has a plurality of transmission-capable nodes. A method is provided for suppressing interference at a critical sensor situated within this system. The system is first three-dimensionally mapped. Next, phase shifts are estimated for transmissions from the nodes to produce net destructive interference at the critical sensor, based on the three-dimensional mapping of the system. An aggregate electromagnetic signal from the nodes is sensed at the critical sensor. The phase shifts are then adjusted based on the sensed aggregate electromagnetic signal. [A52]

"Artifact reduction within a SAR image"

The various technologies presented herein relate to reducing and/or filtering undesired artifacts in a SAR image, wherein the artifacts are generated by RF interference resulting from a communication signal being included in a radar return which also comprises radar clutter. The radar return is separated into two subapertures, a first subaperture comprising radar clutter only, and a second subaperture comprising radar clutter and the communication signal. The communication signal is extracted from the second subaperture and reapplied to the initially received radar return. Reapplication of the communication signal to the radar return enables any undesired artifacts arising from the communication signal to have their return strength reduced or minimized, while maintaining any desired radar returns in the SAR image. [A53]

"Systems and methods for calibration and optimization of frequency modulated continuous wave radar altimeters using adjustable self-interference cancellation"

Systems and methods for calibrating and optimizing frequency modulated continuous wave radar altimeters using adjustable self-interference cancellation are disclosed. In at least one embodiment, a radar altimeter system comprises: a local oscillator delay line including a variable delay circuit configured to output a delayed signal, a transmitter coupled to the local oscillator delay line and configured to output a transmitter signal, a transceiver circulator coupled to an antenna and coupled to the transmitter, and a frequency mixer coupled to the delay line and coupled to the transceiver circulator. The transceiver circulator directs the transmitter signal to the antenna and the antenna is configured to transmit the transmitter signal and receive a reflected signal from a target. Further, the frequency mixer is configured to receive the delayed signal and the target reflected signal from the transceiver circulator. [A54]

"Aircraft collision avoidance system"

An aircraft collision avoidance system including (a) at least one separation monitoring device connectable to at least a portion of an aircraft and/or vehicle, the separation monitoring device comprising (1) at least one transmitter, (2) at least one receiver, and (3) an image sensor, and (b) a master unit. [A55]

"Methods and apparatus for providing a dynamic target impact point sweetener"

Methods and apparatus for providing a dynamic target impact point sweetener is disclosed. An example method includes identifying a target based on a composite three-dimensional image generated based on data received from a first aerial vehicle acting as a master vehicle and a second aerial vehicle acting as a slave vehicle, changing a role of the first aerial vehicle to the slave vehicle, changing the role of the second aerial vehicle to the master vehicle, and causing, using the second aerial vehicle acting as the master vehicle, a third vehicle to attack the target based on the identity of the target. [A56]

"Method and apparatus for stacking multi-temporal MAI interferograms"

An apparatus and method for stacking multi-temporal MAI interferograms Disclosed are disclosed herein. The apparatus includes a processor configured to: generate a forward-looking InSAR (Interferometric Synthetic Aperture Radar) interferogram and a backward-looking InSAR interferogram of multi-temporal interferometric pairs, generate a residual forward-looking interferogram and a residual backward-looking interferogram by removing low-frequency phase components from the forward-looking InSAR interferogram and the backward-looking InSAR interferogram, generate a stacked forward-looking interferogram and a stacked backward-looking interferogram by separately stacking the residual forward-looking interferogram and the residual backward-looking interferogram, and generate a stacked MAI interferogram based on a phase difference between the stacked forward-looking interferogram and the stacked backward-looking interferogram. [A57]

"Velocity and attitude estimation using an interferometric radar altimeter"

A method and system for estimating velocity of an aircraft is provided. The method comprises transmitting a beam toward a surface from the aircraft using a Doppler beam sharpened radar altimeter, receiving a plurality of reflected signals that correspond to portions of the transmitted beam that are reflected by the surface, and forming a plurality of Doppler beams by filtering the received signals. A complex-valued array of range bin is computed with respect to frequency of the Doppler beams from at least one antenna aperture of the radar altimeter, and a range for each of the Doppler beams is estimated. A velocity vector magnitude for the aircraft is estimated by a curve fit of the range with respect to the frequency of the Doppler beams. [A58]

"Drone mitigation methods and apparatus"

Systems and methods for drone mitigation, or the deterrence of aerial drones from flying in an given area, are described. The systems and methods take advantage of the fact that destabilization of a drone can be accomplished by externally changing the performance of one or more of its propeller driven systems. In doing so, the drone is incapable of maintaining stability in flight, thereby causing the remote controlled pilot to force a retreat, or risk and result in a crash of the drone. Embodiments utilizing sonic energy and liquids are described. [A59]

"Ranging and positioning system"

A ranging and positioning system comprising transmitters and receiver nodes communicating together by chirp-modulated radio signals, that have a ranging mode in which ranging exchange of signals takes place between a master device and a slave device that leads to the evaluation of the range between them. The slave is arranged for recognizing a ranging request and transmit back a ranging response containing chirps that precisely aligned in time and frequency with the chirps in the ranging requests, whereupon the master can receive the ranging response, analyze the time and frequency the chirps contained therein with respect to his own time reference, and estimate a range to the slave. [A60]

"Anti-rocket system"

A counter-flying object system comprising a sensor array including at least one active sensor configured to detect and track the flying object, and a missile launcher configured to launch an interceptor to intercept the flying object, wherein upon launching of the interceptor, the sensor array is configured to determine the location of the interceptor and send said object and interceptor locations to a control system, the control system being configured to provide mission data to the interceptor based on said object and interceptor locations for guiding the interceptor toward the flying object and activating a fragmentation warhead on or in the vicinity of said flying object when a lethality criteria is met. [A61]

"Turbine blade monitoring"

A blade monitoring system and method for a turbine assembly comprising rotating blades (14) , the system comprising at least one sensor (10, 12) for transmitting a signal towards said rotating blades and detecting a time-varying return signal therefrom, and one or more processors (20) configured to calculate the time derivative of said return signal, generate a phase variation signal for said time derivative, determine minima points within said phase variation signal and measure said signal at said minima points so as to identify data representative of respective minimum path lengths, each said minimum path length corresponding to the returned signal as each respective blade passes said sensor, and generate, using said minimum path lengths, a time series of data representing the returned signal from individual blades as they pass the sensor. [A62]

"Method for guiding an aircraft"

The guiding method such as described correctly guides an aircraft on a platform of an airport, even in complex taxiing areas. [A63]

"Method for adjusting a viewing/masking sector of an environment scanning device, and corresponding adjusting device and operator terminal"

A method of adjusting a viewing/masking sector of an environment scanning device, and a corresponding adjusting device and operator terminal are disclosed. In one aspect, the method includes activating a phase of operator adjustment of the parameters, to show, on the information display, an angular viewing/masking sector of the scanning device having radii indicating the central axis orientation and the lateral edges of the angular viewing/masking sector, and touch-sensitive interactive zones configured to be angularly moved by the operator in order to set the corresponding parameters of the environment scanning device. The method further includes adjusting the orientation and aperture of the angular viewing/masking sector based on a touch-sensitive interaction between the operator and the corresponding interactive zones and moving at least one of the corresponding radii toward at least one new adjustment position. [A64]

"Passive radio frequency identification ranging"

Systems, methods, apparatuses, and computer readable media are disclosed for providing timing-based distance measurement to a passive radio frequency identification ("RFID") tag using one or more wideband RF signals synchronized with the standard narrowband RF signal. In some embodiments, the narrowband RF signal activates a passive RFID tag creating a backscatter reflection target which returns a modulated narrowband signal and a wideband signal from the passive RFID tag. The one or more wideband receivers determine time-of-flight and/or time-of-arrival measurements for the returned wideband signal. A location measurement is then calculated for the passive RFID tag using the tag data, the known location of the wideband transceivers, and the time-of-flight/time-of-arrival data. [A65]

"Aviation display depiction of weather threats"

A method for indicating a weather threat to an aircraft is provided. The method includes inferring a weather threat to an aircraft and causing an image to be displayed on an aviation display in response to a determination by aircraft processing electronics that the inferred weather threat to the aircraft is greater than a measured weather threat to the aircraft. [A66]

"Systems and methods for recognizing objects in radar imagery"

The present invention is directed to systems and methods for detecting objects in a radar image stream. Embodiments of the invention can receive a data stream from radar sensors and use a deep neural network to convert the received data stream into a set of semantic labels, where each semantic label corresponds to an object in the radar data stream that the deep neural network has identified. Processing units running the deep neural network may be collocated onboard an airborne vehicle along with the radar sensor (s) . The processing units can be configured with powerful, high-speed graphics processing units or field-programmable gate arrays that are low in size, weight, and power requirements. Embodiments of the invention are also directed to providing innovative advances to object recognition training systems that utilize a detector and an object recognition cascade to analyze radar image streams in real time. The object recognition cascade can comprise at least one recognizer that receives a non-background stream of image patches from a detector and automatically assigns one or more semantic labels to each non-background image patch. In some embodiments, a separate recognizer for the background analysis of patches may also be incorporated. There may be multiple detectors and multiple recognizers, depending on the design of the cascade. Embodiments of the invention also include novel methods to tailor deep neural network algorithms to successfully process radar imagery, utilizing techniques such as normalization, sampling, data augmentation, foveation, cascade architectures, and label harmonization. [A67]

"Innovative orbit design for earth observation space missions"

The invention concerns a method for reducing the costs of a satellite remote sensing service. The method comprises providing a satellite remote sensing system that includes only one satellite equipped with a sensor configured to acquire images of areas of the earth's surface, the satellite remote sensing system being designed to provide a satellite remote sensing service based on the images acquired by the sensor on board the satellite. In particular, the satellite follows a predefined orbit around the earth with an orbit repeat cycle shorter than three days, whereby a satellite remote sensing service with very good time performance, excellent interferometric capabilities and with drastically reduced costs is obtained. [A68]

"Systems and methods for detecting, tracking and identifying small unmanned systems such as drones"

A system for providing integrated detection and countermeasures against unmanned aerial vehicles include a detecting element, a location determining element and an interdiction element. The detecting element detects an unmanned aerial vehicle in flight in the region of, or approaching, a property, place, event or very important person. The location determining element determines the exact location of the unmanned aerial vehicle. The interdiction element can either direct the unmanned aerial vehicle away from the property, place, event or very important person in a non-destructive manner, or can cause disable the unmanned aerial vehicle in a destructive manner. [A69]

"Using radar derived location data in a GPS landing system"

In aspects herein, if GPS signals used as inputs into a GPS landing system become unreliable, an aircraft instead uses signals derived from radar data to operate the GPS landing system. Generally, GPS signals are unreliable if they cannot be received or if the signals are corrupted. Instead of using GPS signals, the landing system uses radar derived location data as inputs. In one example, the radar derived location data is generated using a radar system located at the intended landing site--e.g., an airport or aircraft carrier. The landing site transmits this data to the aircraft which processes the data using its GPS landing system that outputs control signals for landing the aircraft. Thus, even when GPS signals are unreliable, the aircraft can use the GPS landing system to land. [A70]

"Aerial vehicle system"

A system is provided for maneuvering a payload in an air space constrained by one or more obstacles, and may include first and second aerial vehicles coupled by a tether to a ground station. Sensor systems and processors in the ground station and aerial vehicles may track obstacles and the tether's and the vehicles' positions and attitude to maneuver the payload and the tether to carry out a mission. The sensor system may include airborne cameras providing data for a scene reconstruction process and simultaneous mapping of obstacles and localization of aerial vehicles relative to the obstacles. The aerial vehicles may include a frame formed substantially of a composite material for preventing contact of the rotors with the tether segments. [A71]

"Method and apparatus for correcting ionic distortion of satellite radar interferogram"

An apparatus and method for correcting the ionospheric distortion of an SAR (Synthetic Aperture Radar) interferogram are disclosed herein. The apparatus includes a multiple aperture SAR interferometry (MAI) interferogram generation unit, a transformed MAI interferogram generation unit, an ionospheric distortion interferogram generation unit, and a corrected SAR interferogram acquisition unit. The multiple aperture SAR interferometry (MAI) interferogram generation unit generates a multiple aperture SAR interferometry (MAI) interferogram using an SAR interferogram. The transformed MAI interferogram generation unit generates a transformed MAI interferogram representative of the azimuth direction derivatives of ionospheric distortion phases using the phases of the MAI interferogram. The ionospheric distortion interferogram generation unit generates an ionospheric distortion interferogram using the transformed MAI interferogram. The corrected SAR interferogram acquisition unit acquires a corrected SAR interferogram by eliminating the generated ionospheric distortion interferogram from the SAR interferogram. [A72]

"Methods and systems for suppressing clutter in radar systems"

Methods and systems for suppressing clutter, for example, ground clutter, in radar systems are provided. The methods and systems can be employed in radar systems having an antenna system and at least two receive beams, for example, a main beam and an auxiliary beam. The methods include receiving data streams from each of the at least two receive beams, where each data stream is associated with range bins and include data representing clutter, and, before or after Doppler filtering, generating an adaptive weight from summations of the data streams for each of the range bins, and applying the generated weight to at least one of the data streams to provide Doppler filtered and spatially nulled data streams that can be used to more accurately identify targets, such as, aircraft. [A73]

"Radar-based detection and identification for miniature air vehicles"

An unmanned aerial vehicle (UAV) radar apparatus may be used in aircraft detection and avoidance. The radar apparatus may include an RF front end configured to transmit and receive RF signals, a filtering module coupled with the RF front end module that filters RF signals received at the RF front end module, and a target data processing module coupled with the filtering module that detects and identifies one or more targets based on the filtered RF signals. Avoidance procedures may be initiated based on the identification and detection of one or more targets. [A74]

"Method and passenger information system for providing flight information data"

Method for providing flight information data for a passenger in an aircraft, wherein the flight information data are transmitted from a cockpit system in the aircraft to at least one passenger information system in the same aircraft, wherein the flight information data are transmitted as a secondary radar signal and/or monitoring signal and received by the at least one passenger information system. [A75]

"Directional speed and distance sensor"

A method of using a directional sensor for the purposes of detecting the presence of a vehicle or an object within a zone of interest on a roadway or in a parking space. The method comprises the following steps: transmitting a microwave transmit pulse of less than 5 feet, radiating the transmitted pulse by a directional antenna system, receiving received pulses by an adjustable receive window, integrating or combining signals from multiple received pulses, amplifying and filtering the integrated receive signal, digitizing the combined signal, comparing the digitized signal to at least one preset or dynamically computed threshold values to determine the presence or absence of an object in the field of view of the sensor, and providing at least one pulse generator with rise and fall times of less than 3 ns each and capable of generating pulses less than 10 ns in duration. [A76]

"Systems and methods for displaying obstacle-avoidance information during surface operations"

Systems and methods for aiding in pilot awareness of obstacles relative to aircraft features. An exemplary processor receives sensor information from one or more sensors mounted in an aircraft feature (e.g. light modules) , determines if at least one obstacle is located within a predefined field of view based on the received sensor or database information and generates an image. The image includes an ownship icon having at least one feature representing wingtips of the aircraft and at least one indicator associated with the determined at least one obstacle. A display device presents the generated image. The display device presents a tip of a first sense coverage area adjacent to one wingtip feature associated with the port wing and a tip of the second sense coverage area adjacent to one wingtip feature associated with the starboard wing. The indicator is presented within at least one of the coverage areas. [A77]

"Transportation using network of unmanned aerial vehicles"

Embodiments described herein include a delivery system having unmanned aerial delivery vehicles and a logistics network for control and monitoring. In certain embodiments, a ground station provides a location for interfacing between the delivery vehicles, packages carried by the vehicles and users. In certain embodiments, the delivery vehicles autonomously navigate from one ground station to another. In certain embodiments, the ground stations provide navigational aids that help the delivery vehicles locate the position of the ground station with increased accuracy. [A78]

"Method and a sensor for determining a direction-of-arrival of impingent radiation"

A sensor for determining a direction-of-arrival of radiation impingent on the sensor which has antennas positioned in a particular set-up different from a rectangle, so that information may be derived between two pairs of the antennas, positioned in corners of a rectangular grid and additional information may be derived from an additional antenna, combined with one of the "grid" antennas forming a third pair of antennas. The additional antenna is positioned away from the corners and other pre-defined lines of the rectangle/grid. In this manner, such as from phase differences between the pairs of antennas, more information may be derived compared to antennas positioned merely at the corners of a rectangle to remove ambiguous angles of direction-of-arrival without compromising accuracy of an angular determination. [A79]

"Systems and methods of analyzing moving objects"

According to some embodiments, the present disclosure may relate to a method including transmitting a microwave towards a moving object and receiving a reflection of the microwave reflecting off of the moving object. The method may also include determining a speed of the moving object based on the reflection of the microwave and based on the speed of the moving object and a flight path distance of the moving object, determining an optimal photograph timeframe when the moving object is in a field of view of a camera. The method may further include automatically capturing a plurality of images during the optimal photograph timeframe. [A80]

"Phase calibration of a stepped-chirp signal for a synthetic aperture radar"

A Radar Calibration Processor ("RCP") for calibrating the phase of a stepped-chirp signal utilized by a synthetic aperture radar ("SAR") is disclosed. The RCP includes a periodic phase error ("PPE") calibrator, first non-periodic phase error ("NPPE") calibrator in signal communication with the PPE calibrator, and a second NPPE calibrator in signal communication with the first NPPE calibrator. [A81]

"Aircraft weather radar coverage supplementing system"

In one example, this disclosure is directed to a system configured to receive weather data from one or more weather data sources. The system is further configured to receive, from a requesting weather radar system, a request for supplemental weather data covering an identified region, wherein the requesting weather radar system is associated with a specific weather radar data format. The system is further configured to identify a set of supplemental weather data for the identified region, based on the received weather data from the one or more weather data sources, wherein the supplemental weather data is in the specific weather radar data format associated with the requesting weather radar system and comprises weather forecast information for the identified region. The system is further configured to transmit the supplemental weather data for the identified region to the requesting weather radar system. [A82]

"System and method for 3D imaging using a moving multiple-input multiple-output (MIMO) linear antenna array"

A method generates a three-dimensional (3D) scene image of a scene using a MIMO array including a set of antenna by first selecting a subsets of the antennas as transmit antennas and receive antennas. Radio frequency (RF) signal are transmitted into the scene using the subset of transmit antennas while the MIMO array is moving at a varying velocity. The RF signal are received at the subset of receive antennas as MIMO data, which is aligned and regularized. Then, a compressive sensing (CS) -based reconstruction procedure is applied to the aligned MIMO data to generate the 3D image of the scene. [A83]

"Methods and apparatus for identifying terrain suitable for aircraft landing"

A method for providing landing assistance for an aircraft is provided. The method analyzes terrain data, identifies one or more landing zones, based on analyzing the terrain data, each of the one or more landing zones comprising a flat area lacking obstacles to aircraft landing, and presents the one or more landing zones via a display element onboard the aircraft. [A84]

"System and methods for automatically landing aircraft"

Disclosed is an autonomous landing system for landing a vertical take-off and landing (VTOL) aircraft. The autonomous landing system may include a flight control system having radar sensors, altimeters, and/or velocity sensors. The flight control system can include a processor to provide pitch, roll, and yaw commands to the VTOL aircraft based at least in part on data from the radar sensors, the altimeters, and/or the velocity sensors. The flight control system can be used to navigate and land the VTOL aircraft on a movable object, such as a ship. [A85]

"Display system and method using weather radar sensing"

An enhanced vision method uses or an enhanced vision system includes an onboard weather radar system configured to improve angular resolution and/or resolution in range. The onboard weather radar system generates image data representative of the external scene topography of a runway environment associated with radar returns received by the onboard weather radar system. The radar returns are in an X-band or a C-band. The enhanced vision system also includes a display in communication with the onboard weather radar system and is configured to display an image associated with the image data that is generated by the onboard weather radar system. The enhanced vision system can also be used as an enhanced flight vision system. [A86]

"Enhancing engine performance to improve fuel consumption based on atmospheric rain conditions"

Systems and methods for enhancing engine performance based on atmospheric rain conditions are provided. for example, a method can include selecting one or more points along a flight path of an aircraft and receiving a radar reflectivity measurement for each of the one or more points obtained using a radar device located on the aircraft. The method can further include determining an estimate of liquid water content for each of the one or more points based at least in part on the radar reflectivity measurements, and controlling at least one component of the aircraft engine (e.g., a variable stator vane) based at least in part on the estimate of liquid water content for at least one of the plurality of points. [A87]

"Locational and directional sensor control for search"

A method of controlling a directional facing of a sensor mounted to a vehicle includes storing, by a sensor control computer, previously-searched locations of a terrain at which the sensor is directed. The method includes determining a likelihood of detecting a target at one or more points on the terrain and controlling a directional facing of the sensor onto the terrain based on the previously-searched locations and the likelihood of detecting the target. [A88]

"Method for determining the geographic coordinates of pixels in SAR images"

A method for effecting the airborne determination of geographic coordinates of corresponding pixels from digital synthetic aperture radar images, where the SAR images are available in the form of slant range images and the recording position of the respective SAR image is known. The coordinates of the corresponding pixels in the SAR images and the corresponding range gates are used in each case to determine the distance between a corresponding resolution cell on the ground and the respective recording position of the respective SAR image. The determined distances and associated recording positions of the SAR images are used to determine the geographic coordinates of the corresponding pixels in the SAR images by employing a WGS84 ellipsoid. [A89]

"System and method for distinguishing ADS-B out function failures from transponder failures"

Systems and methods for testing and distinguishing ADS-B Out function failures from transponder failures are disclosed. The system may include a transponder configured to: detect a test signal on an electronic interface coupled with the transponder, in response to a detection of the test signal, determine whether the transponder is experiencing a transponder failure or an Automatic Dependent Surveillance-Broadcast (ADS-B) Out function failure, and for a predetermined period of time starting from the detection of the test signal, report a failure signal to only when it is determined that the transponder is experiencing the transponder failure. [A90]

"Aircraft navigation performance prediction system"

Systems and methods for predicting aircraft navigation performance are provided. In one embodiment, a method can include determining that one or more navigational aid measurements are not available to the aircraft. The method can include estimating a future actual navigation performance of the aircraft for a future point in the flight plan. The method can include determining a future required navigation performance associated with the future point in the flight plan. The method can include comparing the future actual navigation performance to the future required navigation performance to determine if the future actual navigation performance satisfies the future required navigation performance. The method can include providing, to an onboard system of the aircraft, information indicative of whether the future actual navigation performance satisfies the future required navigation performance. [A91]

"Generating a map conveying the probability of detecting terrestrial targets"

An exemplary computer implemented digital image processing method conveys probabilities of detecting terrestrial targets from an observation aircraft. Input data defining an observation aircraft route relative to the geographical map with lines of communications (LOC) disposed thereon are received and stored as well as input data associated an aircraft sensor's targeting capabilities and attributes related to the capability of targets to be detected. Percentages of time for line-of-sight visibility from the aircraft of segments of LOC segments are determined. Probability percentages that the sensor would detect a terrestrial target on the segments are determined. The segments are color-coded with visibility and sensor detection information. A visual representation of the map with the color-coded segments is provided to enhance the ability to select appropriate observation mission factors to achieve a successful observation mission. [A92]

"Aircraft systems and methods for providing landing approach alerts"

A method is provided for monitoring a landing approach of an aircraft. The method includes receiving instrument landing system (ILS) signals, determining a glideslope deviation from the ILS signals, disabling, when the glideslope deviation is less than a first predetermined threshold, at least one glideslope alert function, evaluating a current glideslope condition by comparing a designated glideslope angle to a glideslope check value, and re-enabling the at least one glideslope alert function when the glideslope check value differs from the designated glideslope angle by more than a second predetermined threshold. [A93]

"Measuring apparatus for measuring the trajectory of a target object"

A measuring apparatus for measuring the trajectory of a target object includes a receiving device having a primary mirror and a secondary mirror, a first detector for detecting first electromagnetic radiation having a first wavelength and a second detector for detecting second electromagnetic radiation having a second wavelength. The primary mirror is designed to reflect the first electromagnetic radiation and the second electromagnetic radiation and to direct the radiation onto a focal region. The secondary mirror is arranged between the primary mirror and the focal region and is designed to reflect only the second electromagnetic radiation in the direction of the second detector. The first detector is arranged behind the secondary mirror in the focal region of the primary mirror. [A94]

"Multiple sensor tracking system and method"

A system and method for tracking the flight of golf balls at driving range. The invention includes a plurality of hitting stations, a plurality of sensors, a computer, and a range surface. Each hitting station in the plurality of hitting stations includes a golf ball, a golf club, a monitor, and a sensor. At least one other sensor in the plurality of sensors is placed outside the hitting station. The flight path of the golf ball is calculated by the computer using parameters by the plurality of sensors. The method includes steps for determining whether a first sensor detected a first parameter and a second parameter, whether a second sensor detected a first and a second parameter, whether a third sensor detected a third parameter, and depicting the flight path of the golf balls using the first parameter, the second parameter, and the third parameter. [A95]

"Method and a device for assisting low altitude piloting of an aircraft"

A method of assisting low altitude piloting of an aircraft and comprising determining at least one main guard curve, determining all of the obstacles present in at least one search zone, and performing a comparison between a top of each obstacle of a search zone and the main guard curve. In order to perform the comparison, if at least one "potentially dangerous" obstacle is situated above the main guard curve in a search zone, then, for each potentially dangerous obstacle, a sight angle (.alpha.) is determined for the top of the potentially dangerous obstacle, and it is considered that the most dangerous obstacle is the potentially dangerous obstacle presenting the greatest sight angle (.alpha.) . [A96]

"Integrated, externally-mounted ADS-B device"

An integrated, externally-mounted Automated Dependent Surveillance-Broadcast (ADS-B) device comprising in one embodiment a 1030 MHz transmitter, a 1030 MHz antenna, a 1090 MHz receiver, a 1090 MHz antenna, a GNSS receiver, at least one GNSS antenna, a 978 MHz transmitter, and a 978 MHz antenna, wherein these components are integrated into a single enclosure, and wherein the GNSS antenna is placed at least partially into a projection extending out from the main enclosure body, such that the GNSS antenna has improved visibility to GNSS signals originating from altitudes above the current altitude of aircraft when the ADS-B device is mounted on the bottom of an aircraft. [A97]

"Method and system for detecting man-made objects using polarimetric, synthetic aperture radar imagery"

A system and method for locating a man-made object comprising a transmitter and receiver combination or transceiver configured to emit mixtures of polarizations comprising HH, VV, VH and or HV polarization images, at least one processor configured to form co-polarimetric and cross-polarimetric images, to select a pixel under test and analyze the surrounding pixels by performing spatial averaging using the cross polarimetric image, and to replace the pixel under test and the pixels adjacent thereto with an average pixel value calculated from the pixel under test and pixels adjacent thereto, the at least one processor configured to diminish background effects to produce clearer co-polarimetric and cross-polarimetric images and to locate the left-right point of symmetry indicative of a man-made object by comparing each pixel under test in the cross-polarimetric image to pixels in the vicinity to locate an intensity differential in excess of 3 dB. [A98]

"Detection of stealth vehicles using VHF radar"

A radar system for detecting stealth vehicles, e.g., stealth aircraft. Relatively long-wavelength very high frequency (VHF) or ultra high frequency (UHF) radar radiation is used to reduce the ability of the stealth vehicle to direct the reflected radar radiation away from the radar receiver. The radar is operated with two or more transmitting beams. The beams are separately modulated and misaligned relative to each other. When the stealth vehicle is nearer to a first beam than to a second beam of the transmitting beams, the vehicle reflects more of the first beam radar radiation, and more of the corresponding modulation, back toward the receiver. The receiver measures the magnitudes of the modulations in the reflected radar radiation and infers, from the difference between these magnitudes, the direction to the stealth vehicle. [A99]

"Collision detection system"

An aircraft ground collision detection system comprising: an object detection device for mounting on an aircraft and arranged to detect objects and output the location of each detected object, and a processor arranged to: receive the ground speed of the aircraft and the heading of the aircraft and the detected location of each detected object, predict the aircraft's path based on the ground speed and the heading, compare the predicted aircraft path with the object locations, and output an alert based on the overlap or proximity of the predicted aircraft path with the object locations. By predicting the path of the aircraft based on detected ground speed and heading, the system can accurately assess which detected objects pose a collision threat. [A100]

"Synthetic aperture radar processing"

For synthetic aperture radar (SAR) processing, a SAR receives a plurality of SAR signals. The SAR generates a piecewise approximation of the plurality of SAR signals over a coherent processing interval. The piecewise approximation may mitigate phase reflection components of each SAR signal. The SAR further generates an estimate of the scene from the piecewise approximation. [A101]

"Enhancement of airborne weather radar performance using external weather data"

Systems and methods for controlling a weather radar system are provided. A system for controlling a weather radar system includes a communications system including a transmitter-receiver and a processor. The transmitter-receiver is configured to receive first weather data from an external location. The first weather data includes a first weather condition, a location of the first weather condition, and a time of sensing the first weather condition. The processor includes a control module coupled with the communications system and configured to determine a point of interest based on the first weather data, acquire, by controlling an onboard weather radar system, second weather data at the point of interest, provide data representative of weather near the point of interest based at least in part on the second weather data, and transmit, by the transmitter-receiver, the data representative of weather near the point of interest to an external weather radar system. [A102]

"Multiple-swath stripmap SAR imaging"

A SAR imaging method is provided that performs N SAR acquisitions in stripmap mode of areas of the earth's surface by means of a synthetic aperture radar transported by an aerial or satellite platform and which includes a single, non-partitioned antenna and a single receiver coupled to the single, non-partitioned antenna, N being an integer greater than one. Each SAR acquisition in stripmap mode is performed using a respective squint angle with respect to the flight direction of the synthetic aperture radar and a respective elevation angle with respect to the nadir of the synthetic aperture radar. The method may further generate SAR images of areas of the respective swath observed via the SAR acquisition in stripmap mode. All SAR images have the same azimuth resolution that is equal to half the physical or equivalent length along the azimuth direction of the single, non-partitioned antenna of the synthetic aperture radar. [A103]

"High-resolution stripmap SAR imaging"

A SAR imaging method performs N SAR acquisitions in stripmap mode of the earth's surface using a synthetic aperture radar transported by an aerial or satellite platform and including a single, non-partitioned antenna and a single receiver coupled thereto. All N SAR acquisitions are performed using the same predetermined elevation angle relative to the nadir of the synthetic aperture radar and using a respective squint angle relative to the flight direction of the synthetic aperture radar. Radar transmission and reception operations are time interleaved with other N-1 SAR acquisitions, resulting in the respective acquisition directions being parallel to each other and not parallel to acquisition directions of other N-1 SAR acquisitions. Radar beams in two immediately successive time instants and related to two different SAR acquisitions are contiguous along the azimuth. SAR images may be generated using all the N SAR acquisitions having an enhanced azimuth resolution. [A104]

"Ball spin rate measurement"

Systems and methods for ball spin rate measurement are described. Some embodiments provide a method whereby a phase-demodulated difference signal of a projectile in flight is received, such as from a Doppler radar system. A first periodic component of the phase-demodulated signal is detected, the first periodic component having a plurality of bipolar pulses, with each of the pulses having a first portion during which an apparent speed of the projectile is greater than a nominal speed of the projectile, and each of the pulses having a second portion during which the apparent speed of the projectile is less that the nominal speed of the projectile. A period of the first periodic component is detected, and the spin rate of the projectile in flight is determined based on the period of the first periodic component. [A105]

"Weather radar system and method for detecting a high altitude crystal cloud condition"

The hazard warning system that included processing system for detecting a high altitude ice crystal (HAIC) or HAIC cloud (HAIC.sup.2) condition. The aircraft warning system can use an inferred detected process or a non-inferred detection process. Warnings of high altitude ice crystal conditions can allow an aircraft to avoid threats posed by HAIC or HAIC.sup.2 conditions including damage to aircraft equipment and engines. [A106]

"System and method for 3D SAR imaging using compressive sensing with multi-platform, multi-baseline and multi-PRF data"

A method generates a 3D synthetic aperture radar (SAR) image of an area by first acquiring multiple data sets from the area using one or more SAR systems, wherein each SAR system has one or more parallel baselines and multiple pulse repetition frequency (PRF) , wherein the PRF for each baseline is different. The data sets are registered and aligned to produce aligned data sets. Then, a 3D compressive sensing reconstruction procedure is applied to the aligned data sets to generate the 3D image corresponding to the area. [A107]

"Systems and methods for using velocity measurements to adjust doppler filter bandwidth"

Systems and methods for using velocity measurements to adjust Doppler filter bandwidth are provided herein. In certain embodiments, a method for adjusting bandwidth for at least one Doppler filter in a Doppler beam sharpened radar altimeter comprises receiving a velocity measurement, adjusting the bandwidth of the at least one Doppler filter based on the velocity measurement, and transmitting a radar beam, wherein the radar beam is aimed toward a surface. The method further comprises receiving at least one reflected signal, wherein the at least one reflected signal is a reflection of the radar beam being reflected off of at least one portion of the surface, and filtering the at least one reflected signal with the at least one Doppler filter to form at least one Doppler beam. [A108]

"Method for measuring a time of flight"

A method of measuring the phase of a response signal relative to a periodic excitation signal, comprises the steps of producing for each cycle of the response signal two transitions synchronized to a clock and framing a reference point of the cycle, swapping the two transitions to confront them in turns to the cycles of the response signal, measuring the offsets of the confronted transitions relative to the respective reference points of the cycles, performing a delta-sigma modulation of the swapping rate of the two transitions based on the successive offsets, and producing a phase measurement based on the duty cycle of the swapping rate. [A109]

"Method and apparatus for drone detection and disablement"

A preferred embodiment of a method and apparatus for detection and disablement of an unidentified aerial vehicle (UAV) includes arrays of antenna elements receiving in two modalities (for instance radio frequency (RF) and acoustic modalities, or RF and optical modalities) . Signal processing of outputs from multiple antenna arrays locates a potential UAV at specific coordinates within a volume of space under surveillance, and automatically aims video surveillance and a short-range projectile launcher at the UAV, and may automatically fire the projectile launcher to down the UAV. [A110]

"Systems and methods for walking pets"

Systems and methods are provided for guiding a target object with an unmanned aerial vehicle (UAV) in an environment. The UAV may be able to recognize and locate the target object. The UAV can be configured to communicate the actions and behavior of the target object to a user through a user device in communication with the UAV. The UAV can provide positive and negative stimuli to the target object to encourage an action or behavior. The UAV can be configured to recognize and manage waste generated by the target object. [A111]

"Electronic countermeasures transponder system"

A system is provided that has an ECM (electronic counter measures) system and a transponder monitor connected to or forming part of the ECM system. The system monitors for a transponder signal from a remote transponder. The system determines information, such as transponder location, based on the transponder signal and makes use of the information in the ECM system and/or the system extracts encoded information contained in the transponder signal, such as information about a transponder owner, such as status of consumables, medical status. The ECM system may have a reactive jammer that is used both for a reactive jamming function, and as the transponder monitor function. [A112]

"Radar apparatus and method"

A radar apparatus for obtaining a higher resolution than conventional SAR apparatus without increasing the bandwidth comprises a transmitter antenna and a receiver antenna. A mixer mixes said receive signal with said transmit signal to obtain a mixed receive signal, and a sampling unit samples said mixed receive signal to obtain receive signal samples from a period of said receive signal. A processor processes said receive signal samples by defining a spatial grid in the scene with a finer grid resolution than obtainable by application of a synthetic aperture radar algorithm on the receive signal samples and determining reflectivity values at grid points of said spatial grid by defining a signal model including the relative geometry of said transmitter antenna and said receiver antenna with respect to the scene, said transmit signal and said spatial grid and applying compressive sensing on said receive signal using said signal model. [A113]

"Systems and methods for remote L-band smart antenna distance measuring equipment diversity"

Various avionics systems may benefit from the proper handling of diversity with respect to antennas. for example, systems and methods for remote L-band smart antenna distance measuring equipment may benefit from being prepared to provide diversity against interference, such as a multipath interference. A method can include determining which antenna of a plurality of antennas of an aircraft is preferred for communication with respect to distance measuring equipment. The method can also include selecting the antenna based on the determination. [A114]

"Wind turbine blade vibration detection and radar calibration"

A wind turbine is provided, having a wind turbine tower and at least one rotatable blade, and further comprising a system for measuring rotor blade vibration of said wind turbine. The system comprises at least one Doppler radar unit operatively configured to emit and receive radar signals, the radar unit being mounted on the wind turbine tower at a position above the lowest position of the at least one blade, the radar unit being positioned so as to measure reflections of an emitted radar signal from the turbine blade. A processing unit is configured to receive measurement data from the radar unit and to determine, by analysis of Doppler shift in received radar signals relative to transmitted signals due to movement of the blade towards or away from the turbine tower, the velocity of the blade in the direction towards or away from the turbine tower. Using a radar unit to measure blade velocity allows a determination to be made of the vibrations occurring in the blade without needing an internal sensor in the blade. This reduces manufacturing and maintenance costs of the blades since sensors in the blades will not need to be replaced, and sensors positioned on the tower are easier to replace in the field. [A115]

"Wind turbine blade vibration detection and radar calibration"

A wind turbine (1) is provided, having a wind turbine tower (2) and at least one rotatable blade (5) , and further comprising a system for measuring rotor blade vibration of said wind turbine. The system comprises at least one Doppler radar unit (7) operatively configured to emit and receive radar signals, the radar unit being mounted on the wind turbine tower at a position above the lowest position of the at least one blade, the radar unit being positioned so as to measure reflections of an emitted radar signal from the turbine blade. A processing unit is configured to receive measurement data from the radar unit and to determine, by analysis of Doppler shift in received radar signals relative to transmitted signals due to movement of the blade towards or away from the turbine tower, the velocity of the blade in the direction towards or away from the turbine tower. Using a radar unit to measure blade velocity allows a determination to be made of the vibrations occurring in the blade without needing an internal sensor in the blade. This reduces manufacturing and maintenance costs of the blades since sensors in the blades will not need to be replaced, and sensors positioned on the tower are easier to replace in the field. [A116]

"Probe tip cooling"

A probe cooling system for a gas turbine engine includes a probe housing and a bushing disposed between an end of the probe housing and a gas path, the bushing extending from the end of the probe housing to form a cavity. The system also includes a first plenum defined within the probe housing and configured to direct air from an internal cooling air supply towards the cavity. The system also includes a second plenum defined between the bushing and the probe housing and configured to direct air from the internal cooling air supply towards the cavity. [A117]

"Single beam FMCW radar wind speed and direction determination"

A single beam frequency modulated continuous wave radar for clear air scatter (CAS) detection and method of monitoring clear air scatterers are provided. CAS monitoring capabilities, including the ability to estimate wind velocity and direction, are obtained using data from a single defined width beam of energy that instead of being averaged is sampled at discrete time steps over a range of altitudes. [A118]

"Dynamic image masking system and method"

A dynamic image masking system for providing a filtered autonomous remote sensing image through a dynamic image masking process is provided. The dynamic image masking system has a remote sensing platform and an imaging system associated with the remote sensing platform. The imaging system has an optical system and an image sensing system. The dynamic image masking system further has a multi-level security system associated with the imaging system and one or more image alteration locations located in the imaging system and the multi-level security system, wherein alteration of one or more images takes place via the dynamic image masking process. The dynamic image masking system further has a computer system associated with the imaging system. The computer system has a gatekeeper algorithm configured to send gatekeeper commands to one or more controllers that control the one or more image alteration locations through the dynamic image masking process. [A119]

"System and method for ice detection"

A hazard warning or weather radar system or method can be utilized to determine a location of ice. The system and method can be used in an aircraft. The aircraft weather radar system can include a radar antenna and an electronic processor. The radar antenna receives radar returns. The processor determines levels of icing conditions and causes the levels to be displayed on an electronic display. [A120]

"Radar velocity determination using direction of arrival measurements"

The various technologies presented herein relate to utilizing direction of arrival (DOA) data to determine various flight parameters for an aircraft A plurality of radar images (e.g., SAR images) can be analyzed to identify a plurality of pixels in the radar images relating to one or more ground targets. In an embodiment, the plurality of pixels can be selected based upon the pixels exceeding a SNR threshold. The DOA data in conjunction with a measurable Doppler frequency for each pixel can be obtained. Multi-aperture technology enables derivation of an independent measure of DOA to each pixel based on interferometric analysis. This independent measure of DOA enables decoupling of the aircraft velocity from the DOA in a range-Doppler map, thereby enabling determination of a radar velocity. The determined aircraft velocity can be utilized to update an onboard INS, and to keep it aligned, without the need for additional velocity-measuring instrumentation. [A121]

"Systems and methods for conflict detection using dynamic thresholds"

Systems and methods are delineated in which dynamic thresholds may be employed to detect and provide alerts for potential conflicts between a vehicle and another vehicle, an object or a person in an aircraft environment. Current systems for airport conflict detection and alerting consider one or more alerting boundaries which are independent of the amount of traffic present at any one time or over the course of time. Because nuisance alerts rates depend to a large extent on the amount of traffic, and because alert detection thresholds are often set based on a desire to limit nuisance alerts to a specific threshold, adapting those thresholds based on, among other things, the amount of traffic can result in earlier alerting in some crash scenarios and can even result in providing an alert in a crash scenario where no alert would have otherwise been generated. [A122]

"Aircraft landing systems and methods"

A method for controlling an aircraft includes storing data aboard the aircraft. The data include the relative positions of radar targets disposed within a region adjacent to the runway. The region is scanned with a radar aboard the aircraft to obtain data corresponding to the relative positions of radar reflections from the region, including reflections from the radar targets. The data corresponding to the radar targets is distinguished from the data corresponding to the radar reflections from the region using correlation techniques. The position and attitude of the aircraft relative to the runway is then assessed using the stored data and the data corresponding to the radar targets. The position and attitude of the aircraft relative to the runway is also evaluated using an independent navigation system. The difference between the assessed position and attitude and the evaluated position and attitude is then used to control the aircraft. [A123]

"System and method for locating impacts on an external surface"

A method for locating external surface impacts on a body. The steps are: modeling the body in a control unit first database to obtain a virtual body model in a virtual system of reference axes, modeling, in a second database, a plurality of clouds of points in the virtual system, each cloud defining an inspection zone representing an external surface portion, selecting an inspection zone, transferring the coordinates of each point of the first and second databases to a geographic system of reference axes, determining geographic coordinates of an initial position of a range finder equipped flying drone communicating with the processing unit, calculating a drone flight plan to scan the selected inspection zone, creating a 3D meshing of the scanned inspection zone, detecting the impacts by comparing the 3D meshing and the virtual aircraft model and calculating the coordinates of each impact in the geographic and virtual systems. [A124]

"Flight hindrance display apparatus, flight hindrance display method, and computer-readable medium"

A flight hindrance display apparatus includes circuitry. The circuitry is configured to acquire surrounding information of an aircraft. The surrounding information is related to a hindrance factor which is a possible flight hindrance to the aircraft. The circuitry is configured to determine a spatial range of the flight hindrance factor on a basis of the acquired surrounding information. The circuitry is configured to determine a flight hindrance cross-section that intersects a plane including a vector of a flight direction of the aircraft and is included in the determined spatial range of the flight hindrance factor. The circuitry is configured to cause a display unit to stereoscopically display an own position of the aircraft, the spatial range of the flight hindrance factor, and the flight hindrance cross-section. [A125]

"Multi-part navigation process by an unmanned aerial vehicle for navigation"

Embodiments described herein may relate to an unmanned aerial vehicle (UAV) navigating to a target in order to provide medical support. An illustrative method involves a UAV (a) determining an approximate target location associated with a target, (b) using a first navigation process to navigate the UAV to the approximate target location, where the first navigation process generates flight-control signals based on the approximate target location, (c) making a determination that the UAV is located at the approximate target location, and (d) in response to the determination that the UAV is located at the approximate target location, using a second navigation process to navigate the UAV to the target, wherein the second navigation process generates flight-control signals based on real-time localization of the target. [A126]

"Weather radar system and method for high altitude crystal warning interface"

A hazard warning system can be utilized in an aircraft. The hazard warning system can include a processing system for determining a high altitude ice crystal (HAIC) condition and causing a warning of the HAIC condition to be displayed. An avionic display can be used to display the warning of the HAIC condition. [A127]

"System and method for determining helicopter rotor blade performance"

A helicopter rotor blade performance system (BPS) allows for accurate determination of blade track height and blade track phase while reducing size, weight, and complexity of the system. The BPS uses sensing technology that is scalable to adapt to a variety of helicopters and is readily and unobtrusively installed. The BPS includes a bused smart system methodology that can directly measure track height, while phase can be estimated using the time synchronous average of the magnitude or range of the return signal from a radar wave. The BPS includes a rotation monitor, radar tracker, and control unit, that allows for a determination of the track errors and consequentially whether a track rebalancing should occur. [A128]

"Efficient retrieval of aviation data and weather over low bandwidth links"

A method of selectively displaying an image representative of a weather condition in relation to an aircraft includes selecting, on a display screen, a display area to display weather data based on the location of the aircraft, selecting a weather condition to display from among a plurality of weather conditions, determining if any weather conditions are available to be displayed outside the selected display area and if the weather conditions should be displayed outside the selected display area based on the location of the aircraft and the severity of the non-selected weather conditions, receiving, from a weather data source, weather data representative of the selected weather condition with respect to the selected display area, and receiving weather data representative of weather conditions that should be displayed outside the selected display area, the weather data including location data for the weather conditions, and displaying the image representative of the selected weather condition within the selected display area and the weather conditions that should be displayed outside the selected display area, the image based on the received weather data. [A129]

"Location based services provided via unmanned aerial vehicles (UAVs)"

An automated method of determining a location of an aerial platform is described. The method includes: transmitting, from the aerial platform, a first pilot signal, receiving, at a set of ground devices, the first pilot signal, determining a first set of values based on measurements associated with the first pilot signal, and calculating a position of the aerial platform based at least partly on the first set of values. An automated method adapted to determine a location of a ground device includes: transmitting, from the ground device, a first pilot signal, receiving, at each aerial platform in a set of aerial platforms, the first pilot signal, determining a first set of values based on measurements associated with the first pilot signal, and calculating a position of the ground device based at least partly on the first set of values. A system adapted to provide location information is described. [A130]

"Radar weather detection for a wind turbine"

A radar system for a wind turbine is provided. The radar system comprises a first radar unit (42) and a control unit (41) arranged to receive an output from the radar unit, the control unit comprising a central processing unit. The central processing unit is configured to perform a first function of determining at least one property of aircraft within a monitoring zone in the vicinity of the wind turbine and controlling a warning device to output a warning signal to detected aircraft based on the determined property, and perform a second function of determining at least one parameter of prevailing weather in the vicinity of the wind turbine. A corresponding method is also provided. [A131]

"Joint synthetic aperture radar plus ground moving target indicator from single-channel radar using compressive sensing"

The various embodiments presented herein relate to utilizing an operational single-channel radar to collect and process synthetic aperture radar (SAR) and ground moving target indicator (GMTI) imagery from a same set of radar returns. In an embodiment, data is collected by randomly staggering a slow-time pulse repetition interval (PRI) over a SAR aperture such that a number of transmitted pulses in the SAR aperture is preserved with respect to standard SAR, but many of the pulses are spaced very closely enabling movers (e.g., targets) to be resolved, wherein a relative velocity of the movers places them outside of the SAR ground patch. The various embodiments of image reconstruction can be based on compressed sensing inversion from undersampled data, which can be solved efficiently using such techniques as Bregman iteration. The various embodiments enable high-quality SAR reconstruction, and high-quality GMTI reconstruction from the same set of radar returns. [A132]

"Systems and methods for providing an ATC overlay data link"

Embodiments of the present invention disclose systems and methods for providing an ATC Overlay data link. Through embodiments of the present invention, existing ATC (or other) modulated signals using existing standard frequencies may be utilized to transmit (e.g., from an aircraft transponder) additional information in a manner that does not render the transmitted signal unrecognizable by legacy ATC equipment. Legacy equipment will be able to demodulate and decode information that was encoded in the transmitted signal in accordance with preexisting standard modulation formats, and updated equipment can also extract the additional information that was overlaid on transmitted signals. [A133]

"Transponder for doppler radar, target location system using such a transponder"

A transponder, able to equip a cooperative target facing a Doppler radar, includes at least one receiving antenna able to receive a signal transmitted by said radar and a transmitting antenna able to retransmit a signal. The signal received by the receiving antenna is amplitude-modulated before being retransmitted by the transmitting antenna to produce a variation of the radar cross-section of the target, the variation triggering a frequency shift between the signal transmitted and the signal received by the radar comparable to a Doppler echo. The transponder applies notably to the field of radars, more particularly for collaborative systems also operating at low velocity or nil velocity. It applies for example to assisted take-off, landing and deck-landing of drones, in particular rotary-wing drones, as well as manned helicopters. [A134]

"Foreign object debris detection system and method"

A method for suppressing the Jet Engine Modulation (JEM) clutter signal returns from compressor blades (26) in data sampled by a system for Foreign Object Debris (FOD) detection in the air intake (30) of a turbine assembly, the method comprising the steps of: (a) identifying in the data the start sample position and length in samples of a single complete shaft rotation, and (b) subtracting from a current rotation dataset the samples from a comparison rotation dataset corresponding to another complete single shaft rotation. [A135]

"Detection and tracking of land, maritime, and airborne objects using a radar on a parasail"

A method and apparatuses may be provided for detection, tracking, and classification of one or more land, maritime, or airborne objects using a real-aperture radar mounted on a parasail airborne platform. Both wide-area and localized radar surveillance can be provided, and the radar can be either a non-coherent radar or coherent radar. A method and apparatus may use a low-cost, rotating, single-beam, non-coherent, X-band radar that is mounted on an unmanned powered parasail and operated remotely like an Unattended Airborne System (UAS) . The parasail, which may be expendable or recoverable, manned or unmanned, powered or unpowered, may have a low operational cost, can carry a heavy payload, stay on station for a long time, circle or move to a specified location for surveillance, operate at an optimal altitude and look-angle, and automatically cue or manually steer an EO/IR camera to a target of interest for classification and identification. [A136]

"Sectorized antennas for improved airborne reception of surveillance signals"

A plurality of antenna elements may receive a plurality of signals. Each of the plurality of antenna elements may correspond to at least one of a plurality of sectors of a sectorized antenna. A receiver may process each of the plurality of signals in parallel, including decoding one or more messages from the plurality of signals. The receiver may output at least one of the one or more messages. [A137]

"Apparatus and method for converting multi-channel tracking information for integrated processing of flight data"

The present inventive concept relates to an apparatus and method for multiplexing tracking information output from a plurality of tracking radar systems that are operated upon testing the flight of guided weapons, converting the multiplexed tracking information into a single PCM stream signal, and processing the tracking information together with telemetry data in an integrated manner, thus enabling the tracking information to be simply and economically utilized for test control and measurement tasks. The apparatus for converting multi-channel tracking information for integrated processing of flight data, includes a signal receiver for receiving pieces of tracking information from tracking radar systems through a plurality of input channels, a programmable semiconductor for multiplexing the pieces of tracking information, and converting the multiplexed tracking information into a data stream-type Pulse Code Modulation (PCM) frame, and a line driver for outputting the PCM frame to another piece of equipment. [A138]

"Identification or messaging systems and related methods"

An identification or messaging system is provided that has embodiments including a embodiment with a structure with different faces and a base with reflective or resonance panels which are positioned at different receiving angles to detect direct signals and amplify them including in a sequence to be detected by an active emitter that emits electromagnetic radiation that is reflected and steered or resonated off or with the panels. An emitter can be an aerial platform with the emitter and a library of reflected or resonated signals that are associated with a particular sequence of panels on the structure which are associated with a particular entity identification or message. Thermal patterned and/or magnetic patterned panels (e.g., for backplane beamforming) and return signal steering can also be provided. Embodiments with secondary signaling systems can also be provided. A variety of various embodiments and methods are also provided. [A139]

"Systems and methods of precision landing for offshore helicopter operations using spatial analysis"

Systems and methods of precision landing in adverse conditions are provided. In one embodiment, a precision landing system comprises a vehicle including: a receiver configured to receive position information for structures and a landing zone of a landing site and a processor coupled to a memory, the memory includes three-dimensional geometric structural information for a landing site. The processor configured to: receive the position information from the receiver, assign geographical coordinates to the three-dimensional geometric structural information using the position information for the structures and the landing zone of the landing site, send the three-dimensional geometric structural information and graphical rendering information to a display device. The vehicle further includes a display device, wherein the display device is configured to render and display a three-dimensional representation of the landing site in real-time based on the three-dimension geometric structural information and the graphical rendering information from the processor. [A140]

"Gimbal-assisted radar detection system for unmanned aircraft system (UAS)"

A gimbal-assisted continuous-wave (CW) Doppler radar detection system mountable to an unmanned aircraft system may be rotated in three degrees of freedom relative to the UAS to provide targeted multidirectional obstacle detection by transmitting CW signals throughout a field of view and analyzing reflected signals from obstacles within the field of view. The radar assembly may be articulated to provide track-ahead detection in anticipation of a heading or altitude change of the UAS, to center on a detected obstacle in order to classify or identify it more clearly. The radar assembly may be rotated below the UAS and its field of view changed to increase breadth and accuracy at a shorter effective range, in order to determine real-time altitude or terrain data while the UAS executes a landing. [A141]

"Method, system and apparatus of time of flight operation"

An apparatus, a system and a method of waking up a station in a wireless local area network (WLAN) to perform time of flight (ToF) measurements. A wake-up signal for waking the station may be configured for a low energy signaling. [A142]

"System for and method of radar data processing for low visibility landing applications"

An apparatus is for use with an aircraft radar system having a radar antenna. The apparatus comprises processing electronics are configured to receive radar data associated with the radar antenna of the system. The processing electronics are also configured to detect periodic data associated with runway lights in the radar data. [A143]

"Redundant determination of positional data for an automatic landing system"

An automatic landing system contains a control device for providing positional data for controlling an aircraft, a first position or range measuring device for detecting first positional data of the aircraft, a second position or range measuring device for detecting second positional data of the aircraft, and a sensor device for detecting sensor data from which a direction in which a landmark is located and/or a distance of the landmark to the aircraft can be determined. The control device may be configured to generate, based on the first positional data, a first hypothesis for the direction and distance of the landmark and, based on the second positional data, a second hypothesis for the direction and distance of the landmark. Moreover, the control device may be configure to confirm or discard the first hypothesis and the second hypothesis, respectively, using the sensor data detected by the sensor device. [A144]

"Radar device and process therefor"

A radar device for the transmission of a signal in a frequency band. The radar device includes a control means and an oscillator. The input of the oscillator is connected to the control means by means of a converter. The oscillator is controllable by means of the control means for the generation of the signal. The signal is generated by means of the oscillator and can be picked up on an output of the oscillator. The radar device also includes at least one transmission aerial for the transmission of the signal being present at the output of the oscillator. The transmission aerial is connected to the output of the oscillator. At least one receiver channel is provided for the reception of a received signal and for the processing of the received signal and for the transmission of the processed received signal to the control means. The receiver channel has at least one receiving aerial and a mixer for the mixing of the received signal with the signal which is present at the output of the oscillator. The mixer is connected to the output of the oscillator, and the output of the oscillator is connected to an input of a switchable amplifier and the amplifier provides a signal at the output and transmits it to the at least one mixer. A wattmeter is provided, which monitors the signal at the output of the amplifier and transmits it to the control means. [A145]

"Systems and methods for efficient reception and combining of similar signals received on two or more antennas"

A radio signal processing system includes a first antenna, a second antenna, a first receiver communicatively coupled to the first antenna, a second receiver communicatively coupled to the second antenna, a first processing unit communicatively coupled to the first receiver and configured to receive a first signal from at least one of the first antenna and the second antenna when the system is operating in a first mode, a second processing unit communicatively coupled to the second receiver and configured to receive a second signal from the second antenna when the system is operating in a first mode, and wherein the first processing unit is further configured to receive a third signal from both the first antenna and the second antenna when the system is operating in a second mode. [A146]

"Weather radar system and method for detecting a high altitude crystal condition using two or more types of radar signals"

The hazard warning system that included processing system for detecting a high altitude ice crystal (HAIC) condition. The aircraft warning system can use at least two types of radar returns to detect the HAIC condition. Warnings of high altitude ice crystal conditions can allow an aircraft to avoid threats posed by HAIC conditions including damage to aircraft equipment and engines. [A147]

"System and method for wide-area stratospheric surveillance"

Methods and apparatuses for providing wide-area surveillance with a radar and/or other sensors from a stratospheric balloon launched from a land or ship platform for detection, tracking, and classification of maritime, land, and air objects such as ships, people/vehicles, or aircraft are described generally herein. In one or more embodiments, an apparatus is battery operated and includes a stratospheric balloon filled that is filled with helium when it is launched and a gondola with a radar system and communication equipment suspended therefrom. When launched, the apparatus can travel with the wind until it reaches an altitude of approximately 68,500 ft., then it can move substantially horizontally with the stratospheric winds until it returns to earth via a parachute. Multiple apparatus launches at periodic intervals can help provide continuous coverage of the surveillance area. The apparatus can be recovered and re-used or can be considered expendable. [A148]

"Radio altimeter for detecting accurate height"

A method and system for adjusting a gain from a receiver antenna. The method may include accessing a radio altimeter data structure for antenna gain data. The antenna gain data may be associated with one or more antennas including a receiver antenna. Additionally, the method may include receiving aircraft maneuver data from a reference system. Furthermore, the method may include adjusting a gain from the receiver antenna based at least on the aircraft maneuver data. [A149]

"Forward looking turret"

A gimbal mechanism for a turret includes a support member and a pair of opposing yoke arms extending from the support member. The pair of opposing yoke arms define a first axis. A sphere is rotatably mounted between the opposing yoke arms for rotation about the first axis. A disk is rotatably mounted within the sphere for rotation about a second axis perpendicular to the first axis. The disk is sized for rotation within the sphere. The second axis may be offset from the first axis. An aperture is provided in the disk. The sphere includes a slot within which the aperture is moveable in response to rotation of the disk about the second axis. The aperture is movable to define a field of coverage in response to rotation of the sphere about the first axis and the disk about the second axis. [A150]

"Integratable ILS interlock system"

Methods and compositions for preventing opposing ILS systems on a single runway from becoming active at the same time. A physical interlock system employs a physical switch element that may activate a first ILS system or an opposing second ILS system, but is not capable of permitting, and may prevent, opposing ILS systems from being active simultaneously. Also included are methods for preventing opposing ILS systems on a single runway from becoming active, comprising the use of a physical switch preventing activating signals from being sent to opposing ILS systems at the same time. [A151]

"Vertical profile display including hazard band indication"

A vertical profile display includes weather information for an aircraft. In some examples, the weather is displayed in the vertical profile display with a hazard band indication. The hazard band indication includes an upper limit line positioned within the vertical profile view at a position corresponding to an altitude greater than or equal to an altitude above which no hazardous weather cells were detected. In some examples, the vertical profile display also includes one or more weather icons, with each weather icon indicating a weather condition for a volume of space. [A152]

"Method and system for rendering a synthetic aperture radar image"

The present disclosure relates to a method (100) for rendering a simulated Synthetic Aperture Radar, SAR, image. The method comprises providing (110) a digital surface model or the like comprising 3D coordinate data in a geo-referenced coordinate system, determining (120) a sub-section of the digital surface model, and obtaining (130) the simulated SAR image based on the subsection of the digital surface model, wherein substantially each point in the simulated SAR image being associated to a 3D coordinate in the geo-referenced coordinate system. [A153]

"High-availability ISAR image formation"

A system and method for high-availability inverse synthetic aperture radar (ISAR) . In one embodiment a set of quadratic phase vectors, each corresponding to a different acceleration, is multiplied, one at a time, in a Hadamard product, with a 3-dimensional data cube, and a fast Fourier transform (FFT) is taken of the result, to form a 2-dimensional array. The two-dimensional array is made sparse by setting to zero elements that fall below a threshold based on a coherency metric, and the sparse arrays are stacked to form a sparse 3-dimensional image. Projections of the sparse 3-dimensional image are formed for presentation to an operator or an image exploitation system. [A154]

"Time of arrival delay cancellations"

The invention relates to a ranging system for measuring the distance between an interrogator and a transponder. The transponder includes: a signal receiver for receiving a challenge signal from an interrogator, a signal processor for processing the challenge signal and generating a response signal in response to the challenge signal, a buffer for storing the response signal generated by the signal processor, and a signal transmitter for sending the response signal stored in the buffer when the signal processor receives a ranging signal from the interrogator, wherein a time interval between the challenge signal and the ranging signal is known to both transponder and the interrogator. [A155]

"Synthetic aperture radar system"

Low cost, generally broad bandwidth synthetic aperture radar systems are detailed. The systems may be bistatic and include analog to digital converters in ground based receivers while transmitters and analogoue repeaters may be space-borne or airborne. Methods of producing synthetic aperture radar images also are detailed. [A156]

"Method for focusing a high-energy beam on a reference point on the surface of a flying object in flight"

A method for focusing a beam of a high energy radiation source on a reference point on the surface of a flying object, comprising: recording a number of consecutive two-dimensional images of the flying object determining the trajectory of the flight path simultaneously determining the line of sight angle between the image acquisition device and the position of the flying object calculating a three-dimensional model of the flying object displaying the currently acquired two-dimensional image marking the reference point on the displayed two-dimensional image of the flying object, calculating the three-dimensional reference point on the surface of the flying object focusing the beam of the high energy radiation source on the three-dimensional reference point. [A157]

"Weather radar system and method with latency compensation for data link weather information"

A method of displaying a weather condition indicator with respect to an aircraft includes receiving weather data from a weather radar system. The weather data includes data indicative of a first location of the weather condition. The method also includes determining a second location of the weather condition based on data indicative of a movement of the weather condition, and displaying the weather condition indicator with reference to the second location. [A158]

"Secondary surveillance radar system for air traffic control"

The invention refers to a secondary surveillance radar, referred to hereinafter as SSR, system (1) for air traffic control. The SSR-system (1) comprises a plurality of secondary radar stations (2) and is adapted for determining a location of an air traffic vehicle within the range of coverage of at least some of the secondary radar stations (2) by means of propagation time measurement of data signals (8) transmitted between the secondary radar stations (2) and a transponder (9) of the air traffic vehicle. Each of the secondary radar stations (2) works on a synchronized local time base. In order to provide for a high-precision synchronisation of the radar stations (2) of the SSR system (1) free of clusters, it is suggested that an SSR system's (1) secondary radar station (2) is synchronized depending on the content of synchronisation signals (10) received by the secondary radar station (2) to be synchronized and broadcast by one of the other secondary radar stations (2) of the SSR system (1) . Preferably, the content comprises a time of transmission of the synchronisation signal (10) . [A159]

"Deterent for unmanned aerial systems"

A system for providing integrated detection and countermeasures against unmanned aerial vehicles include a detecting element, an location determining element and an interdiction element. The detecting element detects an unmanned aerial vehicle in flight in the region of, or approaching, a property, place, event or very important person. The location determining element determines the exact location of the unmanned aerial vehicle. The interdiction element can either direct the unmanned aerial vehicle away from the property, place, event or very important person in a non-destructive manner, or can cause disable the unmanned aerial vehicle in a destructive manner. [A160]

"Waveguide tube slot antenna and wireless device provided therewith"

Provided is a waveguide tube slot antenna (1) including: a plurality of waveguides (2) arranged in parallel with each other, a plurality of radiating slots (3) formed along each of the plurality of waveguides (2) , and a plurality of waveguide tubes (10) connected in parallel with each other, in which the plurality of waveguide tubes (10) each include a first waveguide tube forming member (11) and a second waveguide tube forming member (12) each having a transverse section having a shape with an end, the first waveguide tube forming member and the second waveguide tube forming member being configured to define one of the plurality of waveguides (2) by being connected to each other. [A161]

"SAR data processing"

An apparatus is disclosed for a spaceborne or aerial platform having a frequency demultiplexer for frequency demultiplexing a signal corresponding to a range line or an azimuth line of SAR data, and including information about a plurality of target points, into a plurality of frequency channels, and a compression device for performing compression on each frequency channel, each frequency channel signal having information about the same target points. The frequency demultiplexer and the compression device can be implemented in hardware. The apparatus may be used for either or both of the range compression and the azimuth compression of a SAR arrangement on board a spaceborne or aerial platform and the SAR arrangement may generate a plurality of sub-images corresponding to the frequency channels from the SAR raw data. The sub-images may be combined by averaging in order to reduce the volume of memory required to store the SAR data. [A162]

"FMCW radar with refined measurement using fixed frequencies"

One embodiment is directed to a method for operating a radar altimeter. The method includes transmitting a radar signal at a first frequency, ramping the frequency of the radar signal from the first frequency to a second frequency, and transmitting the radar signal at the second frequency. The reflections can be processed by determining an approximate distance to a target based reflections of the frequency ramp and the approximate distance can be refined based on a phase difference between a reflection of the radar signal transmitted at the first frequency and a reflection of the radar signal transmitted at the second frequency. [A163]

"Stereoscopic 3-D presentation for air traffic control digital radar displays"

An apparatus and method of presenting air traffic data to an air traffic controller are provided. Air traffic data including a two dimensional spatial location and altitude for a plurality of aircraft is received. A disparity value is determined based on the altitude for each aircraft of the plurality of aircraft. Left and right eye images are generated of the plurality of aircraft where at least one of the left and right eye images is based on the determined disparity value. The left and right eye images are simultaneously displayed to the air traffic controller on a display. The simultaneously displayed images provide an apparent three-dimensional separation of each of the aircraft of the plurality of aircraft on the display. [A164]

"Method and apparatus for distance measuring equipment (DME/normal) using alternative pulse shapes"

A method for measuring distance includes transmitting a first pair of RF pulses from an airborne interrogator, where the first pair of RF pulses are temporally separated from each other by a first time interval and each of the RF pulses in the first pair of RF pulses has a first pulse waveform. The method also includes receiving a second pair of RF pulses transmitted by a ground transponder. The RF pulses in the second pair of RF pulses have a second pulse waveform characterized by a filtered asymmetric Gaussian function or a smoothed trapezoidal function. The method further includes determining an elapsed time between transmitting the first pair of RF pulses and receiving the second pair of RF pulses and determining a distance between the airborne interrogator and the ground transponder based on at least the elapsed time. [A165]

"Method and apparatus for distance measuring equipment (DME/normal) using a smoothed concave polygonal pulse shape"

A method for measuring distance includes transmitting a first pair of RF pulses from an airborne interrogator, where the first pair of RF pulses are temporally separated from each other by a first time interval and each of the RF pulses in the first pair of RF pulses has a first pulse waveform. The method also includes receiving a second pair of RF pulses transmitted by a ground transponder. The RF pulses in the second pair of RF pulses have a second pulse waveform characterized by a smoothed concave polygonal function and/or a smoothed concave hexagonal function. The method further includes determining an elapsed time between transmitting the first pair of RF pulses and receiving the second pair of RF pulses and determining a distance between the airborne interrogator and the ground transponder based on at least the elapsed time. [A166]

"Systems and methods for walking pets"

Systems and methods are provided for guiding a target object with an unmanned aerial vehicle (UAV) in an environment. The UAV may be able to recognize and locate the target object. The UAV can be configured to communicate the actions and behavior of the target object to a user through a user device in communication with the UAV. The UAV can provide positive and negative stimuli to the target object to encourage an action or behavior. The UAV can be configured to recognize and manage waste generated by the target object. [A167]

"Variable delay line using variable capacitors in a maximally flat time delay filter"

Systems and methods for a variable delay line using variable capacitors in a time delay filter are provided. In at least one embodiment, a delay line is configured to apply an adjustable time delay to an electromagnetic signal travelling through the delay line. The delay line comprises a filter that includes a first variable capacitor. Further, a capacitance of the first variable capacitor is configured to adjust the delay applied to the electromagnetic signal travelling through the delay line when varied. [A168]

"Secondary surveillance radar signals as primary surveillance radar"

Systems and methods relating to the use of one type of radar technology to accomplish the function of another type of radar technology. Secondary Surveillance Radar/Identification Friend or Foe (SSR/IFF) technology can be used as if it was Primary Surveillance Radar (PSR) to gain the advantages of both systems. Radar signals useful for SSR/IFF are used as PSR signals. Reflections of the SSR/IFF signal off of both airborne and ground based aircraft, and ground based vehicles and items are used to locate and identify these aircraft, vehicles and items. for SSR/IFF transponder equipped aircraft, the reflected SSR/IFF signals provide (prove dial) dual confirmation of the aircraft's presence while for non-transponder equipped aircraft, the reflected signals provide an indication of the aircraft's presence. The use of SSR/IFF signals reflected off of ground based vehicles and items provides an indication of ground based vehicles and items present around the installation receiving the reflected SSR/IFF signals. [A169]

"System and method for filling gaps in radar coverage"

A method of positioning a plurality of radar units in a defined area amongst one or more legacy radar units that provide legacy radar coverage in the defined area is disclosed. The steps of identifying a location of each legacy radar unit, setting a threshold altitude, and determining a legacy occultation of each legacy radar unit from a landscape level up to the threshold altitude are also disclosed. Mapping the legacy occultation of the legacy radar units to provide a three dimensional occultation map in the defined area and locating gaps below the threshold altitude in the legacy radar coverage as a function of the occultation map are also disclosed. Identifying a plurality of sites as a function of the gaps where the sites are accessible to receive a radar unit is also disclosed. Determining an anticipated radar coverage of a radar unit positioned at each of the sites and determining a reduction in the gaps as a function of the anticipated radar coverage are also disclosed. Selecting sites as a function of the reduced gaps is also disclosed. X band, C band or S band radar units can be positioned at the selected sites. The threshold altitude can be 10,000 or 15,000 feet. Affected populations and costs can also be considered in radar placement. [A170]

"Methods and systems for local principal axis rotation angle transform"

A method for processing synthetic aperture radar (SAR) data. The method includes the step of receiving SAR data that has been collected to provide a representation of a target scene, and dividing the data into a plurality of sub-blocks each having a plurality of pixels, each of the plurality of pixels having a coordinate and an amplitude. A transformation performed on each of the sub-blocks includes the steps of: (i) computing a mean coordinate, (ii) subtracting the mean coordinate from the pixel's actual coordinate to arrive at a modified coordinate, (iii) multiplying the modified coordinate by the amplitude to arrive at an amplitude-modified coordinate, (iv) creating a covariance matrix using the amplitude-modified coordinates, (v) performing a singular value decomposition on the covariance matrix to arrive at a vector, and (vi) associating an angle with the calculated vector. [A171]

"Positioning enhancement through time-of-flight measurement in WLAN"

Method and system for obtaining positioning of nodes in a wireless local access network (WLAN) , comprise, by an initiator node of the WLAN, calculating a compensated time-of-flight (ToF) of messages exchanged between the initiator node and a target node and calculating a distance of the target node relative to the initiator node using the compensated ToF, thereby obtaining relative positioning between the initiator and target nodes. The compensated ToF is calculated using OFDM symbol slope inputs measured at the initiator and target nodes. Each node is associated with an enhanced WLAN unit adapted to measure and calculate the compensated ToF. [A172]

"Method and on-board system for viewing weather hazards"

A method and a system for viewing weather hazards which is on-board an aircraft. The system (300) includes communication means (330) for receiving weather information relating to a given region, a processor (310) for determining, at each point of the region, the future instant at which the vehicle would reach this point, an expert system (340) for estimating, at each point of the region, from the weather information and the future instant, the weather hazard at that point, and a graphic interface (360) for displaying, at each point of the region, the weather hazards thus estimated by the expert system. [A173]

"System and method for reducing reflections from metallic surfaces onto aircraft antennas"

An aircraft traffic system is provided that includes a primary antenna operable to generate interrogation signals and receive interrogation replies from other aircraft. The system additionally includes a secondary antenna configured as a tuned absorber having a matched impedance to at least partially absorb reflections of the interrogation signals or interrogation replies utilized by the primary antenna. [A174]

"Unmanned aerial vehicle detection method using global positioning system leakage signal and system therefor"

An unmanned aerial vehicle (UAV) detection method and a system therefor are provided. The UAV detection method includes receiving a radio signal from air, detecting a global positioning system (GPS) leakage signal of a predetermined frequency from the received radio signal, and determining that a UAV is detected when the GPS leakage signal is detected. [A175]

"Apparatus for testing performance of synthetic aperture radar"

An apparatus for testing the performance of a synthetic aperture radar is provided. The apparatus for testing the performance of a synthetic aperture radar includes: a three-axis motion platform that is coupled to an antenna and driven in roll, pitch, and yaw directions so as to reproduce motion components generated from a pointing plane of the antenna, a target simulator configured to reproduce a ground target, and a system simulator that allows the three-axis motion platform and the target simulator to work in conjunction with each other in real time, and controls the three-axis motion platform and the target simulator. Here, the three-axis motion platform may include a three-axis driver that determines the attitude of the three-axis motion platform, based on position and speed information received from the system simulator. The target simulator may include a target modulator that adjusts the amplitude of an output signal, performs range and phase delays, and reproduces a Doppler component, based on simulation target information received from the system simulator. [A176]

"Aviation display depiction of weather threats"

A method for indicating a weather threat to an aircraft is provided. The method includes inferring a weather threat to an aircraft and causing an image to be displayed on an aviation display in response to a determination by aircraft processing electronics that the inferred weather threat to the aircraft is greater than a measured weather threat to the aircraft. [A177]

"Beam broadening with large spoil factors"

Methods for generating weights for the antenna elements (110) in an AESA antenna (100) . In one embodiment, transmitting weights are selected to have unit amplitude and quadratic phase, and receiving weights are selected to provide a two-way antenna pattern which is uniform over a useful portion (300) of the main lobe, and decreases rapidly outside of the uniform portion. In another embodiment the transmitting weights have unit amplitude over a central portion of the array and the receiving weights are selected to provide a two-way antenna pattern which is uniform over a useful portion (300) of the main lobe. [A178]

"Identifying and tracking convective weather cells"

A method for tracking weather cells from a moving platform includes receiving, from a detection and ranging system, reflectivity data sampled for a volume of space and generating a feature map based on the reflectivity data, wherein the feature map is a representation of the volume of space that indicates locations with significant weather and generating a first segmented feature map based on the feature map that identifies the location and spatial extent of individual weather cells. The method further includes translating the first segmented feature map and a second segmented feature map, generated from data collected at a different point in time and/or space, to a common frame of reference and comparing the first segmented feature map to the second segmented feature map. The method further includes creating one or more track hypotheses based on the comparison of the first segmented feature map and the second segmented feature map. [A179]

"Weather radar system and method for estimating vertically integrated liquid content"

A hazard warning system includes a processing system. The processing system determines a vertically integrated liquid (VIL) parameter. The processing system receives radar reflectivity data associated with an aircraft radar antenna and determines the VIL parameter by determining a first reflectivity value at a first altitude and a second reflectivity value at a second altitude using the radar reflectivity data. The processing system determines the VIL parameter using a base storm altitude and a top storm altitude. [A180]

"Methods and apparatus for persistent deployment of aerial vehicles"

Methods and apparatus are disclosed for persistent deployment of aerial vehicles. The present application discloses a mission control system that is configured to control and manage one or more aerial vehicles for deployment to and from one or more docking stations. The one or more docking stations may be configured with a battery swapping device for removing the depleted battery from an aerial vehicle and for refilling a charged battery into the aerial vehicle. The mission control system may be configured to generate a priority list used to determine the recharging order of the one or more aerial vehicles. [A181]

"Device and method of tracking target object"

A target object tracking device is provided. The device includes a memory for storing association information in which a selecting order of target objects is associated with symbols indicating the target objects, respectively, a starting selection accepting module for accepting a selection of the target objects to start tracking thereof, a symbol reading module for reading the symbols for the selected target objects corresponding to the selecting order of the target objects based on the association information, a tracking module for tracking the selected target objects, a symbol displaying module for displaying the symbols read by the symbol reading module, at positions where the target objects tracked by the tracking module are displayed, and a symbol changing module for changing, according to an operation of a user, the association information and displaying the symbols at the positions where the target objects are displayed, based on the changed association information. [A182]

"Concurrent airborne communication methods and systems"

Aircrafts or unmanned air vehicles flying near Earth are used as airborne communications towers or relays. Using techniques of ground based beam forming and wavefront multiplexing enhance the ability to coherently combine the power of the communication signals, and improve the signal-to-noise ratio. [A183]

"Method for controlling an obstruction light"

The invention concerns a method of controlling a flight obstacle lighting arrangement, wherein a receiver co-operates with a switching device for the flight obstacle lighting arrangement. According to the invention it is proposed that the receiver upon receiving a first predetermined signal controls the switching device in such a way that the flight obstacle lighting arrangement is switched off. [A184]

"Non-line-of-sight radar-based gesture recognition"

This document describes techniques and devices for non-line-of-sight radar-based gesture recognition. Through use of the techniques and devices described herein, users may control their devices through in-the-air gestures, even when those gestures are not within line-of-sight of their device's sensors. Thus, the techniques enable users to control their devices in many situations in which control is desired but conventional techniques do permit effective control, such as to turn the temperature down in a room when the user is obscured from a thermostat's gesture sensor, turn up the volume on a media player when the user is in a different room than the media player, or pause a television program when the user's gesture is obscured by a chair, couch, or other obstruction. [A185]

"Weather radar system and method with path attenuation shadowing"

An avionic weather radar system and method can sense a path attenuation condition using radar returns of received via a radar antenna onboard the aircraft. Images of weather can be displayed using an outside source and the radar returns. The images are displayed using information from the outside source when the path attenuation condition is sensed. The images can be displayed using speckled areas, cross hatched areas or other symbols to represent the information from the outside source. The images of the weather can be provided on an avionic display. [A186]

"Avian hazard detection and classification using airborne weather radar system"

A method and system. The method includes receiving weather radar data. The method further includes filtering out weather from the weather radar data to provide filtered radar data. Additionally, the method includes determining whether the filtered radar data includes any non-weather targets. If any of the non-weather targets is a hazard target, the method includes storing data associated with the hazard target in a hazard data structure. [A187]

"Runway incursion detection and indication using an electronic flight strip system"

An electronic flight strip system and method of detecting and indicating runway incursions are disclosed. One such method receives an aircraft location, compares the location to a geofenced area, and generates an indication on the touchscreen display in response to the aircraft location being within the geofenced area without an indication of clearance to enter the geofenced area. The indication may be part of the electronic flight strip associated with the offending aircraft. [A188]

"Phase center alignment for fixed repetition rate synthetic aperture systems"

A system for adjusting phase centers of a receiving array in real time. In one embodiment, a transmitter transmits a sequence of pings. Receiving elements are grouped into staves and summed prior to subsequent processing, and the groups are selected so that the phase center on a ping is substantially in the same location as another phase center on a previous ping. [A189]

"Collision-avoidance system for ground crew using sensors"

A ground obstacle collision-avoidance system includes a plurality of radar sensor modules that each receive at a radar detector radar return signals corresponding to reflections of the emitted signal from a ground obstacle, and transmits radar information associated with the received radar signal reflections reflected from the ground obstacle, wherein each of the plurality of radar sensor modules are uniquely located on a surface of an aircraft that is at risk for collision with a ground obstacle if the aircraft is moving, a gateway unit that receives the radar information transmitted from the radar sensor module and transmits information associated with the received radar information, a processing system configured to determine a distance from the installation aircraft to a detected ground object detected, and a display configured to present a plan view indicating an aircraft icon and a graphical ground obstacle icon that is associated with the detected ground obstacle. [A190]

"Door and window contact systems and methods that include time of flight sensors"

Systems and methods that address the gap, security, and robustness limitations of known door and window contact systems and methods without increasing the overall cost thereof are provided. A system can include a time of flight sensor for mounting in or on a first portion of a window unit or a door unit and a microcontroller unit in communication with the time of flight sensor. The sensor can measure a time for a signal to travel from the sensor to a second portion of the window unit or the door unit and back to the sensor, the sensor can transmit the measured time to the microcontroller unit, and the microcontroller unit can use the measured time to make a security determination. [A191]

"System for protecting an airborne platform against collisions"

Systems and methods for protecting an airborne platform against collisions are provided. One system includes FMCW radar sensors including transmitting antennae, means for receiving signals from echoes and for processing and digitizing same, and means for sending a central unit data representing said digital signals via a dedicated point to point link. The central unit includes means for processing said data to detect obstacles, means for calculating parameters for each obstacle including its radial velocity, distance range and azimuth, and means to transmit an avionic system of said platform data representing said detected obstacles and parameters. The system further includes means for guaranteeing that said emitted signals are shifted in time to create a shift in frequency guaranteeing that the radar sensors operate in the whole frequency band without perturbing each other. [A192]

"Systems and methods for filtering wingtip sensor information"

Systems and methods for providing improved situational awareness for an aircraft while taxiing. An exemplary method generates reflectivity data based on an associated emission at a transceiver located on an aircraft. At a processor, targets are determined if a portion of the generated reflectivity data is greater than a predefined threshold. Then, the analyzed targets are determined as to whether they are within a dynamically defined three-dimensional envelope. The envelope is based on wingtip light module speed and trajectory. On a display device, an indication of the nearest target is presented at the associated range to the nearest target. [A193]

"Single antenna altimeter"

A radio altimeter with at least one transmitting antenna and at least one receiving antenna in a single housing reduces coupling with antennae housings shaped to deflect electromagnetic signals, and spacing between the antennae based on the phase of the transmitting signal. Coupling of less than -40 dB is filtered by software using adaptive leakage cancelling. [A194]

"Radar system and method of due regard/detect and avoid sensing and weather sensing"

A radar system and a method can utilize a radar antenna, such as, an active electronically scanned array antenna. The radar system can include a processor configured to scan a volume of space via the radar antenna to detect aircraft threats and to detect weather threats. The processing system can utilize a first pattern to detect the aircraft threats or obstacles and a second pattern to detect the weather threats. [A195]

"Sensor system and method for determining target location using sparsity-based processing"

A system and method for an arrayed sensor to resolve ambiguity in received signals, improve direction of arrival accuracy and estimate a location of one or more targets in an environment including signal interference. [A196]

"Systems and methods for improving positional awareness within an airport moving map"

Systems and methods for displaying a location reference indicator (LRI) associated with an ownship icon are provided. In various embodiments, an airport moving map (AMM) is displayed, and the ownship icon is displayed in the AMM, where the ownship icon represents the ownship. A degree of zoom of the AMM is determined. In response to a determination that the degree of zoom is not within a range of center referenced threshold values, a first LRI is displayed that indicates that the icon representing the ownship is not to scale with other objects displayed in the AMM. In response to a determination that the degree of zoom is within the range of center referenced threshold values, a second LRI is displayed. [A197]

"Speed assistant for a motor vehicle"

A method for controlling a motor vehicle includes steps of controlling a longitudinal speed of the motor vehicle to a predetermined value and scanning an upcoming driving route with the aid of a sensor on board the motor vehicle. One end of a section of the driving route which is visible with the aid of the sensor is determined. Assuming that there is an obstacle on the driving route beyond the visible section, it is determined that a deceleration which would be required to maintain a predetermined minimum distance from the assumed obstacle exceeds a predetermined threshold value, and a signal is output to a driver of the motor vehicle. [A198]

"System and method for graphically displaying neighboring rotorcraft"

A system and method is provided that displays graphical symbology that enables a pilot to rapidly discern (1) that a neighboring aircraft is a rotorcraft, and (2) whether the rotorcraft is hovering. The provided system and method enables a user to define hovering, by editing a position change (distance) within a predetermined time. [A199]

"Method of system compensation to reduce the effects of self interference in frequency modulated continuous wave altimeter systems"

An altimeter system is provided. The altimeter system includes a receiver mixer including an antenna-input and a local-oscillator-input, a transceiver circulator communicatively coupled to an antenna via a transmission line having a selected length and communicatively coupled to the antenna-input of the receiver mixer, and a transmitter configured to output a transmitter signal to the antenna via the transceiver circulator. The transmitter signal is frequency modulated with a linear ramp. The transmitter is communicatively coupled to the receiver mixer to input a local oscillator signal at the local-oscillator-input of the receiver mixer. The receiver mixer is communicatively coupled to input a target-reflected signal from the antenna at the antenna-input of the receiver mixer. The selected length of the transmission line is set so that a composite-leakage signal at the antenna-input of the receiver mixer has a linear phase across a sweep bandwidth. [A200]

"Multiple sensor tracking system and method"

A system and method for tracking the flight of golf balls at driving range. The system includes a plurality of hitting stations, a plurality of sensors, a computer, and a range surface. Each hitting station in the plurality of hitting stations includes a golf ball, a golf club, a monitor, and a sensor. At least one other sensor in the plurality of sensors is placed outside a hitting station. The flight path of the golf balls being calculated by the computer using parameters by the plurality of sensors. The method includes steps for determining whether a first sensor detected a first parameter and a second parameter, whether a second sensor detected a first and a second parameter, whether a third sensor detected a third parameter, and depicting the flight path of the golf balls using the first parameter, the second parameter, and the third parameter. [A201]

"Ranging and positioning system"

A ranging and positioning system comprising transmitters and receiver nodes communicating together by chirp-modulated radio signals, that have a ranging mode in which ranging exchange of signals takes place between a master device and a slave device that leads to the evaluation of the range between them. The slave is arranged for recognizing a ranging request and transmit back a ranging response containing chirps that precisely aligned in time and frequency with the chirps in the ranging requests, whereupon the master can receive the ranging response, analyze the time and frequency the chirps contained therein with respect to his own time reference, and estimate a range to the slave. [A202]

"Method and apparatus for the detection of objects using electromagnetic wave attenuation patterns"

A method for detecting an object, comprising the steps of defining expected characteristics of scattered electromagnetic radiation to be received at a receiver, attenuating at least a portion of electromagnetic radiation received at the receiver by a presence of an object within a path of electromagnetic information, and detecting the attenuation to indicate a presence of the object. The object may be a low radar profile object, such as a stealth aircraft. The electromagnetic radiation is preferably microwave, but may also be radio frequency or infrared. By using triangulation and other geometric techniques, distance and position of the object may be computed. [A203]

"Synthetic-aperture-radar apparatus and method for production of synthetic-aperture-radar images of moving objects"

A SAR apparatus including: a radar transceiver to emit electromagnetic pulses and to provide a radar signal in response to echoes of the electromagnetic pulses, and a processing unit, configured to produce SAR images of moving objects from the radar signal. The processing unit includes: a first processing module to apply translational motion compensation to a central reference point of a moving object in a subaperture of the radar signal, a second processing module, to execute phase compensation with the single central reference point as reference, and a third processing module to apply phase compensation to the radar signal as a function of an estimated phase component the auxiliary point and of a normalization parameter to a distance in range between the central reference point and the auxiliary point. [A204]

"Weather radar system and method with fusion of multiple weather information sources"

A method of displaying an image representative of a weather condition near an aircraft includes receiving weather data representative of the weather condition from a plurality of weather data sources. The weather data includes location data for the weather condition. The method also includes mapping the weather data received from each source to a common locational reference frame based on the location data, adjusting the weather data received from each source to a common hazard scale, determining a hazard level associated with the weather condition for a reference point in the reference frame based on the adjusted weather data for each source, and displaying the image representative of the weather condition near the aircraft based on the hazard level for the reference point. [A205]

"Reflector antenna for a synthetic aperture radar"

A reflector antenna for synthetic aperture radar, having a reflector including a reflector surface, a vertex, and an optical axis. The reflector antenna also as a plurality of antenna elements arranged side by side and in a row, for transmitting radar transmission signals and receiving radar reception signals produced from a reflection on a surface. The reflector is designed as a one-dimensional defocused reflector having two focal planes. The optical axis coincides with the line of inter-section of two imaginary planes extending at right angles to one another. The reflector has, in a first (X-) plane, a first (X-) focal plane that extends at right angles thereto and to the optical axis, and, in a second (Y-) plane, a second (Y-) focal plane which extends at right angles thereto and to the optical axis. The second (Y-) focal plane is at a greater distance from the vertex than the first (X-) focal plane. [A206]

"Aircraft systems and methods to monitor proximate traffic"

An aircraft system for an own-ship aircraft includes an ADS-B unit configured to receive ADS-B messages with flight information from other aircraft over a plurality of time periods, the other aircraft including a first aircraft. The system further includes a database configured to store at least a portion of the flight information associated with the other aircraft over the plurality of time periods. The system further includes a processing unit configured to compare the flight information for a current time period to the flight information for a previous time period to identify missing flight information from the current time period relative to the previous time period, the missing flight information including the flight information associated with the first aircraft, and initiate an annunciation to an operator of the own-ship aircraft based on the missing flight information associated with the first aircraft. [A207]

"Using frequency diversity to detect objects"

Technologies for detecting a passive object through the use of frequency diversity to find at least a resonant peak are disclosed. for example, a radar system may illuminate a suspect area with a pulsed radio wave based on a large number of frequency bands and based on parameters associated with the passive object. The reflected radio wave may be processed to generate synthetic aperture radar (SAR) maps associated with the frequency bands. The SAR maps may be analyzed and compared to determine large deviation amplitudes that may indicate a location of the passive object. [A208]

"Digital beamforming interferometry"

A method according to an illustrative embodiment includes generating first, second, third, and fourth signals. The method also includes transmitting from an antenna, the first signal, and transmitting the antenna, the second signal. The first and second signals are configured such that when the signals are transmitted simultaneously the signals constructively interact to form a first beam signal. The first beam signal has a first look angle. The method also includes transmitting from the antenna the third signal and from the antenna the fourth signal. The third and fourth signals are configured such that when the signals are transmitted simultaneously the signals constructively interact to form a second beam signal. The second beam signal has a second look angle. The method also includes receiving a first and second reflected signals and generating an interferogram utilizing information in the first and second reflected signals. [A209]

"System and method for evaluating wind flow fields using remote sensing devices"

The present invention provides a system and method for obtaining data to determine one or more characteristics of a wind field using a first remote sensing device and a second remote sensing device. Coordinated data is collected from the first and second remote sensing devices and analyzed to determine the one or more characteristics of the wind field. The first remote sensing device is positioned to have a portion of the wind field within a first scanning sector of the first remote sensing device. The second remote sensing device is positioned to have the portion of the wind field disposed within a second scanning sector of the second remote sensing device. [A210]

"Subsurface imaging radar"

A method and system for obtaining SAR images with reduced or eliminated surface clutter to detect subsurface targets, the method comprising the following steps: --selecting a first frequency and an incidence angle for the radar signal such that the ratio of surface backscattering to subsurface target backscattering is significantly larger for vertical polarization than for horizontal--obtaining vertically and horizontally polarized SAR images based on the same SAR path exploiting the selected first frequency and viewing angle--weighting and differencing the vertically and horizontally polarized SAR images so that the surface backscattering completely cancels between the two images and only the combination of the target backscattering components remains. [A211]

"Ground survey and obstacle detection system"

The present disclosure is directed to a ground survey and obstacle detection system using one or multiple detection devices, such as aerial detection devices. Aerial detection devices are sent ahead of the primary vehicle to survey a territory and map out any obstacles. The aerial detection device is equipped with sensors to scan the ground below it and detect obstacles. The aerial detection device is not affected by or prone to triggering dangerous obstacles. The aerial detection device flies above the ground and may be configured to send a signal back alerting the primary vehicle to the existence of obstacles. [A212]

"Weather radar system and method for estimating vertically integrated liquid content"

A hazard warning system includes a processing system. The processing system determines a vertically integrated liquid (VIL) parameter. The processing system receives radar reflectivity data associated with an aircraft radar antenna and determines the VIL parameter by determining a first reflectivity value at a first altitude and a second reflectivity value at a second altitude using the radar reflectivity data. The processing system determines the VIL parameter using a base storm altitude and a top storm altitude. [A213]

"Method for acquiring and tracking an in-flight target"

A method for acquiring and tracking an in-flight or airborne target using an antenna is provided. In the acquisition process, the antenna is rotated to collect RF power data. The location of peak RF power is determined and the antenna is pointed to that location. The antenna may then undergo a search pattern on either side of that location to detect a specified drop in RF power and a modem on which to lock. In the tracking process, an algorithm allows the antenna to track the target in a pure RF mode, a GPS-based open loop pointing mode or a hybrid mode. The tracking may automatically switch between the pure RF mode and the hybrid mode, depending upon whether GPS data is available from the target. [A214]

"Downrange wind profile measurement system and method of use"

A downrange wind measurement system includes an aerial vehicle with a global positioning system and a communication device, and a remote computer with a display for viewing access and a transceiver. A method to assist a shooter adjust for a wind speed and a wind angle of a wind prior to make a downrange shot includes creating a flight path for an aerial vehicle to fly alongside a projectile path, determining locations for a circular flight path via the flight path, measuring the wind speed and the wind angle along the circular flight path, transmitting the wind speed and the wind angle to a remote computer, and computing via the remote computer scope adjustments with the wind speed and wind angle. [A215]

"Aircraft systems and methods for displaying spacing information"

A display system for a subject aircraft is provided. The system includes a processing unit configured to receive air traffic spacing information associated with a lead aircraft and flight information associated with the subject aircraft and to generate display signals associated with the air traffic spacing information and the flight information, and a display unit coupled to the processing unit and configured to receive the display signals from the processing unit and to render a horizontal situation indicator with spacing symbology based on the air traffic spacing information and the flight information. [A216]

"Methods and apparatuses for engagement management of aerial threats"

Embodiments include engagement management systems and methods for managing engagement with aerial threats. Such systems include radar modules and detect aerial threats within a threat range of a base location. The systems also track intercept vehicles and control flight paths and detonation capabilities of the intercept vehicles. The systems are capable of communication between multiple engagement management systems and coordinated control of multiple intercept vehicles. [A217]

"Sensor-based navigation correction"

A system and method for providing sensor-based navigation correction of a GPS-sensed position of an aircraft includes a synthetic vision system. The synthetic vision system captures a visual image of the surrounding area via image sensors and generates a location model based on the image. A georeference engine compares the location model to static high-resolution terrain and obstacle databases to determine a corrected position of the aircraft. The georeference engine then updates the GPS-sensed position with the corrected position, transmitting the corrected position to the combiner. The combiner generates for display an enhanced image based on the visual image and the corrected position of the aircraft. [A218]

"System and method for human operator intervention in autonomous vehicle operations"

An autonomous vehicle system is configured to receive vehicle commands from one or more parties and to execute those vehicle commands in a way that prevents the execution of stale commands. The autonomous vehicle system includes a finite state machine and a command counter or stored vehicle timestamp, which are used to help reject invalid or stale vehicle commands. [A219]

"Advisory generating system, device, and method"

A system, device, and method for generating at least one advisory presentable on one or more presentation units are disclosed, where the advisory may draw an operator's attention to future turns of the vehicle such as, but not limited to, an aircraft. An advisory generator ("AG") may be configured to receive navigation data, receive feature data representative of one or more edges associated with the designated surface and location/coordinate information associated with one or more nodes of each edge, generate an advisory data set representative of one or more first distances in response to the determination, and provide the advisory data set to the presentation system. The designated surface could include a landing runway, a takeoff runway, and/or a current surface upon which the vehicle operates. One first distance may be a shortest distance (i.e., a distance to the closest intersection) . [A220]

"Augmented aircraft autobrake systems for preventing runway incursions, related program products, and related processes"

Augmented autobrake systems useful in preventing accidents related to runway incursions are provided, as are related processes and program products. In one embodiment, the augmented autobrake system is deployed on an aircraft and utilized in conjunction with a Runway Warning and Status Lights (RWSL) system. The augmented autobrake system includes a wireless receiver configured to receive runway status data from the RWSL system, an aircraft brake mechanism, and a controller coupled to the wireless receiver and to the aircraft brake mechanism. The controller is configured to: (i) identify when the aircraft is projected to enter a runway incursion zone based at least in part upon the runway status data and vector data pertaining to the aircraft, and (ii) when the aircraft is projected to enter a runway incursion zone, commanding the aircraft brake mechanism to stop the aircraft prior to entry into the runway incursion zone. [A221]

"Obstacle detection system providing context awareness"

In sonic examples, an obstacle detection system is configured to generate and display a graphical user interface (GUI) that includes an overhead image of an area in which a vehicle is positioned, a graphical representation of the vehicle, and graphical representations of one or more obstacles, The graphical representations of the one or more obstacles and vehicle can be arranged relative to the overhead image to indicate determined real-world positions of the one or more obstacles and vehicle, respectively, relative to other features shown in the overhead (e.g., airport structure or other buildings) . [A222]

"Aircraft collision warning system"

An aircraft collision warning system includes an optical detection system has a toroidal and conical field of view about the aircraft to detect near objects. The detection system utilizes thermal detection in a passive mode. Optionally, the detection system also includes radio frequency (RF) elements to form a directional radar for improved object detection confidence. The radar is used in either a passive or active mode. The detection system includes a detector array to detect light from the toroidal-shaped and conical-shaped airspace. Data from the detector array is accumulated and analyzed for objects. Upon object detection, the object is tracked, kinetically assessed for collision with the aircraft, and reported to the pilot and/or auto-pilot system. The detection system is configured as a non-cooperative system that stares into the toroidal and conical field of view. [A223]

"Interrogator and system employing the same"

An interrogator and system employing the same. In one embodiment, the interrogator includes a receiver configured to receive a return signal from a tag and a sensing module configured to provide a time associated with the return signal. The interrogator also includes a processor configured to employ synthetic aperture radar processing on the return signal in accordance with the time to locate a position of the tag. [A224]

"Methods for detecting the flight path of projectiles"

Methods for detecting the flight path of projectiles involve a sequence of N target detections that include detecting the measured velocities and azimuthal angle bearings of the projectile along the flight path of the projectile by Doppler radar at the times tn, wherein n=1 . . . N, and determining the flight path and the direction of motion of the projectile are from these measurements. The measurements are adapted in a first nonlinear parameter fit to an analytical relationship of the time curve of the radial velocity of the projectile while the projectile passes through the detection range of the radar and so that the absolute projectile velocity, minimum distance of the project flight path from the radar, time at which the projectile passes the point having the minimum distance, flight path direction in azimuth, and flight path direction in elevation can be estimated. [A225]

"Systems and methods for providing ADS-B mode control through data overlay"

Embodiments of the present invention disclose systems and methods for providing enhanced features using an ATC Overlay data link. Further, there are provided systems and methods for ADS-B Mode Control that enable a transponder to selectively transmit data on a desired link, such as the ADS-B or ATC Overlay link, based on the control inputs such as current active ADS-B applications, thus reducing RF interference while maximizing the amount of pertinent data being transmitted. In various embodiments, ADS-B Mode Control also offers a mechanism to include pilot-entered data onto the ADS-B or ATC Overlay link, thereby producing flexibility for future ADS-B In applications. [A226]

"Method and system for the estimation and cancellation of multipath delay of electromagnetic signals, in particular SSR replies"

A method and system for the estimation and correction of the multipath delay is described. The method comprising analyzing the distortion of the autocorrelation function of each single impulse received with that of an ideal impulse, deriving back the variation of the impulse parameters and estimating the effect of the multipart to be taken into account for compensation on the estimation of the time of arrival (TOA) of the electromagnetic signal. [A227]

"Mountable sensor for an aircraft"

A sensor system runs real-time software on the processor to receive and log temperature and humidity data from the sensors. A processor processes the data, reformats the data packaged with GPS information provided by the centralized sensor control system for transmission to the platform receiver (including error checking) , and provides a diagnostic interface for displaying logged data and status information. This data is time stamped and transmitted to the centralized sensor control system across the external control/data interface. [A228]

"Panoramic laser warning receiver for determining angle of arrival of laser light based on intensity"

A method and apparatus of detecting laser in a laser warning receiver is disclosed. A panoramic lens assembly utilized in cameras is combined with a laser detection focal plane. Incident laser light is refracted in the panoramic lens and made to illuminate a multiplicity of individual sensor elements. By determining the corresponding intensity of the laser light on the sensors, the angle of arrival resolutions superior to the element angular resolutions can be achieved. The combination of a panoramic lens with a laser detection focal plane provides a low cost laser warning for wrap around ground based situational awareness. [A229]

"Method of stabilizing a power grid and providing a synthetic aperture radar using a radar wind turbine"

A blade mounted radar system comprises a wind turbine having a hub and blades extending therefrom, a radar antenna configured to transmit and/or receive a radio frequency (RF) signal, and a processor in electrical communication with the radar antenna and configured to generate the RF signal for transmission and/or to process the received RF signal. The radar antenna is affixed to one of the blades of the wind turbine such that relative motion is defined between the radar antenna and a target within a line of sight of the radar antenna. The problem of the ground based radar line of sight being obscured by the wind turbine is mitigated in this setup, as radar and turbine coexist in the same structure. Improved performance and additional capability are enabled by elevated installation and vertical SAR imaging capability. Doppler capabilities are extended using known motion of the antenna relative to stationary objects. [A230]

"Antenna apparatus and method for electronically pivoting a radar beam"

An antenna apparatus for a radar sensor having a plurality of individual antenna devices that interact through interference to generate and/or receive a radar beam at a predetermined angle of transmission and/or reception. The individual antenna devices are provided with a radar signal and are arranged such that a first angle of transmission and/or reception of the radar beam is determined via an analog beam formation and a second angle of transmission and/or reception of the radar beam is determined via a digital beam formation. The antenna apparatus further includes a feed device configured to generate the radar signal. In addition, the radar beam can be electronically pivoted. Also, an aircraft can include the antenna apparatus. [A231]

"Surveying areas using a radar system and an unmanned aerial vehicle"

System and methods for surveying areas using a radar system and an unmanned aerial vehicle (UAV) are described herein. for example, one or more embodiments include detecting an event in the area using movement measurements from a radar system, wherein the radar system transmits electromagnetic radiation waves to capture the movement measurements in the area, and determining geographic information system (GIS) coordinates of a location of the event. Further, one or more embodiments can include navigating an UAV to the location substantially autonomously using the GIS coordinates of the location of the event and capturing a second number of images of the location using the UAV. [A232]

"Coherent aggregation from multiple diverse sources on a single display"

A system for tracking objects. Objects such as aircraft, ground vehicles, or vessels may be sensed with various sensors, including an Integrated Broadcast Service (IBS) (220) , an Advanced Field Artillery Tactical Data System (AFATDS) (225) , a network (230) of airborne radar sensors, a network (235) of aircraft each reporting its own position, a Blue Force Tracker (BFT) (240) , and a network (245) of ground-based mobile radar sensors. Data from each sensor or network of sensors may also be fed, via a display interface layer (250) , to a display. A tracker which may be referred to as a coherent aggregator (120) receives input from sensors or other trackers and also from an operator. The operator monitors the display and provides input to the coherent aggregator (120) to assist the coherent aggregator (120) in inferring tracks from measurement reports. Multiple coherent aggregators, in communication with each other and loosely coupled, may be operated simultaneously. [A233]

"Ship-based over-the-horizon radar"

A ship-based over-the-horizon (OTH) radar system provides mobile, persistent, wide-area air and ship surveillance across large ocean expanses and in anti-access/area denial (A2AD) environments. A transmit ship may include a log-periodic antenna (LPA) array adapted for use on a ship and a receive ship may include a plurality of monopole or dipole whip antennas. The transmit/receive antenna is fronted by a ground screen, which can be sized taking into account the sea as a naturally reflective surface. The transmit/receive ship can include advanced software to compensate for ship movement and synthetic aperture radar (SAR) techniques can be employed to includes the effective size of the radar receiver aperture. A modular design, using standard commercial container ships and shipping containers, allows for rapid deployment/stowage of radar equipment. Related methods are also described. [A234]

"Near field navigation system"

A near field navigation system is equipped with a base segment provided on a base structure. The base segment includes at least four transmitters. Each transmitter is provided with a base antenna and the base antennas are positioned relative to each other at known distances. A user segment is provided on a user structure, the user segment including at least one receiver, at least one user antenna connected to the receiver, and a processing unit connected to the receiver. The receiver and each of the transmitters together form distance measuring units and the processing unit is adapted to calculate the relative three-dimensional position data of the user structure with respect to the base structure on the basis of distance data obtained from the distance measuring units. [A235]

"Airbag deployment control apparatus and method"

An airbag deployment control apparatus and method utilizes an output of a pre-collision sensor mounted on the vehicle as a first airbag safing signal, and an output of a vehicle mounted impact sensor, when the impact sensor output exceeds a predetermined level corresponding to an actual vehicle collision, as a second airbag safing signal. A control, after determining the occurrence of the two consecutive safing signals, checks airbag arming and deployment criteria for deployment of the airbag. The pre-impact sensor can be a camera, radar, or Lidar sensor mounted on the vehicle. [A236]

"Onboard weather radar flight strategy system with bandwidth management"

This disclosure is directed to devices, systems, and methods for enabling and operating an onboard weather display system with managed bandwidth. In one example, a method includes receiving, by a hub system, initial sets of data from one or more aircraft. The method further includes receiving secondary sets of data from the aircraft, wherein the secondary sets of data are related to a significant weather condition. The method further includes transmitting an initial data stream to a particular aircraft, wherein the initial data stream is based at least in part on the initial sets of data from the one or more aircraft. The method further includes transmitting, in response to a request from the particular aircraft, a secondary data stream based at least in part on the secondary sets of data related to the significant weather condition. [A237]

"Interface for accessing radar data"

A process is described that includes the generation and transmission of collision avoidance data and/or collision avoidance instructions based on data from 3-D radar scans of an airspace. The transmitted data and/or instructions could facilitate collision avoidance by aerial vehicles operating in the airspace. The transmitted data could be limited to protect the security, privacy, and/or safety of other aerial vehicles, airborne objects, and/or individuals within the airspace. The transmitted data could be limited such that only information pertaining to a region of the airspace proximate to a particular aerial vehicle was transmitted. The transmitted data could be limited such that it included instructions that could be executed by a particular aerial vehicle to avoid collisions and such that the transmitted data did not include location or other data associated with other aerial vehicles or airborne objects in the airspace. [A238]

"Phase reference shift for SAR images generated from sub-aperture algorithms"

Embodiments are directed to generating a plurality of sub-images associated with a target via a synthetic aperture radar, processing, by a processor, the sub-images using a sub-aperture algorithm to generate an intermediate image, and applying, by the processor, a phase shift to the intermediate image to generate an output image. [A239]

"SAR point cloud generation system"

The SAR Point Cloud Generation System processes synthetic aperture radar (SAR) data acquired from multiple spatially separated SAR apertures in such a manner as to be able to calculate accurate three-dimensional positions of all of the scatterers within the imaged scene. No spatial averaging is applied thus preserving the high resolution of the original SAR data, and no phase unwrapping processes are required. The effects of height ambiguities are significantly reduced in the SAR Point Cloud Generation System. The SAR Point Cloud Generation System also self-filters against mixed-height pixels that can lead to incorrect height estimates. The system estimates scatterer height by a maximization of an Interferometric Response Function. [A240]

"Directional speed and distance sensor"

A method of using a directional sensor for the purposes of detecting the presence of a vehicle or an object within a zone of interest on a roadway or in a parking space. The method comprises the following steps: transmitting a microwave transmit pulse of less than 5 feet, radiating the transmitted pulse by a directional antenna system, receiving received pulses by an adjustable receive window, integrating or combining signals from multiple received pulses, amplifying and filtering the integrated receive signal, digitizing the combined signal, comparing the digitized signal to at least one preset or dynamically computed threshold values to determine the presence or absence of an object in the field of view of the sensor, and providing at least one pulse generator with rise and fall times of less than 3 ns each and capable of generating pulses less than 10 ns in duration. [A241]

"Auto updating of weather cell displays"

Methods, systems, and computer-readable media relating to providing weather data generated by a weather radar system of an aircraft are provided. The method includes receiving radar returns from at least one of a horizontal radar scan and a vertical radar scan. The method includes detecting a plurality of weather cells based on at least one of the horizontal radar scan and the vertical radar scan. The method includes providing display data representative of the plurality of weather cells. The method includes automatically providing updated display data representative of the plurality of weather cells based on at least one of an additional horizontal radar scan and an additional vertical radar scan. [A242]

"System for and method of adjusting a vision system"

A method or apparatus can be used with an aircraft or other vehicle. The apparatus can include or the method can use processing electronics configured to receive weather and airfield data associated with a weather report and configured to: 1. adjust at least one operational parameter of the vision system in response to the received weather report and airfield data, 2. adjust a display of an image derived from vision system data from vision system and synthetic vision data from a synthetic vision system in response to the data associated with the weather report detect, or 3. perform both operations 1 and 2. [A243]

"Automatic dependent surveillance broadcast (ADS-B) system for ownership and traffic situational awareness"

The present invention proposes an automatic dependent surveillance broadcast (ADS-B) architecture and process, in which priority aircraft and ADS-B IN traffic information are included in the transmission of data through the telemetry communications to a remote ground control station. The present invention further proposes methods for displaying general aviation traffic information in three and/or four dimension trajectories using an industry standard Earth browser for increased situation awareness and enhanced visual acquisition of traffic for conflict detection. The present invention enable the applications of enhanced visual acquisition of traffic, traffic alerts, and en-route and terminal surveillance used to augment pilot situational awareness through ADS-B IN display and information in three or four dimensions for self-separation awareness. [A244]

"Procedure for the detection and display of artificial obstacles for a rotary-wing aircraft"

A procedure for the detection and display of the ground and of obstacles through the use of detection means installed onboard a vehicle, which detection means send measurement signals toward the ground and receive a plurality of elementary plots (Pe) . The procedure makes it possible to create a grid of the ground along a horizontal plane, with each ground cell (Ms (i,j)) consisting of an elementary plot (Pe) having a minimum altitude Zmin (i,j)) , and with each other elementary plot (Pe) corresponding to the ground cell (Ms (i,j)) and having a different altitude (Z.sub.n (i,j)) , thereby forming an obstacle plot (Po.sub.n (i,j)) . Each newly received elementary plot (Pe) is then compared against the corresponding ground cell (Ms (i,j)) and processed according to its altitude (Z.sub.n (i,j)) . The ground cells (Ms (i,j)) and/or the obstacle plots (Po.sub.n (i,j)) are displayed on display means in order to indicate to the pilot of the vehicle the potential obstacles other than the ground. [A245]

"System for mapping and tracking ground targets"

A system for autonomously mapping and tracking of ground targets at a location of interest has been disclosed. The system comprises at least one user control center in operative communication with one or more data relay satellites in Geostationary Equatorial Orbit (GEO) , the data relay satellites in operative communication with one or more UAVs and/or SAR satellites with on-board different imaging sensors to obtain various types of imagery data from the ground targets. The data relay satellites target specific constant communication with the user control center and the UAVs and SAR satellites for continuous feedback and control. Moreover, the system process all raw data obtained from the UAVs and SAR satellites to produce 2D and 3D Digital Elevation Models (DEMs) and high resolution images, which are displayed on the user control center and/or selected mobile handheld devices. [A246]

"System and method for turbulence detection"

A aircraft hazard warning system or method can be utilized to determine a location of turbulence, hail or other hazard for an aircraft. The aircraft hazard warning system can utilize processing electronics coupled to an antenna. The processing electronics can determine an inferred presence of turbulence in response to lightning sensor data, radar reflectivity data, turbulence data, geographic location data, vertical structure analysis data, and/or temperature data. The system can include a display for showing the turbulence hazard and its location. [A247]

"Method for monitoring autonomous accelerated aircraft pushback"

A method for monitoring an autonomous accelerated pushback process in an aircraft equipped with an engines-off taxi system is provided to maximize safety and facilitate the accelerated pushback process. The aircraft is equipped with a monitoring system including a number of different kinds of sensors and monitoring devices positioned to maximally monitor the aircraft's exterior ground environment and communicate the presence or absence of obstructions in the aircraft's path while the pilot is controlling the engines-off taxi system to drive the aircraft in reverse away from a terminal gate and then turn in place at a selected location before driving forward to a taxiway. The sensors and monitoring devices may be a combination of cameras, ultrasound, global positioning, radar, and LiDAR or LADAR devices, and proximity sensors located at varying heights adapted to continuously or intermittently scan or sweep the aircraft exterior and ground environment during aircraft ground movement. [A248]

"Superpixel edges for boundary detection"

Various embodiments presented herein relate to identifying one or more edges in a synthetic aperture radar (SAR) image comprising a plurality of superpixels. Superpixels sharing an edge (or boundary) can be identified and one or more properties of the shared superpixels can be compared to determine whether the superpixels form the same or two different features. Where the superpixels form the same feature the edge is identified as an internal edge. Where the superpixels form two different features, the edge is identified as an external edge. Based upon classification of the superpixels, the external edge can be further determined to form part of a roof, wall, etc. The superpixels can be formed from a speckle-reduced SAR image product formed from a registered stack of SAR images, which is further segmented into a plurality of superpixels. The edge identification process is applied to the SAR image comprising the superpixels and edges. [A249]

"Stealth aerial vehicle"

An aerial vehicle having a low radar signature includes a first side on which turbine openings, and payload bays or landing gear bays are disposed. A second side of the aerial vehicle is designed to have a smaller radar signature than the first side. [A250]

"Transportation using network of unmanned aerial vehicles"

Embodiments described herein include a delivery system having unmanned aerial delivery vehicles and a logistics network for control and monitoring. In certain embodiments, a ground station provides a location for interfacing between the delivery vehicles, packages carried by the vehicles and users. In certain embodiments, the delivery vehicles autonomously navigate from one ground station to another. In certain embodiments, the ground stations provide navigational aids that help the delivery vehicles locate the position of the ground station with increased accuracy. [A251]

"Enhanced flight vision system and method with radar sensing and pilot monitoring display"

An image processing system for enhanced flight vision includes a processor and memory coupled to the processor. The memory contains program instructions that, when executed, cause the processor to receive radar returns data for a runway structure, generate a three-dimensional model representative of the runway structure based on the radar returns data, generate a two-dimensional image of the runway structure from the three-dimensional model, and generate an aircraft situation display image representative of the position of the runway structure with respect to an aircraft based on the two-dimensional image. [A252]

"On-board meteorological radar having a rotating antenna"

A meteorological radar installed on board an aircraft, including a mechanical support fixed to a bulkhead of a nose of the aircraft, wherein an antenna is mounted on the mechanical support to enable turning mobility around an axis of rotation. The antenna includes a pedestal, on which at least one blade, extending radially along the axis of rotation, is installed. A free side of the blade, along which a plurality of radiating elements is distributed, perceptibly has the shape of a portion of conic in a plane including the axis of rotation. Because the blade is mobile only in rotation along the axis of rotation, and the selection of the emission/reception direction is performed electronically, not mechanically, the space and length requirements of the meteorological radar are fixed, whether the meteorological radar is in operation or not, and are determined based on the eccentricity and parameter of the conic. [A253]

"Method and apparatus for enhanced multi-node utilization of an electromagnetic state space"

Methods and systems are provided for efficiently packing nodes within an electromagnetic state space. [A254]

"Satellite having a plurality of directional antennas for transmitting and/or receiving air-traffic control radio signals"

The invention comprises a satellite (1) having at least one transmitting and/or receiving unit (2) , which has an antenna assembly (3) for transmitting and/or receiving air-traffic control radio signals (4) , wherein the antenna assembly (3) has a plurality of directional antennas (6a to 6c) , which each form a respective transmitting and/or receiving sector (7a to 7c, 22a to 22e) within a defined transmitting and/or receiving area (21) and are designed to transmit and/or receive air-traffic control radio signals (4) in the respective transmitting and/or receiving sector (7a to 7c, 22a to 22e) of the directional antenna. [A255]

"Systems and methods for efficient reception and combining of similar signals received on two or more antennas"

A radio signal processing system includes a first antenna, a second antenna, a first receiver communicatively coupled to the first antenna, a second receiver communicatively coupled to the second antenna, a first processing unit communicatively coupled to the first receiver and configured to receive a first signal from at least one of the first antenna and the second antenna when the system is operating in a first mode, a second processing unit communicatively coupled to the second receiver and configured to receive a second signal from the second antenna when the system is operating in a first mode, and wherein the first processing unit is further configured to receive a third signal from both the first antenna and the second antenna when the system is operating in a second mode. [A256]

"Method and system for estimation and extraction of interference noise from signals"

A system for reception of electromagnetic waves in spectrum in which interference occurs comprising at least one transmitter, at least one receiver configured to receive the received signal, a first memory portion configured to store data relating to a point target response, a spectrum estimator configured to estimate the frequencies at which interfering signals occur, at least one processor configured to generate an estimation of the interfering signals at the frequencies estimated by the spectrum estimator, a second memory portion operatively connected to the at least one processor configured to store the estimation of the components of the interfering signals, the at least one processor configured to substantially reduce or eliminate radio frequency interfering signals from the received signal utilizing the point target response and the estimation of the interfering signals, and a method to substantially reduce or eliminate radio frequency interfering signals from for image data. [A257]

"Crossing traffic depiction in an ITP display"

Provided are methods and systems for the disambiguation of an in trail procedure (ITP) vertical display by calculating and rendering symbology on a plan view traffic collision avoidance system (TCAS) display. The symbology represents an intersection point between the ground track of an ITP aircraft and the ground track of a blocking aircraft and further represents an association between the intersection point and the respective ITP blocking aircraft. [A258]

"System and method for ground navigation"

A method for determining a heading, velocity, and/or position of an aircraft includes receiving a first radar return at a radar antenna for mounting to a first wing of the aircraft and receiving a second radar return at a radar antenna mounted to a second wing of the aircraft where the first wing and the second wing extend from opposite sides of the aircraft. The method also includes determining a velocity of each wing based on the radar returns using processing electronics and calculating the heading, velocity, and/or position of the aircraft based on the determined wing velocities using the processing electronics. [A259]

"Single antenna altimeter system and related method"

A system and related method is disclosed for determining a range between a single antenna array and a radio-frequency reflective surface. The system includes a frequency modulated continuous wave (FMCW) signal generator which transmits the FMCW transmission signal through a pair of bias tees and a coupler prior to reaching a circulator. The circulator selectively routes the transmission signal to the single antenna array for transmission. As the transmission signal is reflected from the RF reflective surface, the single antenna array receives the reflected FMCW reception signal. The coupler receives the reception signal and delays and selectively routes the reception signal to a mixer which mixes the reception signal with a transmission signal input to create a low frequency signal. The low frequency signal passes through the pair of bias tees, is converted to digital, and received by a processor which determines the range to the reflective surface. [A260]

"Methods and apparatus for adaptive multisensor analisis and aggregation"

The present invention is directed to a self consistent method for adaptive implementation of overflying multi sensor measurements and derivation of conclusions and determinations "agregants", derived and/or developed from the measured results and/or resulting from science-based processing design to integrate and process the measured results and other data and scientific knowledge. Furthermore, the aggregants may be pertinent to determination of status and proactive management models of the at least one distributed resource by a single or repeatable implementation of one or several steps. [A261]

"Identifying obstacles in a landing zone"

Mechanisms for identifying obstacles in a landing zone are disclosed. A first polarization elevation angle matrix is generated based on reflected radar signals having a first polarization sense. A second polarization elevation angle matrix based on reflected radar signals having a second polarization sense that differs from the first polarization sense is generated. The first polarization elevation angle matrix and the second polarization elevation angle matrix are integrated to form an integrated elevation angle matrix that identifies first scatterers and second scatterers with respect to the landing zone. [A262]

"Autothrottle retard control"

An autothrottle retard initiation method includes receiving an aircraft's ground speed, receiving the aircraft's vertical speed, determining autothrottle retard initiation height based on the aircraft's ground speed, the aircraft's vertical speed, and an aircraft vertical landing speed factor, receiving the aircraft's height above ground, and initiating autothrottle retard when the aircraft's height above ground and the autothrottle retard initiation height are equal. [A263]

"Passive ranging of a target"

In an embodiment, an apparatus includes a detector and a range finder. The detector is configured to determine a direction to a target in response to a signal received from the target, and the range finder is configured to determine a range to the target in response to the direction and independently of an amplitude of the signal. for example, such an apparatus (e.g., a computer-based apparatus) may be disposed on tactical fighter aircraft, and may be able to range (e.g., azimuth range or slant range) a target passively even if an accurate measure of the amplitude of the signal received from the target is unavailable. [A264]

"Radar based tracking system for golf driving range"

A golf ball range target system that includes a golf target, a golf ball dispenser, at least one golf ball, a target sensor, a tracking module, and a client computer is described. The golf target has a known geographic location and includes at least one golf target area. The golf ball dispenser houses golf balls. Each golf ball is associated with a particular player. The tracking module determines a golf ball flight trajectory for the golf ball associated with the particular player. The target sensor determines whether the golf ball has landed in a target area. [A265]

"System and method for multiple spotlight synthetic radar imaging using random beam steering"

A spotlight synthetic aperture radar (SAR) image is generated by directing randomly a beam of transmitted pulses at a set of two or more areas using a steerable array of antennas. Each area is illuminated by an approximately equal number of the transmitted pulses. Then, a reconstruction procedure is applied independently to received signals from each area due to reflecting the transmitted pulses to generate the image corresponding to the set of areas. [A266]

"Bistatic inverse synthetic aperture radar imaging"

A bistatic synthetic aperture radar (SAR) imaging system and method include: combining each radar return pulse from airborne radar platforms with a sinusoid, deskewing each reduced radar return pulse, estimating motion parameters based on a maximum likelihood estimation (MLE) , performing MLE motion correction to generate motion-corrected radar return pulses, acquiring position and velocity estimates of the airborne radar platforms and scattering locations, defining bistatic range and velocity vectors, defining new bistatic range and velocity vectors in a new set of orthogonal axes, projecting vector distance differences between the radar scattering locations along the new set of orthogonal axes to generate new range and velocity measurements along the new set of orthogonal axes, converting the new range and velocity measurements to map Doppler frequency into cross-range, and forming a bistatic SAR image in range and cross-range based on cross-range extent derived from the Doppler frequency mapping. [A267]

"System and method for defense against radar homing missiles"

A defensive interceptor missile is provided for defending a target against a radar-homing attack missile. A Missile Anti-Ship Kill Enhancement System (MASKES) comprises a defensive missile with digital RF memory device for (a) receiving radar signals from an attack missile, (b) processing received attack missile signals, and (c) transmitting amplified, Doppler shifted signals toward the attack missile such that the attack missile would interpret signals as being reflected off ship and target the source of the reflective signal, the defensive interceptor missile. [A268]

"SAR image formation"

SAR imaging method that includes applying PRF decimation to range-compressed IQ data to generate PRF-decimated range-compressed IQ data for each image block of an image and applying motion compensation to the PRF-decimated range-compressed IQ data to generate motion-compensated data for each image block. The method includes computing first stage image values at image grid point intersections of iso-range lines and vertical grid lines for each image bock based on the motion-compensated data for each image block. The method also includes computing second stage image values for the image grid point intersections by interpolation using the first stage image values at the image grid point intersections and correcting image phase of the second stage image values for the image grid point intersections to generate phase-corrected image values for each image block. The method includes generating a full-resolution SAR image by summing the phase-corrected image values for each image block. [A269]

"Situational awareness personal service"

A situational awareness personal service (SAPS) receives data records from a wide variety of data sources and provides real-time, tailored, situational awareness (SA) information to subscribers. The SA information, which can include course of action recommendations and threat assessments, can be made available and affordable to the general public. Subscribers may view the SA information using commercial off the shelf (COTS) devices, such as laptop computers, smartphones, and existing onboard integrated displays. In one aspect, transportation platforms can provide local observation data, such as radar tracking data, to the SA personal service in exchange for tailored SA information. [A270]

"Method for determining a result path of an aircraft, associated device and computer program product"

A method for determining a result path of an aircraft, the result path including a set of successive positions of the aircraft between an initial global point and a final global point that are predetermined for a mission of the aircraft is provided. The aircraft includes a plurality of calculating members, each able to guide the aircraft during at least part of the mission and to calculate an elementary path of the aircraft during that part, each elementary path including a set of successive positions of the aircraft between an initial elementary point and a final elementary point. The device includes calculating a portion of the result path from elementary paths coming from at least two distinct calculating members. [A271]

"Multi-stage detection of buried IEDs"

A surveillance system includes a multi-propeller aircraft having a main propeller and a plurality of wing unit propellers, a housing that houses the main propeller and the wing unit propellers, an optical video camera, an ultra-wideband (UWB) radar imaging system, a control system for controlling flight of the multi-propeller aircraft from a remote location, and a telemetry system for providing information from the optical camera and the ultra-wideband (UWB) radar imaging system to a remote location. [A272]

"Aviation display depiction of weather threats"

A method for indicating a weather threat to an aircraft is provided. The method includes inferring a weather threat to an aircraft and causing an image to be displayed on an aviation display in response to a determination by aircraft processing electronics that the inferred weather threat to the aircraft is greater than a measured weather threat to the aircraft. [A273]

"Passive phased array imager using sub-phase sampling CMOS detectors and a smart ROIC"

A passive phased array imager includes a plurality of antennas, disposed on a substrate, for receiving a wavefront from a target, and a coplanar waveguide, disposed in the substrate and coupled to the plurality of antennas. Also included is a plurality of detectors, disposed across the coplanar waveguide for sampling the received wavefront, and providing multiple output voltages to an imaging circuit for displaying information contained in the received wavefront. The plurality of antennas includes at least two dipoles coupled to the coplanar waveguide, and the two dipoles are spaced by a predetermined length to provide a standing wave at a frequency of interest. [A274]

"Free-hand scanning and imaging"

Wideband synthetic aperture radar (SAR) imaging. A probe transmits a signal through its aperture incident to an object located in a medium of interest remotely from the probe. The probe receives through the aperture a plurality of nonuniformly sampled reflected signals from the object as the probe moves in a measurement plane located a predetermined distance from the object. A processor executes a SAR-based reconstruction algorithm to generate an image. [A275]

"Systems and methods for providing ATC overlay protocols"

An embodiment of the present invention sets forth a method for modulating a signal to include broadcast data, modulating the signal to include an overlay message comprising an address and data for an intended recipient, and transmitting the modulated signal including both the broadcast data and the overlay message including the address and data for the intended recipient. Another embodiment of the present invention sets forth a method for modulating a plurality of signal transmissions to include broadcast data, modulating the plurality of signal transmissions with an overlay message wherein the overlay message comprises a respective plurality of data segments, and transmitting the plurality of signal transmissions including both the broadcast data and the overlay message including the respective plurality of data segments. Further embodiments of the present invention set forth additional methods and related systems. [A276]

"Wide band clear air scatter doppler radar"

Systems and methods for measuring wind speed and direction in clear air conditions using a wide band Doppler radar in accordance with embodiments of the invention are disclosed. In one embodiment of the invention, a wide band Doppler radar system includes an antenna assembly includes at least one transmit antenna and at least one receive antenna, a transceiver connected to the antenna assembly configured to transmit a radar beam includes a transmit signal on a Ka-band carrier frequency and receive a backscattered radar beam includes a carrier frequency that is frequency shifted relative to the transmitted Ka-band carrier frequency of the backscattered radar beam, a data acquisition system connected to the transceiver configured to estimate a wind velocity vector by calculating a Doppler shift between at least one transmitted radar beam and at least one received backscattered radar beam. [A277]

"Systems and methods for monitoring airborne objects"

Systems and methods for monitoring airborne objects are described herein. An air traffic management (ATM) system is provided that includes a memory device for storing data and a processor coupled to the memory device. The processor is programmed to receive object data associated with each of a plurality of airborne objects transmitted by at least one remote sensor device and generate an air traffic map to display a present location and a flight path for each airborne object based on the received object data. The object data includes situational awareness information for each airborne object and real-time position information for the at least one remote sensor device. [A278]

"Method and device for guiding an aircraft during a low level flight"

A calculation unit configured to define a safety corridor, whose width is increased compared with a nominal width, at least by one width of an escape trajectory with a spiral climb of the aircraft, wherein the safety corridor that is thus defined by the calculation unit is used by a construction unit for forming a flight trajectory for a low level flight of an aircraft. [A279]

"Obstacle and terrain warning radar system for a rotorcraft"

Obstacle and terrain warning radar system (1) for a rotorcraft (2) , the system having at least two assemblies (10) , each having at least one radar unit, said rotorcraft (2) including at least one main rotor (20) having at least two blades (22) and a rotor head (23) . Each radar unit transmits a centrifugal radar beam (17) with angular beam width in azimuth .alpha. of at least 5.degree. and beam width in elevation .epsilon. of at least 5.degree.. Said assemblies (10) of at least one radar unit are positioned directly on said rotor head (23) between said blades (22) , said radar system (1) electronically scanning the surroundings with angular coverage in elevation of at least +/-15.degree. and mechanically scanning the surroundings with angular coverage in azimuth of 360.degree., and then informing the pilot of said rotorcraft (2) . [A280]

"Navigator alignment using radar scan"

The various technologies presented herein relate to the determination of and correction of heading error of platform. Knowledge of at least one of a maximum Doppler frequency or a minimum Doppler bandwidth pertaining to a plurality of radar echoes can be utilized to facilitate correction of the heading error. Heading error can occur as a result of component drift. In an ideal situation, a boresight direction of an antenna or the front of an aircraft will have associated therewith at least one of a maximum Doppler frequency or a minimum Doppler bandwidth. As the boresight direction of the antenna strays from a direction of travel at least one of the maximum Doppler frequency or a minimum Doppler bandwidth will shift away, either left or right, from the ideal situation. [A281]

"Electronic device for preventing an accidental touch and operating method thereof"

An electronic device for preventing an accidental touch and an operating method thereof are disclosed, where the electronic device includes a first input device, a second input device, synthetic aperture radar and a main system. The synthetic aperture radar can sense whether a charged body is positioned near the second input device. When the charged body is positioned near the second input device, a voltage state of the synthetic aperture radar is pulled to a first logic level. When the voltage state of the synthetic aperture radar is in the first logic level, the main system disables the first input device. [A282]

"Method of system compensation to reduce the effects of self interference in frequency modulated continuous wave altimeter systems"

An altimeter system is provided. The altimeter system includes a receiver mixer including an antenna-input and a local-oscillator-input, a transceiver circulator communicatively coupled to an antenna via a transmission line having a selected length and communicatively coupled to the antenna-input of the receiver mixer, and a transmitter configured to output a transmitter signal to the antenna via the transceiver circulator. The transmitter signal is frequency modulated with a linear ramp. The transmitter is communicatively coupled to the receiver mixer to input a local oscillator signal at the local-oscillator-input of the receiver mixer. The receiver mixer is communicatively coupled to input a target-reflected signal from the antenna at the antenna-input of the receiver mixer. The selected length of the transmission line is set so that a composite-leakage signal at the antenna-input of the receiver mixer has a linear phase across a sweep bandwidth. [A283]

"Aircraft location system for locating aircraft in water environments"

A method and apparatus for an aircraft location system comprising an aircraft structure and a number of acoustic reflectors associated with the aircraft structure. The number of acoustic reflectors is configured to generate first sound signals in response to receiving second sound signals. [A284]

"Airborne biota monitoring and control system"

Apparatus and methods for an airborne biota monitoring and control system are disclosed. Radar and laser/optical sensors are used to detect insects, with detection zones being over water in some embodiments to reduce backscatter clutter. A pest control laser or small autonomous or radio controlled aircraft under automated or human control may be used to disable a targeted flying insect. One embodiment includes use of a head-mounted display for displaying insect targeting information superimposed on a real landscape view. Technologies such as adaptive lens, holographic optical elements, polarized radar and/or laser beams, light amplifiers and light guides, thin disk, spinning disk, or vertical cavity surface emitting lasers enhance performance of the apparatus or reduce cost of the apparatus. Also disclosed are methods of discrimination of insect types using spectral information and dynamic relative variation of spectral intensities at different wavelengths reflected from an insect in flight. [A285]

"Method of eliminating spurious echoes in SAR imaging"

A method of eliminating spurious echoes in SAR imaging comprises a step Etp1 of defining the SAR imaging parameters, a step Etp2 of calculating the spectrum of the signal received, in each distance bin, of a zone of interest 51, a step Etp3 of filtering the spectra in each distance bin, a step Etp4 of SAR imagette 51 formation and a step Etp5 of concatenating the SAR imagettes 51 to form the final SAR image. [A286]

"Multi-link transponder for aircraft and method of providing multi-link transponder capability to an aircraft having an existing transponder"

A transponder system that is adapted to be positioned in an aircraft includes a transponder that is adapted to transmit information pertaining to the aircraft in which the transponder is positioned includes at least one receiver that is adapted to receive information including information pertaining to another aircraft. The receiver (s) is adapted to receive different types of data on multiple different frequencies. A display, which may be integral with the system housing or remotely mounted, is adapted to display (i) information received by said receiver and/or (ii) information to guide user input selection of information transmitted by said transponder. The housing houses the transponder, the receiver and, in one embodiment, the display. The existing transponder in the aircraft can be removed thereby leaving an opening in the aircraft and the transponder installed in the opening. [A287]

"Automatic tracking camera system"

An automatic tracking camera system includes: an image pickup unit, a driving unit for rotating the image pickup unit in panning or tilting direction, a signal receiver for receiving an object information signal, an image signal processor for recognizing an object in an image and detecting motion of the object in the image, a controller for controlling the image pickup unit, the driving unit, and the image signal processor, and a memory for storing, for each passageway, standby positions at which the image signal processor detects the object. The controller calculates an approaching passageway and angle of the object, selects a corresponding standby position from the standby positions stored in the memory, drives the driving unit and a lens apparatus to the standby position, and controls, when the image signal processor recognizes the object, the driving unit and the lens apparatus to automatically track the object based on detected information. [A288]

"Method for locating aircraft which is independent of any satellite navigation system"

The present invention relates to a method for locating an aircraft (A.sub.k) , the said aircraft (A.sub.k) being equipped with at least one device for sending and receiving ADS-B signals, a set of ADS-B communication beacons being deployed on the ground, the position of each of the said ADS-B beacons being known, the said locating method comprising: a step of calibrating the time biases of the ADS-B beacons with a view to correcting the synchronization discrepancies when sending, by means of the calculation of the time discrepancy existing between the ADS-B beacons (B1, B2) upon reception of downgoing ADS-B signals sent by a set of aircraft equipped with at least one device for sending ADS-B signals, a step of calculating the pseudo-distances between the said aircraft (A.sub.k) and the said ADS-B beacons deployed on the ground, on the basis of the upgoing ADS-B signals. [A289]

"Apparatus and method for short dwell inverse synthetic aperture radar (ISAR) imaging of turning moving vehicles"

An apparatus and method for generating a radar image including acquiring a first plurality of data in a first domain, wherein one or more of the first plurality of data include data of a moving target engaged in a turning motion at a rotational rate greater than a threshold, converting the first plurality of data from the first domain to a second plurality of data in a second domain, wherein the second domain is a first two-dimensional transformation of the first domain, extracting one or more of the second plurality of data, converting the one or more of the extracted second plurality of data to a third plurality of data in a third domain, wherein the third domain is a second two-dimensional transformation of the second domain, phase compensating the third plurality of data, and transforming the phase compensated third plurality of data to generate the radar image. [A290]

"Extended life, timed pinger for aircraft"

A system monitors geographical information for location of an aircraft and supplies that information to a sunrise/sunset calculator that feeds location and sunrise/sunset data to a controller. The controller controls operation of a pinger, limiting its hours of operation to save battery power and extend the time period within which the pinger is audible. The hours of operation are pre-programmed to consist of a time range from sunrise to sunset or from a time after sunrise to a time before sunset. [A291]

"System and method of displaying convective weather on a weather radar display"

A convective weather graphic element generator system generates graphic elements associated with severe convective weather for presentation on a display on an aircraft. An exemplary system employs a weather radar and a processing system. The processing system determines a value associated with the detected convective weather based on the received weather radar returns detected by the weather radar, compares the value associated with the detected convective weather with a threshold, and generates a graphic element for a region of airspace when the value associated with the detected convective weather exceeds the threshold. The display is configured to concurrently present the weather reflectivity information generated by the weather radar and the graphic element associated with the convective weather, wherein portions of both the presented graphic element and the presented weather reflectivity information of the corresponding area are concurrently visible on the display. [A292]

"Detection of low observable objects in clutter using non-coherent radars"

A method and an apparatus for detection and tracking of one or more objects in land clutter, including strong clutter and low observable (LO) objects such as a humans, animals, vehicles, and small, low-flying aircraft using a non-coherent radar or the amplitude output of a coherent radar. The preferred embodiment of the method and apparatus uses an X-band, maritime, non-coherent radar and the Doppler spectra computed from the high-frequency amplitude modulations produced by the object interacting with the land-based clutter to determine the presence, velocity, and track of the object. [A293]

"Measurement of bladed rotors"

Measurement of bladed rotors and, more particularly, speed measurement of bladed rotors in a turbine engine using microwave probes is described. In one embodiment, an apparatus for measuring bladed includes a microwave sensor that radiates a microwave signal toward a bladed rotor and receives a reflected microwave signal from the bladed rotor, a radio frequency module that generates the microwave signal radiated by the microwave sensor and down-converts the reflected microwave signal into a down-converted signal, and a main processing module configured to generate an output pulse train signal representative of a speed of the bladed rotor based on the down-converted signal. In another embodiment, a method for measuring bladed rotors is described including radiating a microwave signal, receiving a reflected microwave signal, down-converting the reflected microwave signal, and generating an output pulse train signal representative of a speed of a bladed rotor based on the down-converted signal. [A294]

"Wavefront compensation in optical synthetic aperture imaging processors"

There is provided a System and method of wavefront compensation in a synthetic aperture imaging system. A return signal data representative of a signal reflected by a target area to be imaged is received. A compensation phase figure corresponding to a wavefront compensation to be applied is provided. The compensation phase figure is added or otherwise applied to the phase pattern of the return signal data in order to obtain a compensated phase pattern. An optical beam is spatially modulated according to the compensated phase pattern to produce a modulated optical beam such that the compensation phase figure produces a wavefront compensation on the optical beam. An image of the target area is optically generated using the modulated optical beam. [A295]

"Higher order processing for synthetic aperture radar (SAR)"

A method for processing received return signals in a visual synthetic aperture radar (ViSAR) system is provided. The method includes receiving a plurality of pulsed radar return signals over a time period corresponding to a plurality of data frames. From this data, processing is performed to generate a SAR image for each single data frame of the plurality of data frames. In parallel, the radar pulses used to form the image frames are buffered into a longer pulse sequence that is used to perform the detection processing, including identifying targets as having characteristics associated with one or more predetermined motion classes according to phase changes sensed between data frames. A visual indication of targets associated with a predetermined motion class is generated, and overlaid onto one of the SAR images. [A296]

"Intelligent radar detection device and method thereof"

An intelligent radar detection device and method thereof comprise an airport signal detection device detecting a specific airport signal intensity for judging if the device enters an airport, a radio communication device identifying a takeoff of the airplane and reporting location information of the device after the airplane lands, a GPS device acquiring GPS data to ensure the location information, and a system power respectively connected to the radio communication device, the airport signal detection device, and the GPS device. The radio communication device is respectively connected to the airport signal detection device and the GPS device. The present invention for locating and tracking packages and goods transported through aviation can automatically identifies if the device enters the airport to turn off the radio communication function. The present invention also automatically identifies the takeoff of and the landing of the airplane to turn on the radio communication function. [A297]

"Aircraft avoidance method and drone provided with a system for implementing said method"

A method enabling an aerial drone not having a TCAS system to avoid an intruder aircraft, the method including the steps of acquiring the position of the intruder aircraft in order to determine the distance between the aerial drone and the intruder aircraft, measuring the angular speed of the intruder aircraft in a horizontal plane, and determining whether the intruder aircraft is fitted with a TCAS system, and, if so, receiving a resolution advisory transmitted by the TCAS of the intruder aircraft and following a previously-determined avoidance path. The invention also provides a drone fitted with a system implementing the method. [A298]

"Pose estimation using long range features"

Aspects of the present disclosure relate to using an object detected at long range to increase the accuracy of a location and heading estimate based on near range information. for example, an autonomous vehicle may use data points collected from a sensor such as a laser to generate an environmental map of environmental features. The environmental map is then compared to pre-stored map data to determine the vehicle's geographic location and heading. A second sensor, such as a laser or camera, having a longer range than the first sensor may detect an object outside of the range and field of view of the first sensor. for example, the object may have retroreflective properties which make it identifiable in a camera image or from laser data points. The location of the object is then compared to the pre-stored map data and used to refine the vehicle's estimated location and heading. [A299]

"Harmonizing code from independent airborne aircraft identification systems"

An Automatic Dependent Surveillance-Broadcast (ADS-B) system, and method of harmonizing a transponder Squawk code and an ADS-B system, ensures that a Squawk code broadcast by the ADS-B system matches the transponder Squawk code. The transponder Squawk code is transmitted from a transponder positioned onboard an aircraft and the transmitted transponder Squawk code with a device positioned onboard the aircraft. A Squawk code input of an ADS-B Squawk code to be transmitted with the ADS-B system is received. The ADS-B Squawk code is compared with the received transmitter Squawk code using a comparator and the pilot is informed whether the transmitter Squawk code matches the ADS-B Squawk code. A message formatter generates a message that includes the ADS-B Squawk code. A wireless transmitter broadcasts the ADS-B Squawk code generated by the message formatter. [A300]

"On-board radar apparatus, object detection method, and object detection program"

An on-board radar apparatus includes a transmission wave generating unit configured to generate a first modulated wave, a second modulated wave, and a third modulated wave which are different from each other, a transmitting antenna configured to transmit a transmission wave based on the first modulated wave, the second modulated wave, and the third modulated wave, a receiving antenna unit configured to receive a reception wave arriving by allowing the transmission wave to be reflected by an object, and an azimuth detecting unit configured to detect a signal based on the first modulated wave, the second modulated wave, and the third modulated wave from the reception, wave and to detect an azimuth of the object based on the detected signal. [A301]

"Long range weather information display system and method"

A system and method of displaying weather data related to weather for an aircraft can include receiving onboard weather data and external weather data. A vertical weather profile is provided on a display based on the onboard weather data and the external weather data. Display includes a first portion associated with a first range closest to the aircraft and a second portion associated with a second range farthest from the aircraft. First images of weather in the first range are provided on the first portion in response to the onboard weather data and second images of the weather in the second range are provided on the second portion in response to the external weather data. Blended images can be provided on a blended portion between the first range and the second range. [A302]

"System and method for ice detection"

A hazard warning or weather radar system or method can be utilized to determine a location of ice. The system and method can be used in an aircraft. The aircraft weather radar system can include a radar antenna and a processor. The radar antenna receives radar returns. The processor can: 1. identify on a display a region of potential ice associated with a blow off region in response to the radar returns, temperature data, and wind data, 2. identify on a display a region of potential ice associated with a stratiform region in response to radar returns, temperature data, and a history of convective cells in the stratiform region, or 3. perform both 1 and 2. [A303]

"Route image generating system, device, and method"

A present novel and non-trivial system, device, and method for generating a route image presentable on a display unit is disclosed, where a route may be presented to draw a viewer's attention to one or more objects located along or below the route. An image generator ("IG") may be configured to receive navigation data, receive object data, construct one or more raised ground track profiles as a function of the first elevations and one or more object clearance distances, identify, if any, one or more penetrated segments of one or more raised ground track profiles, and generate an image data set representative of an image of a divisible route configured to present a plurality of route section highlighters comprised of one or more first route section highlighters corresponding to non-penetrated segment (s) and at least one second or subsequent route section highlighters corresponding to first or subsequent penetrated segment (s) , respectively. [A304]

"Multi-elevational antenna systems and methods of use"

The present disclosure provides systems and methods associated with an antenna system comprising a tension member configured to be towed by an aerial platform and/or secured to an orbiting satellite. In some embodiments, a first end of the tension member may be secured to the aerial platform and the second end may extend unsecured from the aerial platform at a different elevation than the first end. A plurality of antenna assemblies, each comprising at least one antenna, may be secured to and spaced along the length of the tension member. Each of the plurality of antennas may be adapted for use with a particular frequency or frequency bandwidth. for example, each of the plurality of antennas may be adapted or tuned for one or more frequencies useful for synthetic aperture radar (SAR) . In some embodiments, a receiving system, a communication link, and/or an antenna location system may be utilized. [A305]

"Terrain detection and classification using single polarization SAR"

The various technologies presented herein relate to identifying manmade and/or natural features in a radar image. Two radar images (e.g., single polarization SAR images) can be captured for a common scene. The first image is captured at a first instance and the second image is captured at a second instance, whereby the duration between the captures are of sufficient time such that temporal decorrelation occurs for natural surfaces in the scene, and only manmade surfaces, e.g., a road, produce correlated pixels. A LCCD image comprising the correlated and decorrelated pixels can be generated from the two radar images. A median image can be generated from a plurality of radar images, whereby any features in the median image can be identified. A superpixel operation can be performed on the LCCD image and the median image, thereby enabling a feature (s) in the LCCD image to be classified. [A306]

"Wide beam SAR focusing method using navigation solution derived from autofocus data"

An algorithm for deriving improved navigation data from the autofocus results obtained from selected image blocks in a wide-beam synthetic aperture radar (SAR) image. In one embodiment the navigation error may be approximated with a vector of low-order polynomials, and a set of polynomial coefficients found which results in a good phase error match with the autofocus results. In another embodiment, a least squares solution may be found for the system of equations relating the phase errors at a point in time for selected image blocks to the navigation error vector at that point in time. An approach using low sample rate backprojection (150) initially to select suitable image blocks, and full sample rate backprojection (156) for the selected image blocks, followed by full sample rate backprojection (164) for the image, using the improved navigation solution, may be used to reduce the computational load of employing the algorithm. [A307]

"Pulse radar ranging apparatus and ranging algorithm thereof"

A pulse radar ranging apparatus and a ranging algorithm thereof are provided. The pulse radar ranging apparatus includes a radio frequency pulse generator, a radio frequency filter, a radio frequency switch and a transceiver aerial. The radio frequency pulse generator generates a pulse signal. The radio frequency filter receives the pulse signal and generates a high-pass filter signal, wherein the high-pass filter signal includes a radio frequency pulse reference signal. The radio frequency switch controls an output of the radio frequency pulse reference signal. The transceiver aerial transmits the radio frequency pulse reference signal. The radio frequency pulse reference signal contacts an object and generates a return signal, and the transceiver aerial receives the return signal. The ranging algorithm processes and analyzes the signals obtained by the pulse radar ranging apparatus, and calculates a distance between pulse radar ranging apparatus and the object by using polynomial interpolation. [A308]

"Terrain awareness system with obstruction alerts"

Current TAWS systems generally do not provide alerts based on structures or wire obstacles. Such structures and wire obstacles include transmission and electrical wires, and power lines, bridges, and buildings. The current system allows just such alerting. Such alerts are particularly useful for helicopter aircraft, which commonly fly at heights where such structures and obstacles are present near the normal flying altitude of the aircraft. Certain implementations of the system and method include a method of creating an obstacle for use in a terrain awareness warning system, including: receiving data about a first terminus of an obstacle, receiving data about a second terminus of the obstacle, constructing a virtual volume about the first and second termini and a volume therebetween, and storing the virtual volume, whereby a database may be constructed of virtual volumes for use in addition to terrain information to provide alerting on obstacles for an aircraft. [A309]

"Multi-elevational antenna systems and methods of use"

The present disclosure provides systems and methods associated with an antenna system comprising a tension member configured to be towed by an aerial platform and/or secured to an orbiting satellite. In some embodiments, a first end of the tension member may be secured to the aerial platform and the second end may extend unsecured from the aerial platform at a different elevation than the first end. A plurality of antenna assemblies, each comprising at least one antenna, may be secured to and spaced along the length of the tension member. Each of the plurality of antennas may be adapted for use with a particular frequency or frequency bandwidth. for example, each of the plurality of antennas may be adapted or tuned for one or more frequencies useful for synthetic aperture radar (SAR) . In some embodiments, a receiving system, a communication link, and/or an antenna location system may be utilized. [A310]

"Guided wave radar level gauge system with dielectric constant compensation through multi-frequency propagation"

The present invention relates to a method of determining a filling level of a product contained in a tank by propagating a first transmitted electromagnetic signal in a first frequency range and a second transmitted electromagnetic signal in a second frequency range different from the first frequency range along a transmission line probe towards a surface of the product in the tank, receiving a first reflected electromagnetic signal in the first frequency range and a second reflected electromagnetic signal in the second frequency range, and determining the filling level based on a time-of-flight of the first reflected electromagnetic signal and a difference in time-of-flight of the first reflected electromagnetic signal and the second reflected electromagnetic signal. [A311]

"System and method for weather detection using more than one source of radar data"

A radar system can include electronics configured to receive communications from a terrestrial location. The communications can include composite weather data from a plurality of sources and scheduling data. The scheduling data can include an indication of timing for sending local weather data sensed by an airborne radar system to the terrestrial location. The terrestrial system can provide composite weather radar data to an airborne source. [A312]

"Systems and methods for enhanced awareness of obstacle proximity during taxi operations"

Systems and methods for predicting and displaying targets based on height in relation to the wing, wingtip or other elements of the aircraft, such as engine nacelles. The location of ground obstacles is based on radar returns (from sensors deployed on the ownship) , aircraft surveillance data, and/or an airport moving map database. [A313]

"Three dimensional radar system using usual radars installed in sea facilities"

There is provided a three-dimensional radar system by using the combination of commercialized usual radars for vessels at relatively low price so as to enable to strengthen the surveillance capability about aircrafts flying at low altitude and strengthen the surveillance capability on the sea and in the air to protect important facilities of a port with more developed than the conventional surveillance system of monitoring only ships or vessels in a port while overcoming the operational limitation of VTS (Vessel Traffic Service) . [A314]

"System and method for aircraft navigation based on diverse ranging algorithm using ADS-B messages and ground transceiver responses"

A method of aircraft navigation via receiving signals emitted by other aircraft and corresponding reply message transmitted by ground transceivers and the using a new diverse-ranging algorithm that solves for the positions of a eavesdropping aircraft and the positions of direct-reply aircraft emitting the signals received by the eavesdropping aircraft. [A315]

"Method to determine the location of a receiver"

A method, device, system and use for determining a distance, location and/or orientation including the at least relative determination of a position of at least one object using at least two active anchors. A first signal is emitted by a first of the two anchors and is received at the object and by a second of said two anchors. A phase measurement is performed at said second anchor and wherein a distance determination with respect to said first anchor is performed and/or the distance from said first anchor to said second anchor is known. A second, particularly electromagnetic, signal is emitted from said second anchor, and information on phase measurement and distance between said first and second anchors is made available to a computation unit and at least one phase measurement respectively of said first and second signal is performed at said object and made available to said computation unit. [A316]

"Aircraft capable of hovering, aircraft maneuvering assist method, and interface"

An aircraft capable of hovering, and characterized by having at least one sensor, which has a plane sweep region and is designed to acquire, when the aircraft is maneuvering, values of respective distances between first points on an obstacle within the plane sweep region, and a second point on the aircraft, and a control unit designed to generate an alarm signal when at least one of the first points lies within a safety region containing the second point on the aircraft. [A317]

"Obstacle information system of a helicopter"

An obstacle information system and method for a helicopter with a warning information processor (3) and a display unit (1) for any obstacle (2) within a predetermined minimum distance d4. Said warning information processor (3) is fed with information related to detected distance d5 and direction of said at least one obstacle (2) detected by an obstacle sensor system (4) to compute and prepare the information for presentation on the display unit (1) . Said display unit (1) comprises at least an indication area with a central circular surface (6) and a concentric ring-shaped area (7) around the circular surface (6) . Said circular surface (6) is used exclusively for alerts. The ring-shaped area (7) is used for both. Warnings and alerts and the repartition in the indication area of circular surface (6) and ring-shaped area (7) are dependent on the detected distance d5 of said at least one obstacle (2) . [A318]

"Aircraft comprising an onboard weather radar antenna provided with inclined panels"

An aircraft comprising a fuselage and a radome fixed to the fuselage. The radome defines a housing and the fuselage comprises a sealed bulkhead closing the housing. A weather radar antenna comprises a main panel. A plurality of peripheral panels are arranged around the main panel, inclined from a planar surface of the main panel and located on the same side of the planar surface. The housing contains the antenna which is mounted on the fuselage through a mechanical support fixed to the fuselage and to the weather radar antenna on the same side of the planar surface as the peripheral panels. A bird strike shield is located between the antenna and the sealed bulkhead. The shield comprises a dome with a top and a base, the base being fixed to the aircraft fuselage. An opening is formed at the top of the dome through which the mechanical support passes. [A319]

"Proximity warning system for helicopters"

A proximity warning system for a helicopter (22) comprising at least two radar units (1-3) , preferably three radar units (1-3) arranged to transmit microwaves and receive reflections of said microwaves from obstacles (10) . The at least two radar units (1-3) are fixed next to a main rotor head (s) (20) of the helicopter (22) for horizontally scanning an entire environment of 360.degree. around the helicopter (22) , all of said at least two radar units (1-3) operating essentially at the same frequency. [A320]

"Passive range estimating engagement system and method"

A system and method for determining a 3-dimensional target position and velocity using 2-dimensional IR sensor angular measurements for objects travelling in a ballistic manner within an IR sensor's field of view (FOV) . Resulting 3-dimensional states may be used to generate updated inputs for correlation and object selection to drive missile guidance and intercept operations. [A321]

"System and method for social networking of aircraft for information exchange"

A system and method for exchanging information between aircraft (210) . Sensors on a first aircraft (210) provide data about the first aircraft's environment, including hazards such as turbulence, icing, lightning, or birds. The system transmits the data to receiving systems in other aircraft (210) , which display the data, to warn the pilots flying the other aircraft of potential hazards. The pilot of the first aircraft may supplement the information with visual observations, about birds or unmanned aerial vehicles, for example. In one embodiment, the information is transmitted from aircraft to aircraft over a data link using ADS-B. In another embodiment, a first aircraft may transmit data to a second aircraft, which may relay, or re-transmit, the data to a third aircraft. [A322]

"Collision-avoidance system for ground crew using sensors"

A ground crew collision-avoidance system includes a plurality of radar sensor modules that each emit a radar signal, receives at a radar detector radar return signals corresponding to reflections of the emitted signal from a ground object, and transmits radar information associated with the received radar signal reflections reflected from the ground object, wherein each of the plurality of radar sensor modules are uniquely located on a surface of an aircraft that is at risk for collision with a ground object while the aircraft is being towed, a gateway unit that receives the radar information transmitted from the radar sensor module and transmits information associated with the received radar information, and a ground crew alert indicator that receives the information transmitted by the gateway unit and that presents a graphical alert icon on a display. The display indicates a likelihood of collision between the aircraft and the ground object. [A323]

"Damage proxy map from interferometric synthetic aperture radar coherence"

A method, apparatus, and article of manufacture provide the ability to generate a damage proxy map. A master coherence map and a slave coherence map, for an area prior and subsequent to (including) a damage event are obtained. The slave coherence map is registered to the master coherence map. Pixel values of the slave coherence map are modified using histogram matching to provide a first histogram of the master coherence map that exactly matches a second histogram of the slave coherence map. A coherence difference between the slave coherence map and the master coherence map is computed to produce a damage proxy map. The damage proxy map is displayed with the coherence difference displayed in a visually distinguishable manner. [A324]

"Rapid determination of model transitions for interacting models with bounded parameters"

A state estimation system utilizing an Interacting Multiple Model (IMM) architecture and algorithms that can transition between different regimes of operation described by multiple models. Each individual model includes states, whose dynamics can be modeled, as well as extrinsic parameters, such as inputs to the system and sensor biases, whose dynamics cannot be modeled, but which are constrained to lie within a known range of values. [A325]

"Anti-rocket system"

A counter-flying object system that includes a sensor array including an active sensor for detecting and tracking the flying object. An interceptor missile launcher for launching an interceptor to intercept the flying object, wherein upon launching of the interceptor, the sensor array determines the location of the interceptor and sends the object's and interceptor's locations to a control system. The control system provides mission data to the interceptor based on the object's and interceptor's locations for guiding the interceptor toward the flying object and activating a fragmentation warhead on or in the vicinity of the flying object when a lethality criteria is met. [A326]

"Methods and systems for presenting weather hazard information on an in-trail procedures display"

Systems and methods for improving situational awareness on an in-trails procedures display. A radar system transmits a radar signal and receives and stores weather radar reflectivity values into a three-dimensional reflectivity values indicate the presence of a weather hazard and generates one or more weather hazard icons based on the stored weather reflectivity values. An in-trail procedures display device displays the generated weather hazard icons. Wake vortex information for other aircraft is generated and outputted on the in-trail procedures display. Also, the processor receives a request for an altitude change and generates an alert when the aircraft is determined not to be cleared to transition to the requested altitude based on a projected transition, any existing weather hazards, wake vortices of proximate aircraft, and in-trail procedures. [A327]

"Link path delay estimator that combines coarse and fine delay estimates"

A link-path delay estimator estimates a signal-path delay of a signal path between a master device and a remote device, by combining coarse delay estimates and a fine delay estimate. The coarse delay estimates indicate only an integral portion of the signal-path delay, selected as an integral multiple of a symbol period. The fine delay estimate indicates only a fractional portion of the signal-path delay, selected from a range of values that extends over one symbol period. The link-path delay estimator can combine the coarse and fine delay estimates using a first rule if the two most recent coarse delay estimates are equal, and a second rule if the two most recent coarse delay estimates differ. The coarse delay estimates can arise from both rising edges and falling edges of periodic signals sent along the signal path. [A328]

"Collision avoidance and warning system"

A collision avoidance and warning system for a helicopter uses a type of emitted energy, for example radio frequency radar, from a transceiver positioned to cover a selected field of view for detecting an object or pedestrian in the vicinity of the helicopter. for helicopters that include a tail rotor assembly, the selected field of view can include a region around the tail rotor assembly so that when the helicopter is running on the ground, an alarm can be issued to persons approaching the tail rotor assembly. When the helicopter is in flight, the collision avoidance and warning system can alert the pilot when a portion of the helicopter outside of the pilot's field of view is in danger of a collision with an object. [A329]

"Method and apparatus for providing a dynamic target impact point sweetener"

An apparatus for providing a dynamic target impact point sweetener may include memory and a processor. The memory may store at least a target library indicating respective target parameters for a plurality of known potential targets. The processor may be configured by stored instructions to generate a composite multi-dimensional representation of a target based on radar data received at the apparatus from other aerial vehicles collecting projections over an area in which the target is located and based on radar data collected by an aerial vehicle in which the apparatus is located, identify the target based on the composite multi-dimensional representation, and generate aimpoint data regarding the target based on an identity of the target. The aimpoint data defining the most vulnerable point on the target. [A330]

"System, module, and method for presenting runway traffic information"

A present novel and non-trivial system, module, and method for presenting runway traffic information are disclosed. A partitioned runway awareness zone is established using data received from a source of navigation reference data, where such data could represent runway information, runway awareness zone information, or partitioned runway awareness zone information. After traffic data is received from a source such as an ADS-B, each section of the partitioned runway zone occupied by traffic is determined. Based upon the determination, an advisory data set comprising traffic information is generated and provided to a presentation system, where the advisory data set could include alert data based upon a level of threat. A presentation system used to present traffic information could include a visual display unit (s) , an aural alert unit, and/or a tactile alert unit. A portable device such as handheld may be used to present traffic information. [A331]

"System and method to identify regions of airspace having ice crystals using an onboard weather radar system"

Systems and methods of detecting type I ice crystals using an aircraft's onboard weather radar system are disclosed. An exemplary embodiment identifies radar returns having a return level signal strength less than a radar return sensitivity threshold level, determines if at least one of a weather condition and a flight condition concurrently exists with the identified radar returns having the return level signal strength less than the radar return sensitivity threshold level, and identifies a region of airspace potentially having type I ice crystals when the at least one of the weather condition and the flight condition concurrently exists with the identified radar returns having the return level signal strength less than the radar return sensitivity threshold level. [A332]

"Interferometric inverse synthetic aperture radar and method"

An interferometric inverse synthetic aperture radar (IFISAR) is described that can provide a height measurement of moving objects on a surface using a small radar aperture. The IFISAR includes a two-dimensional antenna array including a plurality of elements that are configured to receive a plurality of return signals carrying energy of a transmitted RF signal that are reflected from the target. A first antenna group and a second antenna group of the plurality of elements respectively located at opposite ends of the array are enabled, and a third antenna group of the plurality of elements located between the first antenna group and the second antenna group are disabled. A processor of the IFISAR is operatively coupled to the plurality of elements and configured to determine height characteristics of the target according to interferometric processing of the return signals received by the first antenna group and the second antenna group. [A333]

"Method and system for random steerable SAR using compressive sensing"

A synthetic aperture radar image is generated by directing randomly a beam of transmitted pulses at an area using a steerable array of antennas, wherein the area is uniformly by the transmitted pulses while the array of antennas moves along a path. A sparse reconstruction procedure is applied to received signals from the area due to reflecting the transmitted pulses to generate the image corresponding to the area. The radar system can operate in either sliding spotlight mode, or scan mode. The area can be of an arbitrary shape, and a resolution of the image can be increased. [A334]

"Radar system and control method thereof"

A radar system comprises a transmitting device comprising a reference frequency source, for generating a reference frequency signal, a direct-digital synthesizer, coupled to the reference frequency source, for generating a synthesized frequency signal according to the reference frequency signal, a phase lock loop, coupled to the direct-digital synthesizer, for converting the synthesized frequency signal to an output signal, a transmitting antenna, coupled to the phase lock loop, for emitting the output signal to the air, and a loop switch module, coupled to the phase lock loop, for switching the phase lock loop between an open loop mode and a closed loop mode, and at least one receiving device, for receiving at least one wireless signal, and processing the at least one wireless signal according to the output signal generated by the phase lock loop. [A335]

"Method and apparatus for compensating for a parameter change in a synthetic aperture imaging system"

There is described a method for processing data generated by a synthetic aperture imaging system, comprising: receiving raw data representative of electromagnetic signals reflected by a target area to be imaged, receiving a parameter change for the synthetic aperture imaging system, digitally correcting the raw data in accordance with the parameter change, thereby compensating for the parameter change in order to obtain corrected data, and generating an image of the target area using the corrected data. [A336]

"Method and system using a polarimetric feature for detecting oil covered by ice"

A method for detecting an oil mass covered by ice includes collecting polarimetric radar data at different depths into the ice using at least one airborne platform moved about a search area above the ice so that the polarimetric radar data defines polarimetric volumetric radar data. The polarimetric volumetric radar data is processed based upon at least one polarimetric feature to thereby detect an oil mass covered by the ice. [A337]

"Apparatus and method using radar in the ground to detect and/or count bicycles"

A package, wireless sensor module, wireless sensor node and wireline sensor node are disclosed including a radar configured to embed beneath vehicles in pavements, walkways, parking lot floors and runways referred to herein as in ground usage. An access point interfacing to at least one of the sensors is disclosed to provide traffic reports, parking reports, landing counts, takeoff counts, aircraft traffic reports and/or accident reports based upon the sensor's messages regarding the radar and possibly magnetic sensor readings. A runway sensor network is disclosed of radar sensors embedded in lanes of at least one runway for estimating the landing count and/or takeoff count effect of aircraft. [A338]

"Method and system for aiding the navigation of an aircraft"

A system including at least one global navigation database including data for aerial navigation and airport navigation of the aircraft and data mentioned on navigation maps, a central unit for carrying out a contextualized filtering of data intended for a display and received, at least in part, from said navigation database, and a display device for carrying out the display on one and the same screen, said display being based on information from said contextualized filtering. [A339]

"Systems and methods for improving bearing availability and accuracy"

Systems and methods for improving bearing initialization for a pair of two-element antennas. An exemplary system includes two-element antennas mounted on the bottom and top of an aircraft fuselage, an output device, and a processing device. The processing device receives phase-difference information based on phase of signals received at each element of a two-element antenna, determines if the received phase-difference information is within a predefined low-confidence region, and initializes bearing if the phase-difference information is not within the low-confidence region or the phase-difference information from a predefined number of consecutively received signals meets a predefined consistency requirement. [A340]

"Identification device and identification system"

A preferred embodiment of the invention includes: an identification device (1) for receiving a first signal and transmitting a second signal, the device including: a receiving means (35) for receiving the first signal to generate a voltage, an integrated circuit (37) having a state selection means (41) for selecting whether the device (1) is in a first state or a second state, a connection (39) between the receiving means (35) and the integrated circuit (37) , a transmission means (45) for generating the second signal. The invention also includes a system (50) that includes an interrogator (43) for interrogating a plurality of the identification devices (1) . [A341]

"Systems and methods for autotilting a ground-mapping radar"

Systems and methods that utilize a terrain database to find the elevation of the ground in the area of ground-mapping illumination to optimize the tilt of a ground-mapping antenna. An exemplary system located on a host aircraft includes a memory that stores terrain elevation data and a component that provides height, position, and orientation information of the host aircraft. A processor receives the height, the position, and the orientation information, defines a desired terrain area to be mapped, based on the received information, retrieves terrain elevation data from the memory, based on the desired terrain area to be mapped, and calculates at least one tilt angle for a ground-mapping radar function based on the retrieved terrain height value and the aircraft's height, position, and orientation information. One or more actuators is commanded to move an antenna based on the calculated at least one tilt angle. [A342]

"Method of approaching a platform"

A method having a preparation stage for preparing an approach path (25) to a theoretical position (20') of a platform (20) . During a consolidation stage, a current position (20'') of said platform (20) is determined and an alert is triggered when the distance (D1) between said theoretical position (20') and said current position (20'') is greater than a first threshold. During a security stage, entities provided with respective automatic identification systems and present in a predetermined monitoring zone (OCZ) are monitored, and a horizontal representation of said approach path (25) is displayed on a display screen (8) together with the following for each entity: a plot (41) representing its current position, an indication (42) of the travel direction of the entity, and a representation (43) relating to the danger level of the entity. [A343]

"Pre-processing SAR image stream to facilitate compression for transport on bandwidth-limited-link"

Pre-processing is applied to a raw VideoSAR (or similar near-video rate) product to transform the image frame sequence into a product that resembles more closely the type of product for which conventional video codecs are designed, while sufficiently maintaining utility and visual quality of the product delivered by the codec. [A344]

"Probabilistic surface characterization for safe landing hazard detection and avoidance (HDA)"

Apparatuses, systems, computer programs and methods for performing hazard detection and avoidance for landing vehicles are provided. Hazard assessment takes into consideration the geometry of the lander. Safety probabilities are computed for a plurality of pixels in a digital elevation map. The safety probabilities are combined for pixels associated with one or more aim points and orientations. A worst case probability value is assigned to each of the one or more aim points and orientations. [A345]

"Method and system using radiometric volumetric data for detecting oil covered by ice"

A method for detecting an oil mass covered by ice includes collecting radiometric data different frequencies, corresponding to respective different depths into the ice, using at least one airborne platform moved about a search area above the ice so that the radiometric data defines radiometric volumetric data. The radiometric volumetric data is processed to thereby detect an oil mass covered by the ice. [A346]

"Method and system using coordinated airborne and ground platforms for detecting oil covered by ice"

A method for detecting an oil mass covered by ice includes collecting alert data at a first probability of detection using an airborne platform moved about a search area above the ice. An alert area having a likelihood of an oil mass covered by the ice is determined based upon the alert data. Confirmation data is collected at a second probability of detection higher than the first probability of detection using a ground platform moved over the alert area. An oil mass covered by the ice is detected based upon the confirmation data. [A347]

"Ballistic missile debris mitigation"

A method for identification of one or more launched objects obscured by debris objects within a debris field comprises: directing one or more sensor pulses at the debris field to obtain a plurality of sensor images, identifying objects within the debris field based on the sensor images, determining acceleration characteristics for each of the identified objects within the debris field based on the sensor images, identifying objects exhibiting free fall acceleration characteristics as debris objects, and identifying objects exhibiting centripetal acceleration characteristics as the one or more launched objects. [A348]

"Distance measuring quality factor using signal characterization"

A system and method for providing a range (distance) measurement by measuring electromagnetic signal time of flight. The system provides an estimate of the quality of the range measurement by evaluation of the multipath environment based on signal characterization. In one embodiment, a received ultra wideband signal is evaluated by a scanning receiver to produce a channel scan waveform inclusive of the transmitted signal and multipath response. The channel scan waveform is evaluated for envelope rise rate, amplitude, leading edge direct path pulse time, saturation, blockage, and signal history characterization. Signal characteristics are used to determine a signal classification. Signals are then evaluated for quality based on the signal classification. In one embodiment, the signal quality is used to estimate a variance of the range estimate for use in navigation algorithms. [A349]

"Front structure and rear structure of vehicle"

In order to provide a front structure, of a vehicle, which prevents reduction in efficiency in cooling an auxiliary component, by using intake air, and suppresses damage to the auxiliary component, which are caused by a millimeter-wave radar in the event of collision, a front structure of the vehicle includes a front right side radar for transmitting and receiving a radio wave to detect obstacles to a front right side of the vehicle, a front left side radar for transmitting and receiving a radio wave to detect obstacles to a front left side of the vehicle, a bumper reinforcement, crash boxes at the left and the right, and a condenser which is cooled by intake air. The front right side radar is arranged to a side farther out than a right end of the condenser, and the front left side radar is arranged to a side farther out than a right end of the condenser. [A350]

"Airport travel surface edge lighting and foreign object detection system and method"

An object detection system for use in airports including an airport travel surface light assembly, a rotatable sensor assembly mounted on the airport travel surface light assembly for sensing objects and an omnidirectional illuminator mounted above the rotatable sensor assembly. [A351]

"Weather hazard threat level computation and display"

A method for computing and displaying a weather hazard threat level for a weather radar system of an aircraft includes receiving weather radar returns from a radar antenna of the weather radar system. The weather radar returns include at least one of horizontal scans and vertical scans. Radar reflectivity may be determined from the weather radar returns, and, for at least one of the horizontal scan data and the vertical scan data, areas of radar reflectivity and a temperature associated with the areas of radar reflectivity may be determined. A lightning flash rate may be estimated using the radar reflectivity, areas of radar reflectivity, and temperature associated with the areas of radar reflectivity. Weather radar information may then be displayed, wherein the weather radar information is adjusted on the display based on the lightning flash rate. [A352]

"Systems and methods of providing a TCAS primary radar"

Systems and related methods are delineated for employing a TCAS to provide a radar function for a UAS. One such system comprises a TCAS having at least a transceiver and an antenna, and a processor coupled to the transceiver for receiving signals generated from receipt of reflected energy received over the antenna, the reflected energy resulting from the one or more of a Mode S interrogation waveform and an ATCRBS interrogation waveform transmitted from the antenna. [A353]

"Wideband waveform synthesis using frequency jump burst-type waveforms"

Methods are provided for obtaining wideband waveforms from a set of narrowband waveforms. The synthesized wideband waveforms are suitable for generating fine range resolution synthetic aperture radar images. Furthermore, narrowband pulse compressed data can be siphoned from the processing chain to be used in multi-look GMTI processing either independently or jointly. [A354]

"Method and apparatus for determining a doppler centroid in a synthetic aperture imaging system"

There is described a method for determining a Doppler centroid in a synthetic aperture imaging system, comprising: receiving raw data representative of electromagnetic signals reflected by a target area, selecting, among the raw data, at least two sets of sub-area data each representative of electromagnetic signals reflected by a corresponding sub-area of the target area, the sub-areas being substantially aligned along an azimuth axis of the target area and having a substantially identical surface area, for each one of the sets of sub-area data, generating an image corresponding to the corresponding sub-area, and measuring a mean intensity of the image, and estimating the Doppler centroid from a skew of an intensity function representing the mean intensity as a function of a look number for the corresponding sub-area. [A355]

"Hybrid pulsed-FMCW multi-mode airborne and rotary wing radar ESA device and related method"

A device and method is disclosed for a hybrid multi-mode airborne and rotary wing radar Electronically Scanned Antenna (ESA) . Pulsed Radio Frequency Integrated Circuit (RFIC) Transmit and Receive Modules (TRM) are nested with Frequency Modulated Continuous Wave (FMCW) transmit elements within the aperture of an ESA. FMCW elements only transmit while the pulsed TRM receive both the pulsed return and the FMCW return. During the hybrid configuration, both the pulsed and FMCW performance is limited to less than the full ESA aperture. In an alternate configuration, individual TRM are configured for transmit and receive of both FMCW and pulsed signals are coupled within the aperture of the ESA. The individual elements offer full aperture performance in both pulsed and FMCW operation. A diplexer controls channel deconfliction between the pulsed and the FMCW transmissions/receptions while a switching network directs the individual elements to hop between the pulsed and FMCW modes. [A356]

"Radar wind turbine"

A blade mounted radar system comprises a wind turbine having a hub and blades extending therefrom, a radar antenna configured to transmit and/or receive a radio frequency (RF) signal, and a processor in electrical communication with the radar antenna and configured to generate the RF signal for transmission and/or to process the received RF signal. The radar antenna is affixed to one of the blades of the wind turbine such that relative motion is defined between the radar antenna and a target within a line of sight of the radar antenna. The problem of the ground based radar line of sight being obscured by the wind turbine is mitigated in this setup, as radar and turbine coexist in the same structure. Improved performance and additional capability are enabled by elevated installation and vertical SAR imaging capability. Doppler capabilities are extended using known motion of the antenna relative to stationary objects. [A357]

"System and method for ensuring ADS-B integrity of departing aircraft"

A system for ensuring Automatic Dependent Surveillance--Broadcast (ADS-B) integrity of an aircraft includes a designated aircraft interrogation area, an ADS-B receiver, and an alerting mechanism. The ADS-B receiver is configured to receive ADS-B data from the aircraft when the aircraft is located in the designated area and to send a signal to the alerting mechanism indicating that the aircraft is in the designated area. [A358]

"Low range altimeter antenna"

The present disclosure is directed to low range altimeter (LRA) antenna implementations that are resistant to signal degradation under critical weather conditions. An altimeter may include a first antenna communicatively coupled to a transmitter configured to transmit a ranging signal to a surface. The altimeter may further include a second antenna communicatively coupled to a receiver configured to receive at least a portion of the ranging signal reflected from the surface. Each of the first (transmitting) antenna and the second (receiving) antenna may include a driven element and at least one parasitic director element. In some embodiments, at least a portion of an aircraft surface may function as a parasitic reflector element in accordance with a Yagi-Uda array antenna topology. [A359]

"Aircraft distance measuring equipment with directional interrogation"

A multi-function avionics system that includes, but is not limited to, a combined traffic collision avoidance system (TCAS) and directional measuring equipment (DME) system that utilizes a multi-function directional antenna for both functions. The multi-function system utilizes the same directional antenna for TCAS and DME functions, which typically utilize the same communication frequency band. The multi-function antenna may include four antenna elements that discriminate the direction of the DME ground station squitter. The DME system establishes a bearing to the ground station from the squitter and uses this information to determine which directional beam to use for the DME interrogation. Directional DME interrogation reduces the power requirements relative to that required for omni-directional DME interrogation. The integration of DME and TCAS enables the removal of antennas and feeder cables from the aircraft, saving weight, drag and cost. [A360]

"Threat analysis toolkit"

A method and system for managing an aircraft's flight path by identifying and categorizing potential threats in the aircraft's original flight path and determining an alternate flight path. The alternate flight path is selected from potential flight paths and has a threat value lower than any of the potential flight paths. The potential flight path candidates are generated from combinations of the original flight path coordinates, and coordinates that vary from the original coordinates by a set range. [A361]

"Software-defined multi-mode ultra-wideband radar for autonomous vertical take-off and landing of small unmanned aerial systems"

A small unmanned aerial system (sUAS) is used for aerial and on the ground surveillance while an operator of the sUAS, or other personnel, remain at a safe distance. The sUAS system can perform an autonomous landing and can be operated at an extended, e.g., greater than 100 meters, standoff from the detection apparatus and potential harm. The sUAS may be implemented as an easy-to-operate, small vertical take-off and landing (VTOL) aircraft with a set of optical, thermal, and chemical detection modules for performing aerial surveillance and ground surveillance after landing. [A362]

"Correction of spatially variant phase error for synthetic aperture radar"

A method, apparatus, and computer program product is present for focusing an image. A spatial model for spatial variation in phase error is identified for the image. The image is divided into a number of subpatches based on the spatial model. Phase correction is applied to each of the number of subpatches to form a number of focused subpatches. The number of focused subpatches is merged to form a focused image. [A363]

"System, device, and method of protecting aircrafts against incoming threats"

System, device and method for protecting aircrafts against incoming threats. The system includes: (a) a dual-band

Radio Frequency (RF) track-and-confirm module comprising: a dual-band RF receiver to receive high-band RF signals and low-band RF signals, a threat confirmation module to confirm a possible incoming threat based on processing of RF signals received at the dual-band RF receiver, a threat parameters calculator to calculate a fine angular position and a precise angular position of a confirmed incoming threat, based on processing of RF signals received at low-band RF for fine angular position and at high-band RF for precise angular position, (b) a countermeasure directed Laser module to activate a directed Laser countermeasure towards said precise angular position of said confirmed incoming threat. [A364]

"Enhanced radar range resolution"

A synthetic aperture radar imaging method that combines each radar return pulse with a sinusoid to reduce the radar return pulses to a baseband frequency and deskew each radar return pulse. It includes determining a maximum likelihood estimate (MLE) of residual motion parameters for a dominant scatterer on the ground relative to the airborne radar and correcting for errors in inertial navigation system measurements based on the MLE residual motion parameters. It includes convolving each radar return pulse with its corresponding radar transmission pulse to generate a range compressed image for each radar return pulse and generating a sub-band range profile image for each radar return pulse and its corresponding radar transmission pulse based on the corresponding range compressed image that has been corrected for residual motion. Performing bandwidth extrapolation on each sub-band and subsequently combining the three bands to produce an enhanced resolution image without grating lobes. [A365]

"System for the detection of incoming munitions"

A system for detecting munitions in flight comprises a radar transmitter, receiver, and associated antennas, wherein the antennas are oriented to include ground level coverage, and where a receive antenna is arranged to provide a plurality of receive beams. The system further incorporates a Doppler filter arranged to reject targets that have velocity profiles that do not match those expected of targets of interest. If a target of interest is detected then an indication is provided, preferably in the form of an audible alert, allowing those nearby time to take cover. The system provides a simple munitions detection capability that may operate in CW mode to allow rapid detection, and may also have means such as switchable FMCW, and elevation measurement to allow estimation of possible landing areas of the target. [A366]

"Location of a leak in a pipe"

A method and a device including the steps of: locally detecting an event in a pipe, generating at least one signal, coded according to the detected event, and detecting a frequency signature of said signal in images generated by a synthetic aperture radar. [A367]

"Methods and systems for avoiding a collision between an aircraft on a ground surface and an obstacle"

The disclosed embodiments relate to methods and systems for avoiding a collision between an obstacle and a vehicle, such as an aircraft, on a ground surface. A processor receives a detection signal from one of a plurality of proximity sensors. The detection signal indicates that the obstacle has been detected. In response to receiving the detection signal, a video image signal is transmitted from the processor to a display in the cockpit of the aircraft. The video image signal corresponds to a particular video imager that is associated with the particular proximity sensor that detected the obstacle. A video image, of a particular region around the aircraft that includes the obstacle is displayed on a display. In response to receiving the detection signal, the processor can also transmit an alert signal, and a brake activation signal to activate a braking system to prevent the aircraft from colliding with the obstacle. [A368]

"Image processing method"

An image processing method using an algorithm which incorporates simulated annealing by parallel Markov chains, the calculation of fitness values of states of the Markov chains which have substantially the same simulated annealing temperature, the calculation of the standard deviation of these fitness values, and the use of this standard deviation in setting the simulated annealing cooling schedule. The method may be used to delineate an object of interest in an image against a background by estimating the boundary of the object and optimizing the fit of the region within this boundary to the region occupied by the object. [A369]

"Optimized two panel AESA for aircraft applications"

A two panel radar system is disclosed. The radar system may include a pair of AESA panels respectively positioned on either side of a central axis, wherein a pointing direction of the first AESA panel is offset by a predetermined angle in a clockwise direction with respect to the central axis and a pointing direction of the second AESA panel is offset by the predetermined angle in a counterclockwise direction with respect to the central axis. A controller may be configured for selectively activating at least one of: the first AESA panel for providing a first coverage area in a first direction offset from the central axis, the second AESA panel for providing a second coverage area in a second direction offset from the central axis, or the pair of AESA panels jointly for providing a third coverage area between the first coverage area and the second coverage area. [A370]

"Radar detection of radiation-induced ionization in air"

A millimeter wave measurement system has been developed for remote detection of airborne nuclear radiation, based on electromagnetic scattering from radiation-induced ionization in air. Specifically, methods of monitoring radiation-induced ionization of air have been investigated, and the ionized air has been identified as a source of millimeter wave radar reflection, which can be utilized to determine the size and strength of a radiation source. [A371]

"Method and apparatus for rejecting intermodulation products"

Methods and apparatus for providing a radar system that rejects intermodulation products than can generate false targets. In one embodiment, a method includes transmitting a first signal at a first time at a first frequency to detect a target within a first altitude range, determining a range from a first receive time to a second receive time for possible signal return from the target within the first altitude range, receiving the possible signal return from the target in a frequency band of interest based upon the first frequency while transmitting a second signal at a second frequency spaced a selected frequency distance from the first frequency to place transmit feedthrough outside of the receive frequency band of interest and false target return outside the frequency band of interest for rejecting intermodulation products. [A372]

"Aircraft radar altimeter structure"

Embodiments described herein are directed towards a radar altimeter for mounting onto an aircraft. The radar altimeter includes a base configured to mount to an external surface of an aircraft, the base having an inner portion and a flange disposed around the inner portion, wherein the inner portion has a generally rectangular geometry defining a long dimension and a short dimension. A chassis is mounted to the base and has a planar portion that is disposed perpendicular to a plane formed by the base. A plurality of circuit boards are mounted to the planar portion of the chassis and disposed parallel to the planar portion of the chassis. The base is configured to mount over a second aperture in the external surface of the aircraft such that the chassis and the plurality of circuit boards are placed through the aperture and are disposed inside of the aircraft. [A373]

"Processing SAR imagery"

A method and apparatus (1) for processing SAR imagery data, comprising: determining variance ratio data from the SAR imagery data, and processing, for use in change detection, the determined variance ratios data by making use of the F-distribution. The method may further comprise selecting a desired false alarm rate, and wherein making use of the F-distribution comprises determining a change detection threshold for the determined variance ratios data that is dependent upon the F-distribution and the desired false alarm rate. Another possibility is that making use of the F-distribution comprises using the F-distribution to determine probabilities for the determined variance ratios data. [A374]

"Method and device for tracking the path of motion of a moving object as well as computer program and data storage media"

Method, device, computer program and computer program product for tracking the path of motion of a moving object. The method includes a) providing data of at least one state variable to be determined, which influences the movement of the moving object, at a first point in time, b) initializing the probability density (p) of the at least one state variable to be determined at the first point in time, c) predicting of the probability density (p) of the at least one state variable to be determined at a next point in time after the first point in time, d) verifying of whether measurement data are available that can be used for a calculation of the probability density (p) of the at least one state variable to be determined, and d') recalculating the probability density (p) with these measurement data when such data is available, e) calculating the prediction values of the state variable (s) to be determined from the probability density (p) , f) outputting the calculated prediction values to a downstream data processing device, and g) repeating the steps c) through f) . The steps of initializing the probability density (p) of step b) , predicting the probability density (p) of step c) , recalculating the probability density (p) of step d') , and calculating the prediction values of step e) are performed by discretizing the probability density (p) on sparse grids. [A375]

"Digital radar altimeter"

A method for determining a height above ground of an aircraft broadly comprises the steps of generating a transmit signal with a transmitter, transmitting the transmit signal with a first antenna, generating a local oscillator signal with a local oscillator, receiving a receive signal with a second antenna, mixing the receive signal with the local oscillator signal to generate a baseband signal, determining a frequency of interest of the baseband signal, and calculating an aircraft altitude corresponding to the frequency of interest. [A376]

"Development of a contrast phantom for active millimeter wave imaging systems"

A contrast phantom for an active millimeter wave imaging system is made from different materials or sections having different reflectivities. The reflectivities incrementally increase in discrete steps so that the phantom is useable to calibrate the active millimeter wave imaging system. The reflectivities preferably range from 0% to 100% and incrementally and linearly increase in equal steps. A method of producing the contrast phantom for the active millimeter wave imaging system is also described. [A377]

"Method and system for forming images by comparing subsets of image data"

A system and method for generating enhanced images of a target area using projection data obtained using an electromagnetic radiation source, the method comprising forming an initial aperture of data points containing positional information of the transmitter and receiver of the electromagnetic radiation, and an associated data record, randomly removing data points from the initial aperture to form subapertures with randomly missing data points, creating a subset of data points from each of the plurality of subapertures, the subsets containing data points containing image data for portions of the target area which are the same or overlapping, comparing the subsets of data points to determine variations in the data points indicative of transient data, based upon the comparison between overlapping subsets of image data, determining whether the subsets of data points comprise image data relating to physical objects or noise. [A378]

"Pose estimation using long range features"

Aspects of the present disclosure relate to using an object detected at long range to increase the accuracy of a location and heading estimate based on near range information. for example, an autonomous vehicle may use data points collected from a sensor such as a laser to generate an environmental map of environmental features. The environmental map is then compared to pre-stored map data to determine the vehicle's geographic location and heading. A second sensor, such as a laser or camera, having a longer range than the first sensor may detect an object outside of the range and field of view of the first sensor. for example, the object may have retroreflective properties which make it identifiable in a camera image or from laser data points. The location of the object is then compared to the pre-stored map data and used to refine the vehicle's estimated location and heading. [A379]

"Weather information display system and method"

Systems and methods for displaying weather data relating to weather near an aircraft are provided. A method includes generating a three-dimensional weather profile of the weather near the aircraft based on reflectivity data from radar returns of a weather radar system of the aircraft. Generating the three-dimensional weather profile includes estimating weather data above a freezing layer height using a function that is based on a rate of reduction in reflectivity above the freezing layer. The method further includes transmitting weather display data to a display device, the weather display data being configured to cause the display device to display a visual representation of the three-dimensional weather profile. [A380]

"Method for validating aircraft traffic control data"

A method for group travel and group communications, wherein the group travel parameters and group communications are combined for verifying and validating ADS-B data on aircraft. The full connectivity within a navigating group of aircraft allows all the group members to communicate spatial/temporal observations and collaborate in group protocols, e.g., majority voting protocol, which can determine if a received ADS-B message is corrupted or from a false target aircraft. Well-established distributed protocols based on group communications and majority voting exist for (1) detecting compromised members, i.e., false target aircraft, and (2) verifying message integrity, i.e., ADS-B data, given a minority fraction of members are compromised/colluding. Such protocols can be based on IP multicast communications over the IP networking data links available on the aircraft. Also disclosed is a method for verification and validation of position indicator message data on aircraft. [A381]

"Systems and methods for safely landing an aircraft"

A system for safely landing an aircraft including a low range radio altimeter, a barometric altimeter, and an autothrottle control. The low range radio altimeter calculates a first height of the aircraft above ground-level, the barometric altimeter calculates a second height of the aircraft above ground-level, and the autothrottle control determines if the first height and the second height do not correlate. If the first and second heights are determined to lack correlation, then automatic thrust-control of the aircraft is stopped. In some embodiments, the second height is partially calculated by accessing a ground elevation database to obtain an elevation of the ground above sea level and determining a difference between the elevation of the ground above sea level and an elevation of the aircraft above sea level. [A382]

"RF based tracker for rotating objects"

An RF beam is used to probe the presence or absence of a rotating blade in a known field of view. Timing of appearance or disappearance or "zero-crossing" of a reflected signal is correlated with timing of the blade movement. Blades which are leading or lagging versus other blades will produce different timing signatures representative of alignment of the blades. [A383]

"Apparatus and method for assisting vertical takeoff vehicles"

According to one aspect of the present invention, a radar system is provided which accurately measures the surface profile in a wide sector beneath and forward of a helicopter, to aid low level transit and landing in poor visibility. This uses an electronic beam synthesis technique to form multiple beams directed at the area of interest, each measuring the distance to the first reflected signal received by each beam. These distances represent the profile of the ground and any objects on the ground. A processor then compares the measured profile with the ideal ground profile for safe landing. If the deviations from straight and level exceed the specified requirement for safe landing, or if sufficient rotor clearance is not detected, then a warning is given to the operator. A display will show the measured ground profile highlighting the unsafe regions, allowing the operator to seek a safe region to land. The novelty lies in the way the beams are formed to measure and display the ground profile and provide a warning system. This beam-forming technique is simpler and more cost effective than with a conventional phased array radar. [A384]

"SAR autofocus for ground penetration radar"

A method of synthetic aperture radar autofocus for ground penetration radar. The method includes transmitting a signal via an antenna, receiving a reflected signal comprising a plurality of image blocks via the antenna, reading each image block from the reflected signal via a processor, locating prominent targets in each image block via the processor, estimating ground penetration phase error via the processor in each image block via phase error inputs including pulling range and quantization level by generating a 1D phase error and converting the 1D phase error into a 2D phase error of an image spectra, refocusing each image block according to estimated ground penetration phase error for that image block via the processor, and forming an image mosaic comprising each refocused image block via the processor. [A385]

"System and method for processing and displaying wake turbulence"

A system and method to display, when within an envelope of an ownship's flight path, a symbol representing wake turbulence from another aircraft based on aircraft type and flight parameters received from the other aircraft, the symbol being formatted to indicate the severity of portions of the wake turbulence. The format is modified periodically in accordance with the aircraft's flight path and a decay rate of the wake turbulence. [A386]

"Air defense system architecture combining passive radars and active radars"

The architecture includes a passive radar using opportunistic transmitters and a plurality of active radars that cooperate in the form of a coalition to assure the surveillance of an area of space. The passive radar and the active radars that form the architecture include means for exchanging information and the passive radar is configured to adopt two alternate operating modes: (i) a "watching" mode in which the passive radar carries out surveillance of the area of space concerned and generates detection information, and (ii) an "on-demand data feed" mode in which the passive radar executes at the request of one or more active radars an object search in a given sector of the area under surveillance or an analysis of certain characteristics of the signal received in a given sector. [A387]

"Radar antenna elevation error estimation method and apparatus"

Methods and systems of determining the altitude of an aircraft are provided. The method includes receiving data associated with aircraft position, a position of a first point and a second point on the runway, and an altitude of the first point and the second point, radar returns from the runway. The method includes determining a first range and second range between the aircraft, and the first point and the second point. The method includes determining a first angle and a second angle between the first point and second point, and the aircraft. The method includes determining a corrected angle. The method includes determining the altitude of the aircraft based on the corrected angle, the runway altitude of at least one of the first point and the second point, and at least one of the first range and the second range. [A388]

"Method for detecting a message sent by an interrogator or a transponder in mode S"

A method for detecting a message provided with a preamble with a number of pulses in a signal sent by an interrogator or a transponder in mode S, said method including a step for decomposition of said signal into an amplitude signal and into a complex phase signal, a step for detection of said preamble by correlating the amplitude signal with a replica signal of the expected pulses, and a phase control step executed by adding together the samples of the phase signal for the duration of the pulses of said preamble and by comparing the sum obtained with a threshold. The method may include a step for time synchronization by correlation of the complex phase signal with a reference sequence formed by one or more known bits before the decoding of the data. The method applies notably to the decoding of interrogation messages borne by low-power signals. [A389]

"Aviation display depiction of weather threats"

A method for indicating a weather threat to an aircraft is provided. The method includes inferring a weather threat to an aircraft and causing an image to be displayed on an aviation display in response to a determination by aircraft processing electronics that the inferred weather threat to the aircraft is greater than a measured weather threat to the aircraft. [A390]

"Acquisition of SAR images for computing a height or a digital elevation model by interferometric processing"

The present invention relates to a method for acquiring SAR images for interferometric processing. The method comprises acquiring, by one or more airborne SAR sensors, SAR images of one and the same area with an acquisition geometry such that to enable interferometric processing of said SAR images. The method is characterized by an acquisition geometry in which each SAR image of the area is acquired in a respective direction of acquisition that defines a respective squint angle with respect to the direction of flight, and in which the squint angles are such that to determine a mean squint angle different from zero. [A391]

"Spectrometric synthetic aperture radar"

This invention relates to improved ultra-wideband synthetic aperture radar and inverse synthetic aperture radar, capable of simultaneously and independently imaging a plurality of spectral and polarimetric channels covering multiple radio frequency octaves. Advances in technologies relating to signal processing, graphical user interfaces, color representations of multi-spectral radar images, low aerodynamic drag polarimetric SAR antenna systems, and synthetic aperture radar aircraft platforms are some of the advancements disclosed herein. [A392]

"Distance determination and type of aircraft determination during docking at the gate"

A device for detecting an object moving in a space includes a measuring device aimed at the object, the measuring device detecting a distance pattern which contains the distances of at least two different points on the object to the measuring device. The measuring device detects the object in the space if at least one part of the distance pattern remains constant over time. [A393]

"Methods and systems for satellite communications employing ground-based beam forming with spatially distributed hybrid matrix amplifiers"

A satellite communications system includes a satellite configured to communicate with terminals, a station configured to communicate signals intended for the terminals to the satellite via a plurality of feeder links and a beamformer including an input multi-port hybrid matrix (MPHM) and a complementary output MPHM in a signal path with the plurality of feeder links. The output MPHM is positioned at the satellite and coupled to the input MPHM via the plurality of feeder links. for example, the input MPHM may be positioned at a ground-based satellite gateway. The input and output MPHMs may be configured to implement fully populated signal transformation matrices that collectively provide a substantially diagonal signal transformation matrix. [A394]

"Radiometric imaging device and corresponding method"

A radiometric imaging device and a corresponding method for scanning a scene. The device comprises a radiometer configured to detect radiation in a predetermined spectral range emitted from said scene and to generate a radiation signal from said detected radiation, and a processor configured to process said generated radiation signal by de-convoluting said generated radiation signal by use of a distance-dependent de-blur kernel, which is determined depending on the distance between said scene and the radiometer. [A395]

"Method for variable control of a zone sensor in a combat aircraft"

The invention relates to a method for controlling a sensor in a combat aircraft (1) comprising the steps of: a) determining (3) direction and size of a defence zone around the combat aircraft (1) based on a plurality of characteristic parameters of an enemy combat aircraft (2) , b) determining (4) direction and size of at least one offence zone around the combat aircraft (1) based on the plurality of characteristic parameters of the enemy combat aircraft (2) , and c) controlling (5) the sensor in the combat aircraft (1) according to emission level and detection capacity within at least one of the defence zone and the at least one offence zone. In this way, the sensors are controlled reliably and thus the pilot can act and react mission-oriented. [A396]

"Object-focussed decision support"

The invention relates to a method for decision support of a combat object (1) in a combat situation comprising the steps of: a) detecting (3) an enemy object (2) such that a plurality of characteristic parameters of the enemy object (2) is determined, b) calculating (4) at least one quality factor for at least one combat sensor of the combat object (1) , wherein each quality factor is adapted for indicating identification ability of a combat sensor, and calculating (4) at least one signature factor for at least one enemy sensor of the enemy object (2) based on a predetermined model, wherein each signature factor is adapted for indicating identification ability of an enemy sensor, c) allocating (5) each quality factor calculated in the previous step b) to each combat sensor and allocating (5) each signature factor calculated in the previous step b) to each enemy sensor, and d) controlling (6) each combat sensor against the enemy object (2) based on the result of the previous step c) . In this way, support for the pilot on a target-oriented basis is provided in order to make a quick and efficient decision in a combat situation. [A397]

"System and method for enabling display of vertical weather information on an aircraft horizontal weather display"

A system for displaying vertical weather information on an aviation display aboard an aircraft, the aircraft including an aircraft radar system for scanning a target, is provided. The system includes processing electronics configured to receive a target selection from a user input device, to receive an altitude value of an echo top of the target based on radar return data, and to cause the altitude value to be displayed on plan view of weather images on an aviation display in response to the received target selection. [A398]

"Measurement method and apparatus"

There is provided a method and associated apparatus for measurement. Specifically, a method for determining a distance travelled by a signal in a medium, or the time of flight of a signal travelled. The method comprises considering an unambiguous range wherein the unambiguous range greater than a distance to be travelled by a signal. A signal is then transmitted across the distance to be determined, the signal comprising at least two frequency components, the frequency components based on the unambiguous range and the speed of the signal in the medium. The distance travelled (or the time of flight) is determined by using the variance of the received phase characteristics, such as phase angle) of one frequency component of the received signal with the received phase characteristics of another frequency component of the received signal. [A399]

"Autofocus-based compensation (ABC) system and method for a hovering ground moving target indication (GMTI) sensor"

Embodiments of the present invention generally relate to motion compensation, and in particular to an autofocus-based compensation (ABC) systems and methods for a ground moving target indication platform. According to one embodiment, a method for autofocus based compensation of range data acquired from an object in motion is provided. The method may include: receiving range data, steering at least one receive beam of the range data in a desired direction, transforming the range data into the range domain, determining the width of a main clutter lobe, excluding data that is not part of the main lobe clutter response, transforming the main-lobe clutter response into the range domain, calculating a phase correction term, and applying the phase correction to the original range data. [A400]

"Adjusting a target value for generating a vertical profile view in a weather radar system"

A system and method for adjusting a target value for generating a vertical profile view in an aircraft weather radar system is provided. Processing electronics are configured to receive a target value for generating a vertical profile view of weather detected by the radar system. The processing electronics are also configured to adjust the target value to account for the motion of the aircraft and/or the motion of the detected weather. [A401]

"Synthetic aperture radar images with composite azimuth resolution"

A synthetic aperture radar (SAR) image is produced by using all phase histories of a set of phase histories to produce a first pixel array having a first azimuth resolution, and using less than all phase histories of the set to produce a second pixel array having a second azimuth resolution that is coarser than the first azimuth resolution. The first and second pixel arrays are combined to produce a third pixel array defining a desired SAR image that shows distinct shadows of moving objects while preserving detail in stationary background clutter. [A402]

"Projectile detection system"

A projectile detection system, and method of detecting a projectile (for example a bullet) , for use on a vehicle (100) (for example a helicopter) , the projectile detection system comprising: a radar antenna array (4) arranged to transmit and receive microwave signals so as to provide a plurality of detection segments (40, 42, 44, 46) of a volume of airspace (38) , one or more processors (3) arranged to: determine which segments (40, 42, 44, 46) microwave signals reflected by a projectile (10) are received from, determine timing information relating to a time order in which the received microwave signals are received, and determine directional information relating to a direction of travel of the projectile (10) using the determined segments (40, 42, 44, 46) and the determined timing information, wherein the microwave signals have a frequency between 1 GHz and 30 GHz. [A403]

"Methods and apparatus for beacon code changes in an air traffic control system"

Methods and apparatus for enabling an air traffic control system to set a beacon code on a transponder of an aircraft without voice communication with the flight crew. In one embodiment, an air traffic control system receives a flight plan from an aircraft, relays clearance of the flight plan to the aircraft, sets a beacon code on a transponder on the aircraft without voice communication, receives an acknowledgement of the beacon code setting from the aircraft, sends an acknowledgement to the aircraft, sets a new beacon code on the transponder without voice communication and receives a new acknowledgement of the new beacon code from the aircraft. [A404]

"TCAS primary antenna on aircraft underside system and method"

A system and method for operational placement of Traffic Collision and Avoidance System (TCAS) antennas on an aerial vehicle. A TCAS primary directional antenna is configured to mount on a lower surface of the aerial vehicle wherein the directional antenna receives and determines a direction of reception of an RF signal. The omnidirectional antenna is mounted on an upper surface of the aerial vehicle for transmission and reception of TCAS signals. A TCAS processor has associated ports to send and receive signals to each antenna for communicating with TCAS target aircraft. The TCAS processor is configured to recognize a mounted location of the antennas via signals received from the inputs. The TCAS processor is further configured to accept a plurality of inputs via the associated ports from the lower mounted directional antenna yet still output accurate TCAS information to the TCAS display. [A405]

"Helicopter collision-avoidance system using light fixture mounted radar sensors"

A helicopter collision-avoidance system is disclosed. An exemplary system includes at least one lamp, such as a light emitting diode (LED) lamp, an incandescent lamp, a halogen lamp, an infrared lamp, or the like, a radar emitter configured to emit a radar signal, a radar detector configured to receive a radar return signal associated with reflections of the emitted radar signal that are reflected from an object, and a radio frequency (RF) system configured to wirelessly transmit radar information associated with the received radar return signal to a radar information receiver configured to receive the wirelessly transmitted radar information. The light module is located at one of a plurality of light positions on an external surface of a helicopter. [A406]

"System and method for detecting use of booster rockets by ballistic missiles"

A method for tracking an object using radar includes detecting a wideband radio frequency ("RF") energy at a first radar sensor tracking the object and determining in a computer process if a booster is propelling the object based on the wideband RF energy. The object is tracked in a computer process based on a ballistic trajectory if the booster is not propelling the object, and the object is tracked in a computer process based on a non-ballistic trajectory if the booster is propelling the object. [A407]

"Radar system with synthetic aperture"

Synthetic aperture radar (SAR) system and method of processing signals in a SAR system. The SAR system includes includes a radar antenna having at least one partial antenna, of which each at least one partial antenna includes a plurality of phase centers with assigned transmit/receive modules and a signal processor for coherent processing of signals of the phase centers. The signal processors include a hybrid beam forming module structured and arranged to digitize and process analog receive signals received by the transmit/receive modules of the phase centers, and to convert the digitally processed receive signals into analog signals. Further, an analog receive network is structured and arranged to combine the analog signals of respective transmit/receive modules with one another to form an output signal. [A408]

"Directional AESA with interferometer direction finding mode"

A multi-functional reconfigurable radar system and a method for configuring such a radar system are disclosed. The multi-functional reconfigurable radar system that is operable as a directional antenna or a DF interferometer. The antenna system in accordance with the present disclosure may be installed on a size-constrained platform such as an unmanned aerial vehicle (UAV) and utilized as a common shared asset aperture for intelligence-gathering, electronic countermeasure, self-protection, electronic support, electronic attack as well as direction finding and the like. [A409]

"High-precision, compact altimetric measurement system"

An altimetry system for a satellite, including an altimeter transmitting and receiving signals on at least one first frequency band, a radiometer receiving signals on at least one second frequency band, the altimeter and the radiometer being connected to one and the same antenna, reception means common to the altimeter and to the radiometer, and capable of amplifying and filtering the signals received from the antenna on a frequency band including the first frequency band and the second frequency band, means for separating the signals on the first frequency band from the signals on the second frequency band, the signals on the first frequency band being exploited to estimate an altimetric distance of the satellite, and radiometric measurements being exploited in order to correct the estimate. [A410]

"Radar system and method for a synthetic aperture radar"

A radar system for a synthetic aperture radar including an arrangement of at least one transmitter, two receivers, two antennas and signal processing means located on a platform. The platform is arranged to move over ground and arranged to transmit a known signal shape and receive signals reflected from the ground. The received signals are used to produce a synthetic aperture radar image of the ground. The synthetic aperture radar image includes a number of resolution cells. The radar system is further arranged to operate in a frequency band with a center frequency and with a wide bandwidth of at least one octave. A first antenna and a second antenna have a length of less than half the wavelength of the center frequency. The radar system is further arranged for: a radar system transfer function to be flat over the frequency band and one-sided beam forming with wideband antenna gain. Also a corresponding method. [A411]

"Ladar backtracking of wake turbulence trailing an airborne target for point-of-origin estimation and target classification"

A weapon-locating ladar system estimates a backward trajectory of an airborne target by using flow field measurements to follow the wake turbulence trailing the airborne target from a position at which the target is detected backwards until the wake is no longer observable. The system may use the backward trajectory to estimate the point-of-origin of the target. The system may also use the flow field measurements along the backward trajectory to classify the target. Target classification may be used to refine the point-of-origin estimate, to influence counter-fire or to adapt the flow field measurements. [A412]

"Aircraft weather radar with reduced heading, attitude and range artifacts"

An avionic weather radar system tracks aircraft orientation with respect to acquired scan radar data to correct the display of the weather radar data for range distortion and orientation changes of the aircraft between radar acquisition and display, reducing image artifacts. [A413]

"Subterranean image generating device and associated method"

In certain embodiments, a subterranean imaging apparatus comprises at least two receive channels configured on a land-based vehicle and a synthetic aperture radar (SAR) system. The at least two receive channels are operable to generate electrical signals according to electromagnetic radiation reflected from a subterranean target below a ground surface. The SAR system is operable to receive the electrical signals from the at least two receive channels, generate raw images from the received electrical signals, generate a weighting according to phase statistics of pixels in the raw images, and combine the raw images using the weighting to generate a refined image of the subterranean target. [A414]

"Near field subwavelength focusing synthetic aperture radar with chemical detection mode"

Detection of objects such as a buried explosive device while operating from a moving platform using a radio frequency emission system having two modes. An electromagnetic wave emission and detection system operates in a first mode to locate objects of interest and in a second mode to determine if an object contains explosive materials. In the first mode, the emission and detection system preferably operates as a subwavelength focusing, wideband, superlens using a near field super gain synthetic aperture continuous wave (CW) swept radar. In the second mode the system preferably enabled after detection of an object in the first mode, uses chemical detection methods such as Nuclear Quadrupole Resonance (NQR) . [A415]

"Device for controlling the display of a weather radar image on board an aircraft"

The device for controlling the display of a radar image on board an aircraft, in particular a weather radar image, is suitable for performing at least one predetermined test on a radar echo in order to decide on a representation corresponding to the echo in a radar image display. [A416]

"Passive bistatic radar for vehicle sense and avoid"

A system and methods for onboard sense and avoidance of an object are disclosed. At least one transmitter and at least one transmitter location of the at least one transmitter are selected from a database of transmitters based on a vehicle location of a vehicle, and at least one total signal is received at the vehicle. The at least one total signal comprises a direct signal of at least one broadcast signal from the at least one transmitter, and a reflection signal comprising a reflection of the broadcast signal reflected off an object. An estimated object location of the object is estimated based on the at least one total signal, the at least one transmitter location, and the vehicle location. [A417]

"System and method for turbulence detection"

A aircraft hazard warning system or method can be utilized to determine a location of a turbulence hazard for an aircraft. The aircraft hazard warning system can utilize processing electronics coupled to an antenna. The processing electronics can determine an inferred presence of turbulence in response to lightning sensor data, radar reflectivity data, turbulence data, geographic location data, vertical structure analysis data, and/or temperature data. The system can include a display for showing the turbulence hazard and its location. [A418]

"Method of automatic target angle tracking by monopulse radar under conditions of interference distorting location characteristic"

Method of automatic target angle tracking by sum-and-difference monopulse radar covers radiolocation sphere and specifically monopulse direction finding systems. It can be used in order to increase guidance accuracy, for example, for anti aircraft missiles and of unmanned aerial vehicles to radar targets such as: radio beacons, aerial vehicles reflecting the radio signal that illuminates them, aerial vehicles and ground-based devices radiating radio signals and jamming signals. The aim of the method consists in the assurance of reliability and stability and in the enhancement of guidance accuracy of automatic target angle tracking due to elimination of automatic tracking losses and great errors arising during the influence of the signals of orthogonal polarization or polarization close to it. The proposed method provides full protection from polarization jamming for all types of monopulse radars. [A419]

"System for and method of displaying an image derived from weather radar data"

An apparatus is for use with an aircraft radar system having a radar antenna. The apparatus comprises processing electronics configured to provide image data associated with an image associated with radar return data from the radar system. The radar return data is updated at a first frequency. The processing electronics are configured to update the image data at a second frequency greater than the first frequency. [A420]

"Method and apparatus for the detection of objects using electromagnetic wave attenuation patterns"

A method for detecting an object, comprising the steps of defining expected characteristics of scattered electromagnetic radiation to be received at a receiver, attenuating at least a portion of electromagnetic radiation received at the receiver by a presence of an object within a path of electromagnetic information, and detecting the attenuation to indicate a presence of the object. The object may be a low radar profile object, such as a stealth aircraft. The electromagnetic radiation is preferably microwave, but may also be radio frequency or infrared. By using triangulation and other geometric techniques, distance and position of the object may be computed. [A421]

"Producing data describing states of a plurality of targets"

Methods and systems for producing data describing states of a plurality of targets using a processor in a system having at least one onboard sensor. The method includes obtaining data from at least one onboard sensor and performing a first data fusion process on the obtained onboard sensor data to produce onboard sensor fused data. Data is also obtained from at least one off-board sensor, and a second, different data fusion process is performed on the obtained off-board sensor data and the onboard sensor fused data to produce target state data. [A422]

"System and method for detecting and determining remote atmospheric anomalies"

A system for detecting and determining remote atmospheric anomalies is furnished with a movable-beam anemometry probe for measuring the orthogonal projection onto the sighting axis, named the radial component, of a relative velocity remotely, with respect to a remote air mass by Doppler frequency shift. The system comprises means for determining wind heterogeneities remotely, on the basis of at least two successive measurements, at one and the same remote point, of the radial component of the relative velocity of the system with respect to the remote air mass, by said anemometry probe, the line of sight of said anemometry probe comprising said remote point during said successive measurements. [A423]

"Tracking target objects orbiting earth using satellite-based telescopes"

A system for tracking objects that are in earth orbit via a constellation or network of satellites having imaging devices is provided. An object tracking system includes a ground controller and, for each satellite in the constellation, an onboard controller. The ground controller receives ephemeris information for a target object and directs that ephemeris information be transmitted to the satellites. Each onboard controller receives ephemeris information for a target object, collects images of the target object based on the expected location of the target object at an expected time, identifies actual locations of the target object from the collected images, and identifies a next expected location at a next expected time based on the identified actual locations of the target object. The onboard controller processes the collected image to identify the actual location of the target object and transmits the actual location information to the ground controller. [A424]

"Method for optimizing the management of radar time for secondary radars operating in modes"

A method for the real-time management and sequencing of the information interchanges between a secondary radar and a plurality of aircraft includes the interchanges between the radar and a given aircraft being performed, depending on the aircraft concerned, either in a non-selective, SSR, IFF or "All Call" interrogation mode or in a selective "Roll Call" interrogation mode. According to this method, the information interchanges according to the non-selective interrogation modes are performed during successive periods specifically allocated to these modes, whereas each transaction forming an information interchange in selective mode between the radar and a given aircraft is temporally inserted into the time slots not used in periods by the interrogation-response tasks in non-selective mode. The method applies equally to the secondary radars exclusively dedicated to civilian air traffic control and to the secondary radars dedicated to combined civilian and military aircraft control tasks. [A425]

"Aircraft location system for locating aircraft in water environments"

A method and apparatus for an aircraft location system comprising an aircraft structure and a number of acoustic reflectors associated with the aircraft structure. The number of acoustic reflectors is configured to generate first sound signals in response to receiving second sound signals. [A426]

"Method and device for synthetic imaging"

A method of synthetic imaging comprising the steps of: emitting a first electromagnetic signal having a first frequency from a first radiation source, emitting at least one second electromagnetic signal having a second frequency from a second radiation source, wherein the first and second frequencies are different from each other, substantially simultaneously receiving the first signal and the second signal with a first receiver, substantially simultaneously receiving the first signal and the second signal with at least one second receiver, arranging an object on the path of at least one electromagnetic signal between the radiation sources and the receivers, wherein the signals are reflected by the object before they meet the receivers, and computing an image of the object from the signals received by the receivers and a device for practicing the method. [A427]

"Spatially assisted down-track median filter for GPR image post-processing"

A method and system for detecting the presence of subsurface objects within a medium is provided. In some embodiments, the imaging and detection system operates in a multistatic mode to collect radar return signals generated by an array of transceiver antenna pairs that is positioned across the surface and that travels down the surface. The imaging and detection system pre-processes the return signal to suppress certain undesirable effects. The imaging and detection system then generates synthetic aperture radar images from real aperture radar images generated from the pre-processed return signal. The imaging and detection system then post-processes the synthetic aperture radar images to improve detection of subsurface objects. The imaging and detection system identifies peaks in the energy levels of the post-processed image frame, which indicates the presence of a subsurface object. [A428]

"Real-time system for imaging and object detection with a multistatic GPR array"

A method and system for detecting the presence of subsurface objects within a medium is provided. In some embodiments, the imaging and detection system operates in a multistatic mode to collect radar return signals generated by an array of transceiver antenna pairs that is positioned across the surface and that travels down the surface. The imaging and detection system pre-processes the return signal to suppress certain undesirable effects. The imaging and detection system then generates synthetic aperture radar images from real aperture radar images generated from the pre-processed return signal. The imaging and detection system then post-processes the synthetic aperture radar images to improve detection of subsurface objects. The imaging and detection system identifies peaks in the energy levels of the post-processed image frame, which indicates the presence of a subsurface object. [A429]

"Methods for displaying aircraft procedure information"

Methods are provided for presenting procedure information for an airport on a display device onboard an aircraft. A method comprises displaying a map on a display device and displaying a briefing panel overlying a portion the map. The briefing panel includes a plurality of segments, wherein each segment is associated with a type of procedure information for the airport. [A430]

"Automated registration of synthetic aperture radar imagery with high resolution digital elevation models"

A method, a radar image registration manager, and a set of instructions are disclosed. A primary sensor interface 430 may receive a primary sensor image and a camera model of the primary sensor image. A data storage 420 may store a digital elevation model. A processor 410 may automatically align the primary sensor image with the digital elevation model. [A431]

"Method for transmission of a geographic coordinate"

A method for transmission to a receiver of a geographic coordinate .lamda. of a transmitter positioned in a spherical coordinate system .lamda., .phi., at least a portion of one hemisphere of the Earth's sphere being divided into N sections each bounded by a minimum .phi. and a maximum .phi., each section being subdivided into X cells each bounded by a minimum .lamda. and a maximum .lamda., X varying depending on the section, includes at least the following steps: partitioning all of the latitude sections into M+1 classes, M sections being interspersed between two sections of the same class, transmitting, in one and the same message, the coordinate .lamda. of the transmitter referenced relative to the cell in which the transmitter is located and the class of the latitude section in which the transmitter is located, the range of the receiver being at the most equal to the width of a cell along the axis of variation of the coordinate .lamda.. [A432]

"Radar level gauge system with operation monitoring functionality"

A method of monitoring operation of a radar level gauge system installed at a tank and arranged to determine a filling level of a product contained in the tank. The method comprises the steps of: providing a first propagation property discontinuity at a first distance from a reference position at a top of the tank, generating and transmitting an electromagnetic signal, propagating the transmitted electromagnetic signal towards the product contained in the tank, receiving a reflected electromagnetic signal comprising a plurality of echoes resulting from reflections at propagation property discontinuities encountered by the transmitted electromagnetic signal, including a first reference echo resulting from reflection at the first propagation property discontinuity and a surface echo resulting from reflection at a surface of the product contained in the tank, identifying the surface echo, determining the filling level based on the surface echo, evaluating a first portion of the reflected electromagnetic signal exhibiting a time-of-flight corresponding to the first distance from the reference position, determining, based on the evaluation, whether or not the first reference echo is detectable in the first portion of the reflected electromagnetic signal. If it is determined that the first reference echo is detectable in the first portion of the reflected electromagnetic signal, a first signal indicative of the filling level is provided, and if it is determined that the first reference echo is non-detectable in the first portion of the reflected electromagnetic signal, a second signal different from the first signal is provided. [A433]

"Distance separation tracking system"

A distance separation tracking process is provided that includes the transmission of a periodic radio frequency original signal from a beacon transceiver. The original periodic signal from the beacon transceiver is received at a remote target transceiver as a target received periodic signal. The target retransmits the received periodic signal to the beacon transceiver as a return periodic signal. Data points of the return periodic signal are sampled and used to calculate a phase differential between the original periodic signal and the return periodic signal that correlates to the distance separation range between the beacon transceiver and the target transceiver. [A434]

"On-board INS quadratic correction method using maximum likelihood motion estimation of ground scatterers from radar data"

System and method for calculating three dimensional residual motion errors of a moving platform with respect to a point of interest by receiving a radar signal from the point of interest (302) , forming a radar image including a plurality of scatterers (304) , using an MLE method to obtain range, radial velocity and acceleration of the moving platform for a first peak scatterer in the radar image (306) , correcting a location of the first peak scatterer with respect to a scene center of the point of interest (312) , updating the obtained radial acceleration responsive to the corrected location (314) , and updating the obtained radial velocity of the moving platform responsive to the updated radial acceleration (316) . [A435]

"Target-tracking radar classifier with glint detection and method for target classification using measured target epsilon and target glint information"

Embodiments of a target classifier and method for target classification using measured target epsilons and target glint information are generally described herein. The target classifier is configured to compare a total epsilon measurement with target glint information to determine whether to the target being tracked corresponds to an intended target type. Based on the comparison, the target classifier may cause target tracking circuitry of a target-tracking radar to either continue tracking the target or break-off from tracking the target. Glint of different target types may be characterized at different ranges and the target's glint characteristics may be used to distinguish intended from non-intended targets. Accordingly, intended targets such as incoming artillery may be distinguished from non-intended targets such as aircraft to help prevent countermeasures from being launched against non-intended targets. [A436]

"System and method for processing radar imagery"

The present invention relates to a system and method for processing imagery, such as may be derived from a coherent imaging system e.g. a synthetic aperture radar (SAR) . The system processes sequences of SAR images of a region taken in at least two different passes and generates Coherent Change Detection (CCD) base images from corresponding images of each pass. A reference image is formed from one or more of the CCD base images images, and an incoherent change detection image formed by comparison between a given CCD base image and the reference image. The technique is able to detect targets from tracks left in soft ground, or from shadow areas caused by vehicles, and so does not rely on a reflection directly from the target itself. The technique may be implemented on data recorded in real time, or may be done in post-processing on a suitable computer system. [A437]

"Method and apparatus for simultaneous synthetic aperture radar and moving target indication"

Method and apparatus for simultaneous synthetic aperture radar and moving target detection. A plurality of independent radio frequency signals are generated and applied to separate radiating, receiving antenna elements. Signals are generated as basis functions, such that moving target detection and synthetic aperture radar signals are constructed from individual waveform components in space, time, frequency, and coding. Waveform components are sorted and combined at reception. Received data is simultaneously processed to extract synthetic aperture radar images and moving target indication detections. [A438]

"Method for producing sensor-supported, synthetic vision for landing support of helicopters under brown-out or white-out conditions"

A method for producing a sensor-supported, synthetic view for landing support of helicopters under brown-out or white-out conditions is provided. A virtual 3-D representation of the landing zone is continuously created from 3-D data of the intended landing zone recorded during the landing approach and a monitoring routine is available to ensure that no 3-D data that was produced under brown-out or white-out conditions is considered in the representation. As soon as the monitoring routine detects that 3-D data has been recorded under brown-out or white-out conditions, an additional radar sensor is activated to continuously produce distance and/or Doppler data of potential objects entering the landing zone, the objects being displayed to a pilot of the landing helicopter in the synthetic view. [A439]

"Method and apparatus for simultaneous multi-mode processing performing target detection and tracking using along track interferometry (ATI) and space-time adaptive processing (STAP)"

The present invention discloses one or more methods to perform multimode processing using a single set of measured data in a multi-sensor fusion framework. In this context, various data processing methodologies are combined in parallel in a suitable manner to simultaneously image, detect, identify and track moving targets over clutter such as stationary background using data obtained from a single set of measurements. Traditionally multiple sets of data would be required to perform these tasks, furthermore the disparate datum would be processed independently of one another. By using a common data source and interconnected processors the information content of the measured data can be fully exploited and leveraged to provide actionable intelligence and aid logistics. [A440]

"Systems and methods for automatically determining a noise threshold"

Systems and methods for automatically determining a noise threshold are provided. In one implementation, a system comprises: an antenna configured to gather data about a surrounding environment, a processing unit configured to remove samples representing target data from the gathered data, to estimate the noise floor from the gathered data with the removed target data, and to determine a noise threshold from the estimated noise floor, and a memory device configured to store the estimated noise floor. [A441]

"Precision navigation for landing"

In the examples described the forward-looking radar generated real-time terrain model (or in an alternative example in combination with a terrain database) , can allow the use of a radio altimeter to compute aircraft vertical position relative to the runway threshold. Such a system typically provides improved accuracy for precision landings. [A442]

"System and method for microwave ranging to a target in presence of clutter and multi-path effects"

A system for measuring the range to an RFID tag including situations containing high clutter and multi-path signals is disclosed. The system includes an RFID reader, an RFID tag, and a coordinated pulse compression radar system. In the system the RFID reader causes the tag to respond to received signals in a first backscatter state at a first time and a second backscatter state at a second time. The pulse compression radar system transmits short pulses coordinated by the backscatter state of the RFID tag and the system creates a differential signal comprised of the differences between radar signals obtained during the first and second states of the tag to obtain an uncorrupted measure of a round trip time of flight of said radar pulses between the pulse radar system and the RFID tag. [A443]

"Radar with wide angular coverage, notably for the obstacle avoidance function on board auto-piloted aircraft"

A radar includes a transmitting antenna and receiving antenna formed by an array of radiant elements. Antenna beams are calculated in P directions by a BFC function. Detections of a target by secondary lobes of the beams are processed by an algorithm comparing levels received in a distance-speed resolution cell, a single detection at most not being possible for each distance-speed resolution cell. Processing means use the assumption that there may probably be more than one echo with a signal-to-noise ratio that is sufficient to be detectable, for a given resolution cell of the radar, either in speed mode or in distance mode, or, alternatively, a distance-speed depending on the processing implemented, and, if there is more than one echo detectable for each resolution cell out of the plurality of beams formed by BFC, only the echo and BFC that obtain maximum power or maximum signal-to-noise ratio are/is considered valid. [A444]

"System and method for providing weather radar status"

Methods, systems, and computer-readable media relating to providing weather data generated by a weather radar system of an aircraft are provided. A method comprises transmitting scan status data indicating that a weather cell is currently being scanned by the weather radar system to a display device. The display device is configured to display an indication that the weather cell is currently being scanned after receiving the scan status data. [A445]

"System and method for microwave ranging to a target in presence of clutter and multi-path effects"

A system for measuring the range to an RFID tag including situations containing high clutter and multi-path signals is disclosed. The system includes an RFID reader, an RFID tag, and a coordinated pulse radar system. In the system the RFID reader causes the tag to respond to received signals in a first backscatter state at a first time and a second backscatter state at a second time. The pulsed radar system transmits short pulses coordinated by the backscatter state of the RFID tag and the system creates a differential signal comprised of the differences between radar signals obtained during the first and second states of the tag to obtain an uncorrupted measure of a round trip time of flight of said radar pulses between the pulse radar system and the RFID tag. [A446]

"Terminal aircraft sequencing and conflict resolution"

Embodiments provide an advanced decision support tool to enable automated aircraft sequencing and conflict detection and resolution. The tool can be used to assist an air traffic controller (ATC) in determining merging, sequencing, and spacing resolutions, communicating the resolutions to the aircraft, and monitoring execution and compliance with the provided resolutions. According to embodiments, the tool can incorporate a broad range of inputs (e.g., surveillance data, weather information, aircraft equipage, etc.) and can be configured according to different aircraft sequencing modes of operation (e.g., one mode of operation is to minimize aircraft deviations necessary to resolve a particular conflict) . In an embodiment, the tool includes a controller interface, which may be integrated within the controller interface of existing ATC systems or implemented separately. Embodiments can be implemented using software, hardware, or a combination thereof. [A447]

"System for and method of sequential lobing using less than full aperture antenna techniques"

A method of determining an angle within the beam to a target using an airborne radar includes receiving first data associated with first returns associated with a first portion of an antenna. The method further includes receiving second data associated with second returns associated with a second portion of an antenna, wherein the first portion is not identical to the second portion. The method further includes determining the angle within the beam to the target using the first and second data. [A448]

"System and method for generating alert signals in a terrain awareness and warning system of an aircraft using a forward-looking radar system"

A system and methods for generating alerts in a terrain awareness and warning system ("TAWS") in an aircraft, using data acquired from a forward-looking radar The system comprises a forward-looking imaging device, an airport database, a navigation system, a forward-looking terrain alert ("FLTA") processor, and a crew alerting system. The FLTA processor determines a measured clearance altitude of a highest cell within an area and compares it with a required minimum clearance altitude, if the measured altitude is equal or less than the required altitude, the crew is alerted. Alternatively, a terrain database may be used. with the FLTA processor for determining if the aircraft descends below the minimum operating altitude or is predicted to do so and then generating an alert. A method is disclosed for generating TAWS alerts using elevation angle measured by the forward-looking radar and terrain data retrieved from a terrain database. [A449]

"Method and apparatus for detecting command wire utilized to detonate an improvised explosive device (IED)"

A method and apparatus is devised for detecting command wires utilized to detonate an improvised explosive device or other objects of interest in which frequency-scanned RF in the HF region of the electromagnetic spectrum is projected out across a given area and returns are detected and converted into image data in which phase, amplitude, range and frequency associated with the incoming data is correlated with frequency-dependent range templates to determine the existence of, the range of and the direction of command wires or other objects of interest. [A450]

"Wind turbine bird strike prevention system method and apparatus"

A bistatic radar receiver is located on a wind turbine and surrounded by multiple bistatic transmitters to detect and precisely track the positions of nearby birds. Bird target reflections from multiple transmitters are received by the radar receiver and their position and track determined from the transmitter locations, receiver location, and measured transmitter-to-target-to-receiver ranges. Target position and altitude accuracy is similar to GPS. When birds are detected to be on a collision course with the wind turbine, a deterrent is activated to scare them away. Deterrents can be flashing strobe lights, intense sound, air cannon, or any other effective bird deterrent. [A451]

"System and method for microwave ranging to a target in presence of clutter and multi-path effects"

A system for measuring range to an RFID tag including situations containing high clutter and multi-path signals is disclosed. The system includes an RFID reader, an RFID tag, and a coordinated signal compression radar system. The reader causes the tag to respond to received signals in a first backscatter state at a first time and a second backscatter state at a second time. The signal compression radar system transmits signals coordinated by the backscatter state of the tag and creates a differential signal comprised of the differences between radar signals obtained during the first and second states of the tag to obtain an uncorrupted measure of a round trip time of flight of said radar signals between the radar system and the RFID tag. The radar may use signals typical of pulse compression radar systems such as chirp modulation or Orthogonal Frequency Domain Modulation (OFDM) , either pulsed or semi-continuous. [A452]

"System and method for enabling display of textual weather information on an aviation display"

A weather radar system for an aircraft is provided. The weather radar system includes processing electronics configured to process radar return data to identify a weather cell, to store information related to the identified weather cell in a database, to receive a selection of an identified weather cell from a user interface, to receive the information related to the selected weather cell from the database, and to cause the information to be displayed textually on a display in response to the received selection. [A453]

"System and method of determining increased turbulence susceptibility with elapsed flight time"

An aircraft based radar system is provided. The radar system includes processing electronics configured to estimate a vertical loading on the aircraft using radar return data and a time value. [A454]

"Traffic symbology on airport moving map"

A method and system is described for enhancing ground situational awareness to an aircrew via the display of an airport moving map within an own-ship, including determining the position of the own-ship and an aircraft on one of a taxiway, a runway, or an apron, displaying each of the own-ship and the aircraft on an airport moving map by displaying for each a first symbol that indicates the location on the airport moving map, and displaying a second symbol that changes in transparency in proportion to the range of the airport moving map. [A455]

"Synthetic aperture radar system"

An imaging system for generating a three dimensional image of tissue of a patient is provided. The imaging system comprises of a transmitter, receiver, antenna system and a display element to form a synthetic aperture radar system that displays a three dimensional view of the tissue. The SAR system has been configured to operate in the near field as opposed to current equipment which can only perform satisfactorily in the far field. A calibration technique has been utilized that allows the system to perform as well as other systems that operate using far field techniques but allows for a much simpler, cost effective system. [A456]

"System and method for aircraft navigation using signals transmitted in the DME transponder frequency range"

The present invention provides a system and method for aircraft to determine own position and navigate using a navigation heartbeat signal broadcast on a DME uplink and/or a Mode-S uplink frequency. The present invention enables deep integration between the existing navigation systems (DME interrogation-reply ranges and GPS/WAAS raw TDOA or pseudo range measurements) and the DME heartbeat TDOAs or Mode-S heartbeat TDOAs to provide a highly accurate navigation positioning capability and provide necessary backup capability in lieu of GPS to maintain the necessary RNP/RNAV capability and avoid degrading aircraft operational safety. [A457]

"Multistatic target detection and geolocation"

Aspects of this invention are directed to the substantially improved detection and geolocation accuracy of targets (stationary or moving) by using the coherent data received at multiple airborne sensors. Further aspects are directed to aligning the (unknown) time-delayed and Doppler-shifted signals received at the multiple sensors relative to an arbitrary reference sensor, which depend on the unknown target position. This results in the target position and velocity vectors being simultaneously estimated and the detection peak enhanced by obtaining near coherent gain. Still further aspects are directed to the coherent generalized likelihood ratio test (GLRT) and the minimum variance distortionless response (MVDR) statistic for multistatic radar systems, conditioned on estimation of certain parameters that render the system coherent. Analytical and computer simulation results are presented to show substantially enhanced detection and geolocation of moving targets in clutter. [A458]

"Spot restoration for GPR image post-processing"

A method and system for detecting the presence of subsurface objects within a medium is provided. In some embodiments, the imaging and detection system operates in a multistatic mode to collect radar return signals generated by an array of transceiver antenna pairs that is positioned across the surface and that travels down the surface. The imaging and detection system pre-processes the return signal to suppress certain undesirable effects. The imaging and detection system then generates synthetic aperture radar images from real aperture radar images generated from the pre-processed return signal. The imaging and detection system then post-processes the synthetic aperture radar images to improve detection of subsurface objects. The imaging and detection system identifies peaks in the energy levels of the post-processed image frame, which indicates the presence of a subsurface object. [A459]

"Three dimensional radar method and apparatus"

A bistatic radar receiver is centrally located within an array of multiple bistatic transmitters at an airport to precisely determine bird positions and altitudes. Bird target reflections from multiple transmitters are received by the radar receiver. Target location is determined by the transmitter location, receiver location, and measured transmitter-to-target-to-receiver ranges. Target position and altitude accuracy is similar to GPS. The radar receiver antenna is composed of a vertical array of elements and rotated 360 degrees in azimuth. The output of each element is downconverted, digitized, and digitally beamformed to provide multiple simultaneous antenna beams each electronically scanned in elevation. When bistatic transmitters cannot be deployed, a narrow-azimuth wide-elevation transmit antenna beam is overlapped with a wide-azimuth narrow-elevation receive antenna beam electronically scanned in elevation to provide a composite narrow azimuth and elevation beamwidth. [A460]

"Method and device for determining aspect angle progression"

A method and a device are provided for specifying, in the context of the image generation of ISAR processing, the determination of the aspect angle course subject to which the radar illuminates the vehicle during the exposure and subject to which the vehicle echoes are reflected back to the radar. Using the distance between the radar sensor and the vehicle as well as the change in distance, both of which are determined from the radar data, the position and the velocity of the vehicle are determined at any time during the exposure through linkage with available road information. The aspect angle is then determined from the positions of the sensor and of the vehicle as well as from the direction of movement of the vehicle. The required road information can be acquired from digital maps or images (e.g. aerial photographs, SAR-images) . [A461]

"Method and system for avoiding an intercepting vehicle by an airborne moving body"

The present disclosure relates to an avoidance system which comprises means for determining, from at least the value of a parameter for the movement (R, Vr) of an intercepting vehicle relative to said moving body and from the incoming direction (.theta.o, .phi.o) of said vehicle relative to said moving body, an order of avoidance intended for said automatic means of piloting said moving body in such a way that the latter automatically carries out a maneuver for avoiding said vehicle. [A462]

"Method for processing signals of an airborne radar with correction of the error in the radar beam pointing angle and corresponding device"

A method for processing signals of an airborne radar includes a correction of the erroneous angle of pointing of the radar beam, comprising an evaluation of the error in the pointing angle for a constant height of the aerial transporter. for a given angle of scan, the method carries out at least two series of measurements of the power of the echoes returned following the emission of radar signals, each series being associated with a given distance-bin, the measurements being dependent on the angle of pointing of the radar antenna, formulates a vertical profile of the power of the echoes returned for each series of measurements, and then on the basis of each vertical profile, measures the pointing angle corresponding to a power of the echoes returned by the ground alone, and calculates the error in the pointing angle on the basis of the measured pointing angles. [A463]

"High-resolution ranging and location finding using multicarrier signals"

The invention relates to methods and systems for accurate ranging and geo-locationing using coherent multicarrier (CM) signals and based on a high-resolution estimation of a receiver timing offset in a signal receiver that receives ranging CM signals. A transmitter transmits a ranging CM signal having a known subcarrier modulation pattern. The receiver samples the ranging CM signal it receives reflected back from an object or from the remote transmitter, and processes the sampled signal that preserves relative subcarrier phases using a high-resolution model channel response function to determine the receiver timing offset with resolution much better than the receiver sampling period. The receiver timing offset is used to determine a flight time for the ranging CM signal with high accuracy. [A464]

"Single-pass Barankin Estimation of scatterer height from SAR data"

Traditional multi-pass radar techniques are not suitable for missions in which the aerial platform both identifies and prosecutes the target at termination of a single pass. A single pass method running a Barankin Estimator provides target height and variance for 3D target imaging that is suitable for war fighters, missiles, UAV, and other aerial platforms capable of nonlinear flight paths. [A465]

"Process for filtering interferograms obtained from SAR images acquired on the same area"

A process for filtering interferograms obtained from SAR images, acquired on the same area by synthetic aperture radars, comprising the following steps: a) acquiring a series of N radar images (AI . . . AN) by means of a SAR sensor on a same area with acquisition geometries such as to allow re-sampling of the data on a common grid, b) after re-sampling on a common grid, selecting a pixel from the common grid, c) calculating the coherence matrix of the selected pixel, that is estimating the complex coherence values for each possible pair of available images, d) maximizing, with respect of the source vector .theta., here an unknown element, the functional: (formula) being R the operator which extracts the real part of a complex number, .gamma..sub.nm the modulus of the element (n,m) of the coherence matrix, k a positive real number, .phi..sub.nm the phase of the element (n,m) of the coherence matrix, .theta.n and .theta.m the elements n and m of the unknown vector .theta.. Given that only phase differences appear in the functional T, the values of the unknown factor are estimated less an additive constant, which can be fixed by setting for example .theta..sub.1=0, and the phase values .theta..sub.n thus obtained constitute the vector of the filtered phase values. .times..times..times..gamma..times..times.eI.PHI..times..times..t-imes.eI.function..theta..theta. ##EQU00001## [A466]

"Buried object detection in GPR images"

A method and system for detecting the presence of subsurface objects within a medium is provided. In some embodiments, the imaging and detection system operates in a multistatic mode to collect radar return signals generated by an array of transceiver antenna pairs that is positioned across the surface and that travels down the surface. The imaging and detection system pre-processes the return signal to suppress certain undesirable effects. The imaging and detection system then generates synthetic aperture radar images from real aperture radar images generated from the pre-processed return signal. The imaging and detection system then post-processes the synthetic aperture radar images to improve detection of subsurface objects. The imaging and detection system identifies peaks in the energy levels of the post-processed image frame, which indicates the presence of a subsurface object. [A467]

"Automatic monitoring of flight related radio communications"

The present disclosure is generally directed to processing air traffic controller ("ATC") communication directed to aircraft other than the current aircraft. ATC communication is processed using speech recognition and the call sign and augmented flight information for other aircraft is identified. The corresponding aircraft icon on the display representing the aircraft on the display may be augmented by emphasizing the icon and displaying augmented flight information, along with an insignia. This information is displayed for a configurable time duration, after which the display reverts to displaying a conventional aircraft icon and associated flight information on the display. The pilot can subsequently select the aircraft icon and may be presented with a log of past ATC communications for the aircraft. [A468]

"Passive bird-strike avoidance systems and methods"

Systems and methods for providing passive bird-strike avoidance. A passive L-band receiver system is located on an aircraft. The system includes a processor and an antenna having an array of four or more elements. The antenna configured to receive L-band signals. The processor receives the L-band signals from the antenna, determines if the received L-band signals indicate a target, determines distance, direction of travel and speed of any determined targets, determines if the target is a flock of birds based on the determined speed and determines if a hazard condition exists based on the distance, direction and speed. [A469]

"System and method for aircraft altitude measurement using radar and known runway position"

Another embodiment of the disclosure relates to an altitude system for an aircraft. The aircraft radar system includes a processor configured to determine an altitude of the aircraft using runway position information, and an angle to the runway associated with a radar beam to the runway. The angle to the runway is being determined using a pointing angle of the antenna adjusted with an angular offset. The angular offset is determined from phase processing. [A470]

"SAR radar system"

A method for detecting targets including moving and stationary targets with a radar system equipped with Synthetic Aperture Radar (SAR) onboard a SAR platform including navigation equipment for accurate determination of the position of the SAR platform. The SAR platform is transversing a stationary ground region and targets in the ground region, in which the SAR platform obtains radar data utilizing at least one antenna. A SAR processor records the radar data and the position of the antenna or antennas for each transmitted radar pulse. Radar data within synthetic sub-apertures, are successively merged in N iteration steps into SAR images of increasing resolution of the surveyed region and wherein each iteration step includes forming a new SAR image at a new iteration level by a linear combination of neighboring SAR images in the previous iteration step. A radar system and a SAR processor used for calculating the detection and positioning of targets including moving and stationary targets. [A471]

"Missile with ranging bistatic RF seeker"

A ranging seeker apparatus includes an RF antenna and a bistatic ranging detector operatively connected with the RF antenna. The RF antenna and bistatic ranging detector are operative for detecting one or more guidance objects in a RF band and providing angle and range data to the missile. Also, a missile including a missile body, a missile propulsion system disposed in or on the missile body, and the ranging bistatic RF seeker disposed in or on the missile body. [A472]

"Apparatus and method for generating low latency position information from position signals transmitted in a narrow bandwidth channel of a radio frequency"

Present novel and non-trivial apparatus and method for generating low latency position information from position signals transmitted in a narrow bandwidth channel of a radio frequency are disclosed. An aircraft (i.e., ownship) and each target (e.g., aircraft) of a time-division multiple access ("TDMA") network receives its respective position derived from its individual source such as a satellite navigation system. A processing module of a communication device installed in ownship and each target generate position signals, and during the allocated time slots of an interface protocol, exchange position information with the others in the network over a narrow bandwidth channel (e.g., bandwidths of 25 KHz or less) of a radio frequency in the VHF range or lower UHF range. The interface protocol may also be comprised of a voice contention time slot for the transmission of messages and an order wire for the administration of the network. [A473]

"Registering coherent change detection products associated with large image sets and long capture intervals"

A set of co-registered coherent change detection (CCD) products is produced from a set of temporally separated synthetic aperture radar (SAR) images of a target scene. A plurality of transformations are determined, which transformations are respectively for transforming a plurality of the SAR images to a predetermined image coordinate system. The transformations are used to create, from a set of CCD products produced from the set of SAR images, a corresponding set of co-registered CCD products. [A474]

"Positive and negative obstacle avoidance system and method for a mobile robot"

Embodiments of the present invention provide methods and systems for ensuring that mobile robots are able to detect and avoid positive obstacles in a physical environment that are typically hard to detect because the obstacles do not exist in the same plane or planes as the mobile robot's horizontally-oriented obstacle detecting lasers. Embodiments of the present invention also help to ensure that mobile robots are able to detect and avoid driving into negative obstacles, such as gaps or holes in the floor, or a flight of stairs. Thus, the invention provides positive and negative obstacle avoidance systems for mobile robots. [A475]

"Synthetic aperture radar chip level cross-range streak detector"

A method of reducing cross-range streaking in a radar image includes determining a number of on-pixels in each line of at least a portion of the radar image, determining which lines have a determined number of on-pixels that exceeds a threshold number, and removing the on-pixels of lines having the determined number of on-pixels exceeding the threshold number. [A476]

"System and method for aiding pilots in resolving flight ID confusion"

The present invention is a method for aiding pilots in resolving flight identifier (flight ID) confusion. The method includes receiving a first flight ID in a processing system. The method further includes comparing the first flight ID to a second flight ID. The method further includes providing an alert when the compared first flight ID and second flight ID are at least substantially similar. The first flight ID is associated with a first aircraft, the second flight ID is associated with a second aircraft, the first aircraft and second aircraft being located in substantially proximal airspace. [A477]

"Performance model for synthetic aperture radar automatic target recognition and method thereof"

A target correlation matrix is generated for multiple two-class combinations of target types each having a target correlation and a synthetic aperture radar observation space. A target probability density of a target radar cross-section signature and a background probability density of a background radar cross-section signature are utilized. The observation space of each of the two-class combinations is partitioned into a target partition and at least one background partition in accordance with the target correlation. A conditional log likelihood is calculated using at least one random number for each of the partitions in accordance with the target probability density and the background probability density, and summed according to the two-class combinations. A maximum log likelihood is calculated from the summed conditional log likelihoods given that one target type of the multiple two-class combinations is assumed to be true. An automatic target recognition performance prediction based on the maximum log likelihood is generated. [A478]

"System for grade crossing protection"

Apparatus and methods for a grade crossing protection system include at least one camera providing surveillance of a grade crossing, the at least one camera coupled to a transmitter configured to transmit a signal that includes imagery of the grade crossing to a transceiver onboard a train. A display unit onboard the train is provided to allow the train operator to view the grade crossing. A control unit in communication with the transceiver is configured to monitor the received signal and, based upon a determined location of the train relative to the train crossing, issue a command to the train's brake system to reduce the speed of the train, or stop the train, before the train reaches the grade crossing. [A479]

"Method for increasing the time for illumination of targets by a secondary surveillance radar"

A secondary surveillance radar with rotating antenna, configured for transmitting interrogations in S or IFF mode and processing the responses to these interrogations. The radar includes an antenna having a lobe with three channels, a Sum channel, a Difference channel and a Control channel, whose transmission means are configured for transmitting interrogation messages over the Sum and Difference channels and whose reception and processing means are configured so as to carry out, aside from conventional detections by the Sum channel, detections by the Difference channel of the responses from the aircraft having been subjected to interrogation by this same channel. The radar also includes means for Space-Time Management configured for generating interrogation messages and determining whether a given message is to be transmitted by the Sum channel, by the Difference channel or by the two channels simultaneously and controlling its transmission by the corresponding transmission channel. [A480]

"Methods and systems for presenting weather hazard information on an in-trail procedures display"

Systems and methods for improving situational awareness on an in-trails procedures display. A radar system transmits a radar signal and receives and stores weather radar reflectivity values into a three-dimensional reflectivity values indicate the presence of a weather hazard and generates one or more weather hazard icons based on the stored weather reflectivity values. An in-trail procedures display device displays the generated weather hazard icons. Wake vortex information for other aircraft is generated and outputted on the in-trail procedures display. Also, the processor receives a request for an altitude change and generates an alert when the aircraft is determined not to be cleared to transition to the requested altitude based on a projected transition, any existing weather hazards, wake vortices of proximate aircraft, and in-trail procedures. [A481]

"System and method for iterative fourier side lobe reduction"

A method and system for generating images from projection data comprising: at least one processor for processing input data, the input data comprising positional data and image data, the image data comprising frequency data for a pre-determined number k frequencies the at least one processor operating to: a) set the frequency data to zero for a predetermined percentage of the k frequencies to form modified frequency data, b) form a preliminary image comprising an array of retained pixel values based upon first positional data and the modified frequency data, c) set the frequency data to zero for a predetermined percentage of the k frequencies to form modified frequency data, d) form a modified image comprising an array of pixels based upon the positional data and the modified frequency data, e) compare the retained array of pixel values to the pixel values of the modified image formed at step (d) , f) retain the minimum pixel value at each pixel location to form an image comprising minimum pixel values, g) repeat steps (c) through (f) for L iterations each time retaining an array of pixel values, h) output the image of retained pixel values. [A482]

"Target detection in a SAR-imaged sea area"

Disclosed herein is a method of detecting a target in a sea area based on a Synthetic Aperture Radar (SAR) image thereof. The Synthetic Aperture Radar (SAR) image is made up of pixels, each having a respective magnitude. The method comprises computing a first reference quantity which characterizes a Poisson distribution assumed for the magnitudes that the pixels in the Synthetic Aperture Radar (SAR) image would have if the sea area were free of targets. The method further comprises selecting pixels in the Synthetic Aperture Radar (SAR) image, computing a real quantity which characterizes a real statistical distribution of the magnitudes of the selected pixels, and detecting a target in the sea area based on the computed first reference and real quantities. The selected pixels are in a one and the same sub-image of the Synthetic Aperture Radar (SAR) image, and detecting comprises detecting a target in a sea subarea of the sea area, the sea subarea being represented by the sub-image. [A483]

"Systems and methods for generating aircraft height data and employing such height data to validate altitude data"

Present novel and non-trivial systems and methods for generating aircraft height data are disclosed. A processor is configured to receive both first data comprised of radar-based reflection data of a stationary reference point based upon a horizontal distance between the geographic position of an aircraft and the geographic position of the stationary reference point (e.g., landing threshold point) and second data comprised of internally sourced vertical travel data more frequently than the first data. From the first data and second data, an instant vertical distance above the stationary reference point is determined by updating the first data with the second data. Then, instant height data representative of the instant vertical distance above the stationary reference point is generated. Provided with the instant height data, a presentation system comprised of display unit, aural alert unit and/or a tactile alert unit may present the instant vertical distance to the pilot. [A484]

"Method of correcting reflectivity measurements by isotherm detection and radar implementing the method"

A method of correcting the reflectivity measurements performed by a radar such as a weather radar, a reflectivity measurement being associated with a resolution volume includes analyzing the current resolution volume to determine whether the plane representing the 0.degree. C. isotherm passes through it. When the plane representing the 0.degree. C. isotherm passes through the current resolution volume, the volume is split into two parts lying on either side of said plane, the attenuation associated with the resolution volume is determined by taking into account the contribution of each of the parts to the measured reflectivity. The reflectivity associated with the current resolution volume is corrected using the attenuation thus determined. An onboard weather radar implements the method. [A485]

"Zero source insertion technique to account for undersampling in GPR imaging"

A method and system for detecting the presence of subsurface objects within a medium is provided. In some embodiments, the imaging and detection system operates in a multistatic mode to collect radar return signals generated by an array of transceiver antenna pairs that is positioned across the surface and that travels down the surface. The imaging and detection system pre-processes the return signal to suppress certain undesirable effects. The imaging and detection system then generates synthetic aperture radar images from real aperture radar images generated from the pre-processed return signal. The imaging and detection system then post-processes the synthetic aperture radar images to improve detection of subsurface objects. The imaging and detection system identifies peaks in the energy levels of the post-processed image frame, which indicates the presence of a subsurface object. [A486]

"Multistatic radar system for airport monitoring"

The present disclosure relates to a method for monitoring targets on a runway, wherein emitting modules and receiving modules are alternately distributed along each one of longitudinal sides of the runway. Orthogonal signals are emitted in a narrowband by the emitting modules and coherently received in a coherent manner by the receiving modules. An object is detected on the runway on the basis of a distribution of the modules into meshes each including three pairs of neighbouring emitting modules and receiving modules and on the basis of a radio location of the object through triangulation and interferometry in at least one mesh. The modules are also used for analyzing a target moving on the runway, and for monitoring the trajectographies of an air target in the surroundings of the runway. [A487]

"Apparatus for measurement of vertical obstructions"

Accurate measurements of flight path obstructions are taken from a moving aerial platform. Platform position, including altitude, is combined with dynamic data including target distance and target elevation data to calculate obstruction height or altitude. An optical subsystem on the aerial platform images the obstructions and provides a video stream showing the obstructions. The video stream and aerial platform data are wirelessly communicated to a control terminal where an operator observes a presentation of obstructions and obstruction altitudes or heights. The operator can issue commands to the aerial platform. [A488]

"Method for presenting the drift values of an aircraft"

A method for presenting the current drift values of an aircraft on a display device in which the drift values are presented in a vector presentation. The length of the drift vector above a predefined threshold value is presented in a manner proportional to the current drift velocity, and the length of the drift vector below the threshold value is presented in a manner disproportionate to the current drift velocity. There is a continuous transition between the two ways of presentation at the threshold value. [A489]

"System for sensing aircraft and other objects"

A system for sensing aircraft and other objects uses bistatic radar with spread-spectrum signals transmitted from remotely located sources such as aircraft flying at very high altitudes or from a satellite constellation. A bistatic spread spectrum radar system using a satellite constellation can be integrated with a communications system and/or with a system using long baseline radar interferometry to validate the digital terrain elevation database. The reliability and safety of TCAS and ADS-B are improved by using the signals transmitted from a TCAS or ADS-B unit as a radar transmitter with a receiver used to receive reflections. Aircraft and other objects using spread spectrum radar are detected by using two separate receiving systems. Cross-Correlation between the outputs of the two receiving systems reveals whether a noise signal is produced by the receiving systems themselves or is coming from the outside. [A490]

"Altitude sensor system"

A weather radar system improves electronics for receiving radar returns. The weather radar system determines an altitude above ground level using return data derived from the weather radar returns. The weather radar system can utilize movement data related to movement of the aircraft to calculate the altitude. In addition, the weather radar system can utilize previous calculations of the altitude to determine the current altitude underneath the aircraft. The weather radar system can reduce the need for a radio altimeter. [A491]

"Ground vehicle collision prevention systems and methods"

A method and apparatus for detecting a vehicle. An apparatus comprises a proximity detection system, a vehicle management system, and a notification system. The proximity detection system is associated with an aircraft and operably connected to a transducer. The proximity detection system is configured to determine a distance of a vehicle from a surface of the aircraft and a velocity of the vehicle relative to the aircraft. The vehicle management system operably connected to the proximity detection system. The vehicle management system is configured to determine a time the vehicle will be a threshold distance from the surface of the aircraft and an threshold amount of time to bring the vehicle to a predetermined velocity. The notification system is associated with the proximity detection system and configured to generate a notification signal in response to a determination that the time is less than the threshold amount of time. [A492]

"Radar signal pre-processing to suppress surface bounce and multipath"

A method and system for detecting the presence of subsurface objects within a medium is provided. In some embodiments, the imaging and detection system operates in a multistatic mode to collect radar return signals generated by an array of transceiver antenna pairs that is positioned across the surface and that travels down the surface. The imaging and detection system pre-processes the return signal to suppress certain undesirable effects. The imaging and detection system then generates synthetic aperture radar images from real aperture radar images generated from the pre-processed return signal. The imaging and detection system then post-processes the synthetic aperture radar images to improve detection of subsurface objects. The imaging and detection system identifies peaks in the energy levels of the post-processed image frame, which indicates the presence of a subsurface object. [A493]

"Validity check of vehicle position information"

A method for validating received positional data in vehicle surveillance applications wherein vehicles transmit positional data indicating their own position to surrounding vehicles. A a radio direction finding antenna arrangement of a receiving unit receives a signal carrying positional data indicating an alleged position of a vehicle, transmitted from a radio source. The bearing from the receiving unit to the radio source is estimated utilizing the radio direction finding antenna arrangement and the received signal. The distance between the receiving unit and the radio source is estimated based on the time of flight for a signal travelling there between at known speed. An estimated position of the radio source is calculated based on the estimated bearing and the estimated distance. A deviation value indicating the deviation/coincidence between the alleged position of a vehicle is determined according to the received positional data and the estimated position of the radio source. [A494]

"Method for identifying a facility on the ground or at sea"

The present invention includes a method for identifying a facility on the ground or at sea, the method being implemented on an airborne responder linked to at least two antennas, the method including a step of choosing a first transmission antenna and a step of transmitting an interrogation message from the chosen antenna. The method further includes testing whether a response has been received by the responder, and, if at least one response signal is received by at least one of the antennas, choosing a transmission antenna as a function of the response signal or signals received. If no response message is received, a different transmission antenna is chosen from the antenna that transmitted the last interrogation message. The method is repeated from the step of transmitting the interrogation message. [A495]

"Scanning near field electromagnetic probe"

A method and apparatus is devised for detecting objects of interest in which frequency-scanned RF in the HF region of the electromagnetic spectrum is projected out across a given area and returns are detected and converted into image data in which phase, amplitude, range and frequency associated with the incoming data is correlated with frequency-dependent range templates to determine the existence of, the range of and the direction of the objects of interest. [A496]

"Systems and methods for generating data in a digital radio altimeter and detecting transient radio altitude information"

Present novel and non-trivial systems and methods for generating data in a digital radio altimeter system and detecting transient radio altitude ("RA") information are disclosed. Preliminary RA data is generated by a preliminary spectrum analyzer by analyzing spectrum data (e.g., frequency spectrum data) within a first range, where the spectrum data is representative of RA information. Final RA data is generated by a final spectrum analyzer by analyzing the spectrum data within a second range, where the second range is based upon the preliminary RA data and final RA data previously-generated and fed through a feedback data generator. The final

RA data may be provided as source data to one or more user units. One user unit may be a transient RA detector which detects transient RA information based upon the preliminary RA data and the final RA data. [A497]

"Radar system and method"

A system includes an aircraft radar system configured to perform at least one radar scan of a specific region and receives airborne radar return data from the at least one radar scan. The aircraft radar system transmits the airborne radar return data to a weather system via a wireless communication link for supplementing the ground based radar return data with the airborne radar return data. [A498]

"Clutter reduction in detection systems"

The present invention relates to a system (300) for reducing or cancelling unwanted signals when detecting objects of interest with a detection system (200) . The detection system thereby is an antenna based system using two or more receive beams as echo response to an emission signal. The system (300) for reducing or cancelling unwanted signals comprises an input means (310) adapted for obtaining from said antenna system (210) receive signals from a first receive beam and receive signals from at least one second receive beam responsive to the same emission signal. It furthermore comprises a coupling means (320) adapted for coupling the receive signals from the first receive beam to the receive signals from the at least one second receive beam, so as to obtain a detection signal for the objects of interest with suppressed unwanted signal contribution. [A499]

"Creating and processing universal radar waveforms"

A new approach to radar imaging is described herein, in which radar pulses are transmitted with an uneven sampling scheme and subsequently processed with novel algorithms to produce images of equivalent resolution and quality as standard images produced using standard synthetic aperture radar (SAR) waveforms and processing techniques. The radar data collected with these waveforms can be used to create many other useful products such as moving target indication (MTI) and high resolution terrain information (HRTI) . The waveform and the correction algorithms described herein allow the algorithms of these other radar products to take advantage of the quality Doppler resolution. [A500]

"Process for identifying statistically homogeneous pixels in SAR images acquired on the same area"

A process includes acquiring radar images on the same area, calculating a vector of n amplitude or intensity values relating to a sample pixel in the n images available, identifying the vector as a sample vector, and defining an estimation window for the sample pixel for identifying a set of pixels around the sample pixel. Additionally, calculating vectors of N amplitude or intensity values for each pixel contained in the estimation window, comparing each vector with the sample vector, identifying pixels associated with the vectors that have passed a statistical test and identifying pixels associated with the vectors that have not passed the statistical test, eliminating the pixels contained in the estimation window that are not connected to the sample pixel, and identifying the set of pixels that are statistically homogeneous with the sample pixel. [A501]

"Runway identification system and method"

A runway identification system and method utilizes a set of (reflectors or sources) . The reflectors or sources can be located in proximity to the end of runway. The method receives electromagnetic energy from the reflectors or sources. A runway identification is determined from the electromagnetic energy. The runway identification can be displayed on a display in the aircraft. The reflectors can be corner reflectors, laser reflectors or other reflective optics. [A502]

"Broadband multifunction airborne radar device with a wide angular coverage for detection and tracking, notably for a sense-and-avoid function"

A multifunction airborne radar device includes a plurality of transmit antenna modules and/or receive antenna modules that are fixed relative to the aircraft, placed substantially over the surface of the aircraft so as to form transmit and receive beams, enabling targets to be detected for implementing a sense-and-avoid function. The airborne radar device may also comprise processing means for tracking the detected targets and for generating information sent to an air traffic control center and/or to a control device on board the aircraft. The processing device may also receive data relating to the aircraft, enabling the antenna beams to be adjusted and the tracking calculations to be refined. [A503]

"Synthetic aperture radar system and methods"

A compact synthetic aperture radar system and associated methods are disclosed. [A504]

"Systems and methods for embedding aircraft attitude data and detecting inconsistent aircraft attitude information"

Present novel and non-trivial systems and methods for embedding aircraft attitude data within a pixel data set and detecting inconsistent aircraft attitude information are disclosed. A pixel data set representative of the scene outside the aircraft is generated based upon the navigation data and the terrain data, attitude-exclusive data is generated based upon orientation data, and attitude-exclusive data is embedded into the pixel data set to form an embedded pixel data set. Attitude-exclusive data is comprised of attitude-exclusive pixel data having first and second pixel locations or attitude-exclusive ancillary data. Attitude-exclusive data is compared against separately-provided reference attitude data for the purpose of detecting inconsistent attitude information. Inconsistent attitude information is detected when at least one attitude measurement determined from either the attitude-exclusive pixel data or the attitude-exclusive ancillary data does not equal the respective attitude measurement of the reference attitude data. [A505]

"Aircraft bird strike avoidance method and apparatus"

A non-scanning radar system is installed on an aircraft to detect and avoid bird strikes or collisions with other airborne hazards. Target amplitude, range, and Doppler tracking versus time are used to qualify the collision threat. Avoidance is based on a quick minor altitude change by the pilot or autopilot to exit the imminent bird or other airborne hazard altitude window. In one embodiment, a bistatic passive radar receiver antenna is used in conjunction with an existing geostationary satellite signal. Range and Doppler information are obtained via cross correlation processing of the hazard reflection signal with a direct path reference signal from the satellite. [A506]

"Aircraft MIMO radar"

Traditional airborne radar antennas are typically limited to placement above or below the aircraft, or in one or both of the wings, or in the nose. In the both-wing case, the fuselage prevents coherent array processing of both wing arrays without the introduction of grating lobes. Both wing arrays are coherently combined without grating lobes through appropriate geometric configurations of the arrays and the use of MIMO processing techniques. A virtual array is formed by convolving the transmit and receive apertures to fill in the gap created by the fuselage, thereby allowing fully coherent array processing and greater angular resolution than previously achievable through a conformal array. The signal-to-noise ratios are potentially improved. [A507]

"Navigation method for a missile"

A SAR image recorded by a reconnaissance system is transferred as a reference edge image together with the data of the trajectory as a reference. The signal of the infrared seeker head of the missile is converted into a virtual SAR edge image and compared to the SAR reference image to calculate the precise position of the missile. [A508]

"Method for constructing focused radar images"

A method for constructing focused radar images includes chopping the radar illumination period into p sub-periods, two successive sub-periods overlapping temporally, choosing n successive sub-periods from among the p sub-periods, and for each of the n chosen sub-periods, performing radar acquisitions to generate an image IM_0.sub.x of resolution R.sub.0, and applying an autofocus processing to each of the n images IM_0.sub.x generated, combining the n images so as to generate at least one new focused radar image IM_1.sub.x. The method is applied notably to the production of high-resolution SAR images with the help of an aircraft equipped with a radar antenna. [A509]

"Method for calculating a navigation phase in a navigation system involving terrain correlation"

A method for calculating a navigation phase for a carrier, in a navigation system involving terrain correlation, includes determining a navigability map in which each point of interest of an onboard map is associated with a navigability score. The method is applicable to all terrain aided navigation techniques, and allows the consideration of the quality of the onboard maps and terrain sensors used. [A510]

"System for and method of sequential lobing using less than full aperture antenna techniques"

A method of determining an angle within the beam to a target using an airborne radar includes receiving first data associated with first returns associated with a first portion of an antenna. The method further includes receiving second data associated with second returns associated with a second portion of an antenna, wherein the first portion is not identical to the second portion. The method further includes determining the angle within the beam to the target using the first and second data. [A511]

"Correlation position determination"

Methods and apparatus for navigating with the use of correlation within a select area are provided. One method includes, storing data required to reconstruct ranges and associated angles to objects along with statistical accuracy information while initially traversing throughout the select area. Measuring then current ranges and associated angles to the objects during a subsequent traversal throughout the select area. Correlating the then current ranges and associated angles to the objects to reconstructed ranges and associated angles to the objects from the stored data. Determining at least one of then current location and heading estimates within the select area based at least in part on the correlation and using the least one of the then current location and heading estimates for navigation. [A512]

"Method and system for grade crossing protection"

Apparatus and methods for a grade crossing protection system include at least one camera providing surveillance of a grade crossing, the at least one camera coupled to a transmitter configured to transmit a signal that includes imagery of the grade crossing to a transceiver onboard a train. A display unit onboard the train is provided to allow the train operator to view the grade crossing. A control unit in communication with the transceiver is configured to monitor the received signal and, based upon a determined location of the train relative to the train crossing, issue a command to the train's brake system to reduce the speed of the train, or stop the train, before the train reaches the grade crossing. [A513]

"Locating system based on noisy type waveforms"

The present invention relates to a system for locating non-cooperating objects by means of a random or pseudo-random noisy type waveform generator, an amplifier, of said waveforms and an antenna which radiates them towards the object, which object generates an electromagnetic echo which is detected by a passive subsystem of antennas and receivers. The time delay and Doppler shift values are determined in the latter subsystem and in turn forwarded from encoding and modulating blocks to a central processor which estimates the position and the speed of the object. The passive subsystem receives, through a transmission channel or storage element, the reference signal which represents the transmitted noisy type waveform and uses it for calculating the bi-dimensional cross correlation (ambiguity function) , which permits to estimate the time delay and the Doppler shift. [A514]

"Identification and analysis of source emissions through harmonic phase comparison"

The present invention is a signal processing method to significantly improve the detection and identification of source emissions. More particularly, the present invention offers a processing method to reduce the false alarm rate of systems which remotely detect and identify the presence of electronic devices through an analysis of a received spectrum the devices' unintended emissions. The invention identifies candidate emission elements and determines their validity based on a frequency and phase association with other emissions present in the received spectrum. The invention compares the measured phase and frequency data of the emissions with a software solution of the theoretically or empirically derived closed-form expression which governs the phase and frequency distribution of the emissions within the source. Verification of this relationship serves to dramatically increase the confidence of the detection. [A515]

"Method and system for detecting ground obstacles from an airborne platform"

This method for detecting ground obstacles from an airborne platform comprises: a step of illuminating the whole field of view of interest with an electromagnetic wave in the range of 0.1 to 100 GHz, a step of receiving the echoes with multiple antenna elements from the whole field of interest and of transforming said echoes into a digital signal per antenna element, a step of combining said digital signals simultaneously in order to obtain simultaneously multiple beams, a step of Range and Velocity filtering each beam in parallel, a step of applying on each filtered beam a detection process using a threshold on amplitude to detect potential ground obstacles, and a step of discriminating said ground obstacles from said potential ground obstacles due to their specific signature in terms of both relative velocity and distance using velocity of the airborne platform. [A516]

"System and method for providing a polarized RF reference system with scanning polarized RF reference sources and their self-alignment for munitions"

Arbitrarily deploying scanning polarized RF reference sources and using them to establish a full position and angular orientation reference coordinate system or a full angular orientation reference coordinate system that objects property equipped with polarized RF sensors could use to determine their angular position and/or orientation relative to the reference coordinate system. [A517]

"Spatially adaptive migration tomography for multistatic GPR imaging"

A method and system for detecting the presence of subsurface objects within a medium is provided. In some embodiments, the imaging and detection system operates in a multistatic mode to collect radar return signals generated by an array of transceiver antenna pairs that is positioned across the surface and that travels down the surface. The imaging and detection system pre-processes the return signal to suppress certain undesirable effects. The imaging and detection system then generates synthetic aperture radar images from real aperture radar images generated from the pre-processed return signal. The imaging and detection system then post-processes the synthetic aperture radar images to improve detection of subsurface objects. The imaging and detection system identifies peaks in the energy levels of the post-processed image frame, which indicates the presence of a subsurface object. [A518]

"Radar detection method, notably for airborne radars implementing an obstacle detection and avoidance function"

A method includes: generating a frequency-modulated continuous signal, an emission sequence being formed of successive ramps centered on a carrier frequency, fixing a modulation band .DELTA.F and the duration Tr of a recurrence in such a way that at the range limit, a reception ramp appears shifted by at least one given frequency with respect to the corresponding emission ramp, on account of the propagation delay for the outward-return journey to a target kTr+.theta., k being an integer and .theta. a duration less than Tr, demodulating the signal received by the signal emitted, the resulting signal including a first sinusoid at the frequency .delta.Fdim= (1-(.theta./Tr) .DELTA.F and a second sinusoid at the frequency .delta.Fd= (.theta./Tr) .DELTA.F, sampling the resulting signal and performing a first fast Fourier transformation on this resulting signal over the duration of each emission ramp, detecting in the resulting spectrum the spectral lines appearing at the frequencies .delta.Fd and .delta.Fdim, and performing the vector sum of these two spectral lines after resetting them into phase with respect to one another, and performing a detection by comparing the modulus of the vector sum with a predetermined threshold. [A519]

"Short baseline helicopter positioning radar for low visibility using combined phased array and phase difference array receivers"

A helicopter position location system includes a receiver located substantially in a center of an array of receivers. A first array of receivers is located in a selected pattern separated from the center receiver by a first distance. Selected receivers in the first array are spaced apart from each other by at most one half wavelength of a base frequency of a locator signal transmitted from a helicopter. A second array of receivers is located in a selected pattern by a second distance larger than the first distance. A transmitter on the transmits a signal having a base frequency and a plurality of hop frequencies A processor in signal communication with the receivers is configured to determine phase difference with respect to frequency between any pair of receivers, to determine time delay of arrival based on the phase difference with respect to frequency, to beam steer response of the selected receivers, and to use the beam steered response and time delay of arrival between pairs of receivers to determine a position of the helicopter. [A520]

"Synthetic aperture radar image formation system and method"

A saturated input signal acquired by a synthetic aperture radar (SAR) system is processed by estimating a reconstruction that generated the input signal, reproducing an input signal from an estimated reconstruction to generate a reproduced signal, comparing the reproduced signal with the input signal, adjusting an estimated reconstruction based on the comparison, and iterating from the reproducing step until a termination condition is reached. [A521]

"High resolution SAR imaging using non-uniform pulse timing"

A synthetic aperture radar (SAR) system includes a non-uniform pulse generator, and an echo receiver. A SAR image is reconstructed from samples of received echoes, wherein transmitted pulses and reflected echoes overlap in time. [A522]

"Synthetic aperture imaging interferometer"

There is described a method for generating a synthetic aperture image of a target area, comprising: receiving, from a synthetic aperture imaging system, first raw data representative of electromagnetic signals reflected by the target area and detected by the synthetic aperture imaging system according to a first angle of view, digitally combining the first raw data with second raw data, thereby obtaining combined data, the second raw data being representative of the electromagnetic signals reflected by the target area and detected by the synthetic aperture imaging system according to a second angle of view different from the first angle of view, and generating an interference pattern of the target data using the combined data. [A523]

"Systems, methods, and computer program products of flight validation"

Systems, methods, and computer program products for flight validation (FV) are provided. Embodiments implement the requirements of FAA Notice 8260.67 as they relate to FV. Embodiments enable FV to be performed in its entirety, including flight and/or ground obstacle assessment, and on-course/on-path flight evaluation. Embodiments enable a post-flight validation phase, which provides post flight analysis and archiving capabilities. Using embodiments, a person of minimal skill and training can perform FV as prescribed by FAA requirements. Accordingly, significant costs associated with hiring professional surveyors and air crews to perform obstacle assessment and flight evaluation can be eliminated. Embodiments can be implemented using commercial off-the-shelf (COTS) and relatively inexpensive hardware, making them suitable for large-scale FV operations. Embodiments may also be integrated with existing instrument flight procedure design tools, including, for example, the TARGETS (Terminal Area Route Generation Evaluation & Traffic Simulation) tool developed by the MITRE Corporation. [A524]

"Identification and analysis of persistent scatterers in series of SAR images"

Disclosed herein is a method for identifying persistent scatterers in digital "Synthetic Aperture Radar" images of an area of Earth's surface each taken at a respective time. The method involves processing the digital Synthetic Aperture Radar images to produce digital generalized differential interferograms. The method further involves analyzing properties of pairs of pixels in the digital generalized differential interferograms to identify individual pixels imaging persistent scatterers. [A525]

"Synthetic aperture integration (SAI) algorithm for SAR imaging"

A method and system for detecting the presence of subsurface objects within a medium is provided. In some embodiments, the imaging and detection system operates in a multistatic mode to collect radar return signals generated by an array of transceiver antenna pairs that is positioned across the surface and that travels down the surface. The imaging and detection system pre-processes the return signal to suppress certain undesirable effects. The imaging and detection system then generates synthetic aperture radar images from real aperture radar images generated from the pre-processed return signal. The imaging and detection system then post-processes the synthetic aperture radar images to improve detection of subsurface objects. The imaging and detection system identifies peaks in the energy levels of the post-processed image frame, which indicates the presence of a subsurface object. [A526]

"Radar-based system, module, and method for presenting steering symbology on an aircraft display unit"

A novel and non-trivial radar-based system, module, and method for presenting steering symbology on an aircraft display unit are disclosed. Hazard information acquired from a forward-looking aircraft radar system may be presented as hazard data to a symbology generating processor. A plurality of minimum turn angles may be determined based upon the boundary tangents of the hazard data. Data representative of steering symbology corresponding to a one or more minimum turn angles may be generated, where the symbology may take the form of textual symbology and/or non-textual symbology. Then, the steering symbology data may be provided to a presentation system for depiction of steering symbology on a tactical display unit and/or strategic display unit. [A527]

"Method and system for preventing anti-aircraft warfare engagement with neutral aircraft"

A method and system that prevents engagement with neutral aircraft utilizes secondary surveillance radar (SSR) in conjunction with traffic alert collision avoidance systems (TCAS) conventionally found on various commercial aircraft. The system and method provide for detecting interrogating signals sent out by a TCAS system of an interrogating aircraft searching for another aircraft that may pose a threat for collision. The system and method of the invention provide for a base system generating signals responsive to the interrogation signals such that there is a decreasing time difference between the interrogating signals and the responsive signals. The decreasing time difference indicates to the interrogating aircraft that another aircraft is approaching its airspace urging the neutral aircraft to change course and avoid entering a guarded tactical airspace thus avoiding unnecessary engagement of the aircraft. [A528]

"Method and device for preventing an anti-collision system on board an airplane from emitting alarms, during an altitude capture maneuver"

According to the invention, the device (1) comprises means (3) for detecting, during an altitude capture maneuver, the emission of a first type alarm by the anti-collision system (2) and means (4) for controlling the vertical speed of said airplane (AC) , after the emission of such an alarm, until the triggering of the capture phase. [A529]

"Forward-looking 3D imaging radar and method for acquiring 3D images using the same"

Disclosure is a forward-looking 3D imaging radar, comprising: a transmitting unit which generates RF signals to be radiated for observing object in front of the radar, a transmitting antenna which radiates the RF signal generated by the transmitting unit, a receiving antenna which receives signals radiated from the transmitting antenna and reflected by the object in front of the radar, a receiving unit which mixes the signal received by the receiving antenna and the branched signal from the transmitting unit, and converts the signal to digital signal, and a signal processor which controls the operations of the transmitting unit and receiving unit, sends command to the transmitting unit to generate RF signals, receives the digitally converted signal from the receiving unit and extracts phase information of the object in front of the radar, and generates 3D radar image by producing altitude information based on the principle of interferometer. [A530]

"Virtual aperture radar (VAR) imaging"

Virtual Aperture Radar (VAR) imaging provides terminal phase radar imaging for an airborne weapon that can resolve multiple closely-spaced or highly correlated scatterers on a given target with a single pulse to provide an aimpoint update at a useful range to target without training data and without requiring a large aperture antenna. VAR imaging exploits the sparse, dominant-scatterer nature of man-made targets. The array manifold is constructed with a large number of basis functions that are parameterized by range or angle (or both) to target. The number of basis functions extends the capability to resolve scatterers beyond the Rayleigh resolution. However, this also makes the manifold underdetermined. A sparse reconstruction technique that places a sparsity constraint on the number of scatterers is used to solve the manifold to uniquely identify the ranges or angles to the scatterers on the target. These updates are passed to the weapon's guidance system, which in turn generates command signals to actuate aerodynamic surfaces such as fins or canards to steer the weapon to the target. [A531]

"Position/time synchronization of unmanned air vehicles for air refueling operations"

An aircraft position synchronization system and methods for coordinating positioning of vehicles in motion are presented. A rabbit calculation module calculates a planned position on an orbit pattern of an aircraft in flight, and a planned position-time projection vector comprising a planned velocity vector of the planned position. A display module graphically displays the orbit pattern, the planned position and the planned velocity vector of the planned position moving in real-time along the orbit pattern. The display module further displays the planned position-time projection vector, an actual position of the aircraft, and an actual position-time projection vector of the aircraft based on a bank angle of the aircraft such that a user determines the planned position on the planned position-time projection vector of the aircraft in order to arrive at a predetermined position at a correct time. A rendezvous module coordinates the aircraft with a second aircraft in flight. [A532]

"Method for managing the flight of an aircraft"

The invention relates to a method for managing the flight of an aircraft flying along a trajectory and being subject to an absolute time constraint (on a downstream point) or relative time constraint (spacing with respect to a downstream aircraft) , the said aircraft comprising a flight management system calculating a temporal discrepancy to the said time constraint, wherein the said method includes the following steps: the calculation of a distance on the basis of the temporal discrepancy, the modification of the trajectory: if the temporal discrepancy to the time constraint corresponds to an advance, the lengthening of the trajectory by the distance, if the temporal discrepancy to the time constraint corresponds to a delay, the shortening of the trajectory by the distance. [A533]

"Three dimensional radar method and apparatus"

A bistatic radar receiver is centrally located within an array of multiple bistatic transmitters at an airport to precisely determine bird positions and altitudes. Bird target reflections from multiple transmitters are received by the radar receiver. Target location is determined by the transmitter location, receiver location, and measured transmitter-to-target-to-receiver ranges. Target position and altitude accuracy is similar to GPS. The radar receiver antenna is composed of a vertical array of elements and rotated 360 degrees in azimuth. The output of each element is downconverted, digitized, and digitally beamformed to provide multiple simultaneous antenna beams each electronically scanned in elevation. When bistatic transmitters cannot be deployed, a narrow-azimuth wide-elevation transmit antenna beam is overlapped with a wide-azimuth narrow-elevation receive antenna beam electronically scanned in elevation to provide a composite narrow azimuth and elevation beamwidth. [A534]

"Method and system for locating a target in an interrogation-response system (IFF)"

A method and system for locating a target, of azimuth A.sub.estimated.sup.target and of elevation angle S.sub.estimated.sup.target, in space by a carrier uses at least one first antenna array with electronic scanning ARRAY_H and at least one second antenna array with electronic scanning ARRAY_B. The target emits a signal in response to an interrogation from the carrier, each of said antenna arrays includes at least one antenna and the total number of antennas used is at least equal to three. [A535]

"Method and device for monitoring radioaltimetric heights of an aircraft"

A method and device for monitoring radioaltimetric heights of an aircraft, the device including an auxiliary height generation device that generates an auxiliary reliability height of an aircraft. The device also includes a determination device that determines with the aid of this auxiliary height, an error in incoherent data which are received from two radioaltimeters. To this end, the most reliable reading from the radioaltimeters is determined and sent to a user device. [A536]

"Determining whether a track is a live track or a virtual track"

In one aspect, a method includes tagging a track as a live track if a tagging statistic is greater than a tagging statistic threshold and tagging the track as a virtual track if the tagging statistic is less than the tagging statistic threshold. In another aspect, an article includes a machine-readable medium that stores executable instructions to determine whether a track is a live track or a virtual track. The instructions causing a machine to tag a track as a live track if a tagging statistic is greater than a tagging statistic threshold and tag the track as a virtual track if the tagging statistic is less than the tagging statistic threshold. In a further aspect, an apparatus includes circuitry to tag a track as a live track if a tagging statistic is greater than a tagging statistic threshold and tag the track as a virtual track if the tagging statistic is less than the tagging statistic threshold. [A537]

"Apparatus and method for assisting vertical takeoff vehicles"

According to one aspect of the present invention, there is provided a radar altimeter which utilizes a downward looking MIMO phased array to form multiple beams, covering a relatively wide sector, e.g., +/-60 degrees or thereabouts. The distance to the ground is then measured in each beam allowing the ground profile to be formed. The beams may be tilted forward to cover from about +90 degrees forward (horizontal) to about 30 degrees behind nadir. The provision of such a forward tilt gives a greater degree of coverage in the direction of approach vector to the ground. This additional cover enables the altimeter to more accurately detect other vehicles in the proximity to the current approach vector of the vehicle to the desired landing zone. [A538]

"Mitigating illumination gradients in a SAR image based on the image data and antenna beam pattern"

Illumination gradients in a synthetic aperture radar (SAR) image of a target can be mitigated by determining a correction for pixel values associated with the SAR image. This correction is determined based on information indicative of a beam pattern used by a SAR antenna apparatus to illuminate the target, and also based on the pixel values associated with the SAR image. The correction is applied to the pixel values associated with the SAR image to produce corrected pixel values that define a corrected SAR image. [A539]

"Synthetic aperture processing system and synthetc aperture processing method"

A synthetic aperture processing system that includes a signal transmission unit for generating and radiating a plurality of chirp waves to an irradiation region from measuring sites, a signal reception unit for receiving a plurality of reflected waves caused by the plurality of chirp waves, a range compression unit for range-compressing each of the reflected waves and generating reception data consisting of sinc functions, a cross-correlation computation unit for, based on a plurality of model data segments, calculating correlation values representing a degree of correlation between each of the model data segments and the reception data, and image output unit for outputting the correlation values calculated by cross-correlation computation unit. [A540]

"Point-in-polygon target location"

A command and control system for analyzing target track positional information by comparing target location to pregenerated geographic information. [A541]

"Shape measurement instrument and shape measurement method"

A shape measurement instrument includes a plurality of transmitters 1 to 4 which radiate signals having different waveforms or phases, receivers 31 to 34 which receive signals reflected from an object O, correlation units 41 to 44 which obtain correlation waveforms between waveforms of the signals received by the receivers 31 to 34, and the signal radiated by a transmitter radiating the received signal of the transmitters 1 to 4, and a shape estimation unit 5 which extracts a quasi-wavefront based on the correlation waveforms obtained by the correlation units 41 to 44 and estimates a shape of the object O based on a relationship between the quasi-wavefront and the object O. As a result, a period of time required to measure an object shape can be significantly reduced. [A542]

"Methods and systems for identifying hazardous flight zone areas on a display"

Systems and methods for representing a weather hazard without also including a large percentage of non-hazard area. An exemplary system includes a memory that stores radar reflectivity data in a three-dimensional buffer, a display device and a processor that is in data communication with the memory and the display device. The processor receives a two-dimensional shape based on a portion of the data stored in the three-dimensional buffer, then finds a center of the shape. Next the processor finds the furthest away point of the shape in a plurality of regions sharing the center as a common point and generates a polygon based on the furthest away points. The display device displays the generated polygon. The shape is associated with hazardous weather information determined from the radar reflectivity data stored in the three-dimensional buffer. The display device is an aircraft weather radar display. [A543]

"Systems and methods for generating and verifying altitude data"

Present novel and non-trivial systems and methods for altitude data from a radar system and employing such data to verify altitude data from another source. A processor receives reflection point data generated by an aircraft radar system and reference point data from an applicable data source. Based upon the reflection point data and reference point data, first altitude data representative of a first measurement of aircraft altitude is generated. Then, the processor receives second altitude data representative of a second measurement of aircraft altitude from another source. Validity of the second altitude data may be determined by comparing it with the first data, after which validity advisory data may be generated that, is responsive to the validity determination. Then, the processor may provide the validity advisory data to a presentation system, whereby validity information of the second altitude data is presented to the pilot. [A544]

"Target identification method for a synthetic aperture radar system"

In a synthetic aperture radar system monitoring an area containing at least one moving target for identification, the target is equipped with an identification device, which receives the radar signal transmitted by the radar system, and transmits a processed radar signal obtained by modulating the incoming radar signal with a modulating signal containing target information, such as identification and status information, and by amplifying the modulated radar signal, the radar echo signal reflected by the monitored area and containing the processed radar signal is received and processed by a control station of the radar system to locate the target on a map of the monitored area, and to extract the target information to identify the target. [A545]

"Airborne biota monitoring and control system"

Apparatus and methods for an airborne biota monitoring and control system are disclosed. Radar and laser/optical sensors are used to detect insects, with detection zones being over water in some embodiments to reduce backscatter clutter. A pest control laser or small autonomous or radio controlled aircraft under automated or human control may be used to disable a targeted flying insect. One embodiment includes use of a head-mounted display for displaying insect targeting information superimposed on a real landscape view. Technologies such as adaptive lens, holographic optical elements, polarized radar and/or laser beams, light amplifiers and light guides, thin disk, spinning disk, or vertical cavity surface emitting lasers enhance performance of the apparatus or reduce cost of the apparatus. Also disclosed are methods of discrimination of insect types using spectral information and dynamic relative variation of spectral intensities at different wavelengths reflected from an insect in flight. [A546]

"Device and method for monitoring the location of aircraft on the ground"

The invention relates to a monitoring device and method allowing surveillance of an aircraft in relation to aircraft and/or craft on an airport displacement zone. The invention is a system comprising a dedicated transmitter and receiver to receive the information regarding the location and displacement of the cooperative aircraft and to monitor the location of the said aircraft in relation to the cooperative aircraft. The monitoring application is based on the detection of conflict zones by inter-correlation of constraint surfaces of the airport zone. The invention applies to aircraft carrying communication moans for ADS-B networks for an airport zone monitoring application. [A547]

"Enhanced alerting of characteristic weather hazards"

A method of providing weather radar images to a flight crew of an aircraft includes obtaining raw volumetric radar data corresponding to at least one signal reflected off of a weather system. Based on the radar data, the weather system is computationally classified as being of a first type of a plurality of weather-system types. After classifying the weather system, the radar data is image processed, the image processing yielding an image representing the weather system and corresponding to the first weather-system type. The image is displayed on a display device. [A548]

"Process and a device for detecting aircrafts circulating in an air space surrounding an airplane"

A process and a device for detecting aircrafts circulating in an air space surrounding an airplane is disclosed. The device (1A) comprises means (2, 3) for detecting an aircraft circulating in the air space surrounding the airplane and, in case of a detection, for determining a first position and a second position of the aircraft with respect to the airplane, and means (8A) for comparing said first and second positions so as to check whether they match. [A549]

"Radar for aerial target detection fitted to an aircraft notably for the avoidance of obstacles in flight"

A radar being carried by an aircraft includes means for transmitting an RF wave towards a target, said wave having a double form, a first waveform being composed of at least two sinusoids of different frequencies transmitted simultaneously, the radar comprising reception circuits receiving the signals reflected by the target and analysis means performing the detection of the target on the basis of the signals received. The second waveform is of the pulse type. The transmitted waveform is dependent on the relative speed of the target with respect to the carrier and on the absolute speed of the carrier. [A550]

"Synthetic-aperture radar system and operating method for monitoring ground and structure displacements suitable for emergency conditions"

A synthetic-aperture radar system, and related operating method, for the monitoring of ground and structure movements, particularly suitable for emergency conditions, characterized by a ground based platform with polarimetric capabilities, that able to quickly acquire, embeddedly process and post-process data by a novel data acquisition "On the Fly" mode of operation, reducing by at least an order of magnitude the data acquisition time. The inventive system characteristics allows to achieve on-field measurement results on three-dimensional maps georeferenced to absolute coordinate systems (WGS84, Gauss-Boaga, and so on) . The operating method includes the step of installing the system, the acquiring of the first measurements, the quick data processing and post-processing to provide sub-millimetric precision georeferenced bi-dimensional and three-dimensional displacement maps for the objects belonging to the monitored scenario, with an improved performance and in a measurement time compatible to that required in an emergency condition, with an higher degree of integration with other sensors and autonomously and embeddendly. [A551]

"Active transponder, particularly for synthetic aperture radar, or SAR, systems"

An active transponder for synthetic aperture radar systems includes a receiving antenna for receiving a first radiofrequency signal modulated according to a first train of one or more first pulses, separating means comprising two outputs outputting the first radiofrequency signal, second processing means connected to a first output of the separating means to generate a code synchronized with the first pulses, signal generating means connected to the second output and to the second processing means generate a second radiofrequency signal modulated by the code, and a transmitting antenna means to transmit the second radiofrequency signal to generate, for each one of the first pulses, a sequence of one or more second pulses, the code being synchronized with the second pulses. [A552]

"Adaptive surveillance and guidance system for vehicle collision avoidance and interception"

A surveillance and guidance method and system for use with autonomously guided, man-on-the-loop or man-in-the-loop guided vehicles where the presence of obstacles must be considered in guiding the vehicle towards a target includes a navigation system configured to determine the position of the vehicle on which it is equipped. A communication system is configured for data exchange between the vehicle, neighboring vehicles and ground stations. A surveillance system is configured to detect and locate fixed or moving targets and obstacles. A computer is configured to track the position of targets and obstacles and to provide guidance commands or 4D flight paths to perform collision avoidance with respect to traffic regulations and procedures, and operational airspace restrictions. Additional computer tasks include station keeping or interception of targets. A command and control system is configured to interact with a user interface and control the vehicle's actuators. [A553]

"Device and method for locating a mobile approaching a surface reflecting electromagnetic waves"

Device and a method for locating a mobile object approaching a surface reflecting electromagnetic waves. The location device includes an emission antenna and a reception antenna. The emission antenna has one or more emission positions emitting a detection signal toward the mobile object. The reception antenna has at least one column of one or more reception positions, receiving a signal transmitted by the mobile object. An emission of the detection signal is activated on each emission position. An emission position that produces a detection by the reception antenna, of the signal of maximum energy transmitted by the mobile object, is selected to track the mobile object. One or more signals of maximum energy, received by one or more reception positions, are used to angularly locate the mobile object. The invention can be used to determine the position of an aircraft in the final landing phase for a guidance device. [A554]

"Systems and methods for collision avoidance in unmanned aerial vehicles"

Systems and methods for collision avoidance in unmanned aerial vehicles are provided. In one embodiment, the invention relates to a method for collision avoidance system for an unmanned aerial vehicle (UAV) , the method including scanning for objects within a preselected range of the UAV using a plurality of phased array radar sensors, receiving scan information from each of the plurality of phased array radar sensors, wherein the scan information includes information indicative of objects detected within the preselected range of the UAV, determining maneuver information including whether to change a flight path of the UAV based on the scan information, and sending the maneuver information to a flight control circuitry of the UAV. [A555]

"Explicit probabilistic target object selection and engagement"

An object of interest in a cloud of objects is identified by RF and IR sensing. The RF and IR signals are separately discriminated to determine the probability that the RF tracked object is one of a predetermined number of possible object types, and the IR tracked object is one of the possible object types. Joint probabilities are calculated for all pairs of RF and IR signals and all objects, and the joint probabilities are normalized. Marginal probabilities of the joint RF/IR discrimination results are calculated to produce a vector set of marginal optical probabilities. The vector set is normalized over all object types to thereby produce a vector set of normalized marginal optical probabilities. The object of interest is selected to be the IR object of said vector set of normalized joint optical probabilities with the highest probability of being the object type of interest. [A556]

"Creating and processing universal radar waveforms"

A new approach to radar imaging is described herein, in which radar pulses are transmitted wi th an uneven sampling scheme and subsequently processed with novel algorithms to produce images of equivalent resolution and quality as standard images produced using standard synthetic aperture radar (SAR) waveforms and processing techniques. The radar data collected with these waveforms can be used to create many other useful products such as moving target indication (MTI) and high resolution terrain information (HRTI) . The waveform and the correction algorithms described herein allow the algorithms of these other radar products to take advantage of the quality Doppler resolution. [A557]

"System for sensing aircraft and other objects"

A system for sensing aircraft and other objects uses bistatic radar with spread-spectrum signals transmitted from remotely located sources such as aircraft flying at very high altitudes or from a satellite constellation. A bistatic spread spectrum radar system using a satellite constellation can be integrated with a communications system and/or with a system using long baseline radar interferometry to validate the digital terrain elevation database. The reliability and safety of TCAS and ADS-B are improved by using the signals transmitted from a TCAS or ADS-B unit as a radar transmitter with a receiver used to receive reflections. Aircraft and other objects using spread spectrum radar are detected by using two separate receiving systems. Cross-Correlation between the outputs of the two receiving systems reveals whether a noise signal is produced by the receiving systems themselves or is coming from the outside. [A558]

"Method and a system for processing and displaying images of the surroundings of an aircraft"

The invention relates to a method of processing an image sensed by an image sensor on board an aircraft fitted with an obstacle-locator system, in which the position and the extent of a zone in the sensed image, referred to as the zone of interest, is determined as a function of obstacle location data delivered by the obstacle-locator system, after which at least one parameter for modifying the brightness of points/pixels in said zone of interest is determined to enable the contrast to be increased in said zone of interest, and as a function of said modification parameter, the brightness of at least a portion of the image is modified. [A559]

"Systems and methods for rapid updating of embedded text in radar picture data"

Systems and methods for efficiently updating text or symbol annunciations outputted by an avionics system on legacy displays. Instead of using a set sweeping pattern to update the display, a smart updating concept is used. The smart updating concept senses when the pilot is adjusting the selected altitude control (or other user interface device that will alter displayed annunciations) , then gives priority to updating the radial lines on the display that contain the annunciation field. Once the annunciation field has been updated, the display returns to normal operation. [A560]

"Airspace risk mitigation system"

An airspace risk mitigation system includes a plurality of airspace input sources, an airspace data fusion and sensor coordination system, a communications link, and a risk mitigation support system. The airspace input sources includes a radar for generating radar data for an airspace, and an Automatic Dependent Surveillance-Broadcast (ADS-B) receiver for generating additional data for the airspace. The airspace data fusion and sensor coordination system is configured to receive airspace data from the plurality of airspace input sources, correlating airspace data with new or known objects in the airspace, fusing airspace data into a common airspace data set, and generating target and system status information. The risk mitigation support system is configured to calculate a risk associated with aircraft operation in the airspace as a function of the target and system status information. [A561]

"Aircraft bird strike avoidance method and apparatus using axial beam antennas"

An aircraft avian radar is implemented using multiple axial beam antennas mounted on an aircraft. Target range is determined by radar range. Target azimuth and elevation position is determined by triangulation. An end-fire array antenna composed of a series of monopole antenna elements enclosed inside a long thin protective cover fashioned in the form of a stall fence is mounted on the wings, tail, or fuselage to produce a low drag axial beam antenna pattern directed ahead of the aircraft. Other axial beam antenna choices include helical, pyramidal horn, and conical horn antennas mounted on or inside various forward facing surfaces of the aircraft. [A562]

"Millimeter wave surface imaging radar system"

A short range millimeter wave surface imaging radar system. The system includes electronics adapted to produce millimeter wave radiation scanned over a frequency range of a few gigahertz. The scanned millimeter wave radiation is broadcast through a frequency scanned transmit antenna to produce a narrow transmit beam in a first scanned direction (such as the vertical direction) corresponding to the scanned millimeter wave frequencies. The transmit antenna is scanned to transmit beam in a second direction perpendicular to the first scanned direction (such as the horizontal or the azimuthal direction) so as to define a two-dimensional field of view. Reflected millimeter wave radiation is collected in a receive frequency scanned antenna co-located (or approximately co-located) with the transmit antenna and adapted to produce a narrow receive beam approximately co-directed in the same directions as the transmitted beam in approximately the same field of view. Computer processor equipment compares the intensity of the receive millimeter radar signals for a pre-determined set of ranges and known directions of the transmit and receive beams as a function of time to produce a radar image of at least a desired portion of the field of view. In preferred embodiment the invention is mounted on a truck and adapted as a FOD finder system to detect and locate FOD on airport surfaces. [A563]

"Short baseline helicopter positioning radar for low visibility"

A method for determining position and orientation of a rotating wing aircraft (e.g. helicopter) with respect to a ground station includes transmitting an electromagnetic signal from the aircraft. The signal includes a plurality of electromagnetic signals, each signal having a different selected frequency. The signal is detected at an array of sensors disposed on the ground surface in a selected pattern. The array includes at least one reference sensor and at least three spaced apart time difference determination sensors. A difference in arrival time of the signals between the reference sensor and each of the time difference determination sensors is determined and a spatial position of the aircraft is determined from the time differences. [A564]

"Method for characterizing an atmospheric turbulence using representative parameters measured by radar"

The present invention relates to a method for characterizing an atmospheric turbulence by representative parameters measured by a radar. The emission beam of the radar carried by an aircraft scanning the zone of the turbulence, a measured parameter being the total variance of the velocity of the turbulence .sigma..sub.U, this total variance at a point x.sub.0 inside the turbulence is the sum of the spatial variance of the spectral moment of order 1 of the signals received by the radar Var[M1 ({right arrow over (x) })] and of the spatial mean of the spectral moment of order 2 of the signals received Mean[M2 ({right arrow over (x) })], the moments being distributed as a vector {right arrow over (x) } sweeping an atmospheric domain around the point x.sub.0. The invention applies notably in respect of meteorological radars fitted to aircraft such as airliners for example. [A565]

"Wireless ground link-based aircraft data communication system with roaming feature"

A flight information communication system has a plurality of RF direct sequence spread spectrum ground data links that link respective aircraft-resident subsystems, in each of which a copy of its flight performance data is stored, with airport-located subsystems. The airport-located subsystems are coupled by way communication paths, such as land line telephone links, to a remote flight operations control center. At the flight operations control center, flight performance data downlinked from plural aircraft parked at different airports is analyzed. In addition, the flight control center may be employed to direct the uploading of in-flight data files, such as audio, video and navigation files from the airport-located subsystems to the aircraft. [A566]

"Process and a device for automatically determining meteorological conditions in the vicinity of an aircraft"

A process and a device for automatically determining meteorological conditions in the vicinity of an aircraft is disclosed. The device (1) comprises a meteorological radar (2) , able to determine the meteorological information associated with a primary geographical area ahead of an aircraft, and means (3, 4A, 4B) for automatically determining the meteorological conditions associated with a geographical area being extended with respect to the primary geographical area. [A567]

"Navigation and control system for autonomous vehicles"

A navigation and control system including a sensor configured to locate objects in a predetermined field of view from a vehicle. The sensor has an emitter configured to repeatedly scan a beam into a two-dimensional sector of a plane defined with respect to a first predetermined axis of the vehicle, and a detector configured to detect a reflection of the emitted beam from one of the objects. The sensor includes a panning mechanism configured to pan the plane in which the beam is scanned about a second predetermined axis to produce a three dimensional field of view. The navigation and control system includes a processor configured to determine the existence and location of the objects in the three dimensional field of view based on a position of the vehicle and a time between an emittance of the beam and a reception of the reflection of the emitted beam from one of the objects. [A568]

"Methods and apparatus for integration of distributed sensors and airport surveillance radar to mitigate blind spots"

Methods and apparatus for a first radar, identifying a blind spot in coverage of the first radar, providing a second radar to illuminate the blind spot, and merging data from the first and second radars using target classification prior to tracking to reduce false targets. In one embodiment, polarimetric data is used to classify targets. [A569]

"Systems and methods for providing an advanced ATC data link"

Embodiments of the present invention disclose systems and methods for providing an avionics overlay data link. Through embodiments of the present invention, existing ATC (or other) modulated signals using existing frequencies (or other frequencies) may be utilized to transmit (e.g., from an aircraft transponder) additional information in a manner that does not render the transmitted signal unrecognizable by legacy ATC equipment. In various embodiments, legacy equipment may demodulate and decode information that was encoded in the transmitted signal in accordance with preexisting standard modulation formats, and updated equipment can also extract the additional information that was overlaid on transmitted signals. [A570]

"Multi-waveform antenna and remote electronics for avionics"

The present invention is directed to an avionics system. The avionics system may include a plurality of multifunction antennas. Each multi-function antenna includes a plurality of antenna elements and an antenna electronics system, the antenna electronics system being communicatively coupled with the plurality of antenna elements. The multi-function antennas are configured for being mounted to an exterior surface of a pressure vessel (ex--an exterior surface of an aircraft) . The avionics system may further include a plurality of LRUs connected to the antennas via fiber optical cables, the LRUs being located in an interior of the aircraft. The LRUs receive communication control inputs from a communication system and establish settings of the LRUs based upon the received communication control inputs. The multi-function antennas are configured for performing operations (exs.--transmit operations, receive operations) based upon the settings established by the LRUs and based upon the communication control inputs. [A571]

"Synthetic aperture radar (SAR) imaging system"

One embodiment of the invention includes a synthetic aperture radar (SAR) system including a receiver configured to receive a plurality of reflected radar pulses corresponding to a plurality of radar transmission pulses having been reflected from a target region. A processing controller divides the target region into a plurality of tiles at a highest data layer and each of the plurality of tiles into a plurality of sub-tiles corresponding to one of a plurality of data layers and iteratively processes a portion of pulse data corresponding to a given tile associated with a higher data layer to generate pulse data corresponding to a given sub-tile in a lower data layer. An image processor is configured to generate a radar image of the target region based on the pulse data corresponding to each of the plurality of sub-tiles associated with a lowest data layer of the plurality of data layers. [A572]

"Detection system and method using gradient magnitude second moment spatial variance detection"

A detection system includes a detection processor configured to receive a frame of image data that includes a range/Doppler matrix, perform a rate-of-change of variance calculation with respect to at least one pixel in the frame of image data, and compare the calculated rate-of-change of variance with a predetermined threshold to provide output data. The range/Doppler matrix may include N down-range samples and M cross-range samples. The detection processor may calculate a rate-of-change of variance over an N.times.M window within the range/Doppler matrix. [A573]

"Method for radar monitoring of wake turbulence"

Detecting and grading the state and evolution of wake turbulence caused by an aircraft is made on the basis of radar signals reflected by this turbulence, these signals being analyzed through analysis cells of given dimension in terms of distance and bearing. A first preliminary detection step detects and locates turbulence in a cell. A second step determines the strength of the detected turbulence, while a third step determines the age of the detected turbulence as well as the geometric parameters which characterize it. This method makes it possible to detect wake turbulence and to determine at one and the same time the position and the strength of the latter as well as its stage of evolution. [A574]

"Identification friend or foe (IFF) system"

A method and apparatus for reducing transponder responses to reflected signals utilizes data in an interrogator message to confirm that if two interrogations are received within a predetermined period of time and if the two interrogator signals correspond to a side lobe followed by a reflected main beam signal, the presence of multipath reflection can be correctly identified and the reply to the main beam interrogation can be suppressed. [A575]

"Systems and methods for predicting locations of weather relative to an aircraft"

Systems and methods for predicting when a weather anomaly (e.g., convective cell) will intersect with an aircraft. Direction of movement and velocity information for at least one weather anomaly are received at a processor from a radar system. An intercept point for the at least one weather anomaly is determined based on the received location, direction of movement and velocity information and location and current speed information for the aircraft. Then, a first indicator based on the intercept point is displayed on a display device. [A576]

"System and method for imaging objects"

An active imaging system for imaging a target is described. The system includes a transmitting unit, a receiving unit, an antenna arrangement coupled to the transmitting unit and/or the receiving unit via a front end unit, and an image processing unit coupled to the receiving unit. The system also includes a control system coupled to the transmitting unit, the receiving unit and/or the image processing unit for controlling operation thereof. The antenna arrangement includes at least one rotating antenna synthetically forming a circular antenna. The image processing unit is configured for creating an image of the object by employing a synthetic aperture radar imaging algorithm. [A577]

"System and method for displaying information on a display element"

A method of displaying information on a display element is provided. The display element may be deployed in a vehicle such as an aircraft. The method obtains range data for objects located in a sensing region at a sampling time, and obtains image data corresponding to an image of the sensing region at the sampling time. The method continues by deriving first graphics content from the range data, and by deriving second graphics content from the image data. The first graphics content is correlated with the second graphics content such that they are spatially and temporally aligned with one another. Then, the correlated graphics content is rendered on the display element. [A578]

"Adaptive mainlobe clutter method for range-Doppler maps"

A method of adaptively removing mainlobe clutter from range-Doppler data includes estimating the peak of the mainlobe clutter, and determining clutter regionboundaries adaptively and robustly. The mainlobe clutter peak may be estimated from the range-Doppler data, for example using both nonlinear and linear filters. Alternatively the mainlobe clutter peak may be estimated from knowledge of the position and speed of the vehicle, such as a missile, upon which the radar system moves. The clutter boundaries may be determined at each of the range bins by stepping along Doppler bins from the mainlobe clutter peak estimate in opposite directions, locating the boundary at locations off of the mainlobe clutter peak estimate that meet a given criterion. The method produces a finer determination of the mainlobe clutter region, resulting in less of the range-Doppler data being excluded as part of the mainlobe clutter region. [A579]

"Forward-looking synthetic aperture radar processing"

Processing is described for forming a synthetic aperture radar image of the region toward which a platform moves, and for extracting from this image the physical positions of scatterers in the region, including moving scatterers. The processing entails one-dimensional resampling of the received radar data that can be performed as the data are being collected, facilitating real-time operation. Various embodiments are disclosed. [A580]

"Apparatus for measurement of vertical obstructions"

Accurate measurements of flight path obstructions are taken from a moving aerial platform. Platform position, including altitude, is combined with dynamic data including target distance and target elevation data to calculate obstruction height or altitude. An optical subsystem on the aerial platform images the obstructions and provides a video stream showing the obstructions. The video stream and aerial platform data are wirelessly communicated to a control terminal where an operator observes a presentation of obstructions and obstruction altitudes or heights. The operator can issue commands to the aerial platform. [A581]

"Airborne radar having a wide angular coverage, notably for the sense-and-avoid function"

An airborne radar device having a given angular coverage in elevation and in azimuth includes a transmit system, a receive system and processing means for carrying out target detection and location measurements. The transmit system includes: a transmit antenna made up of at least a first linear array of radiating elements focusing a transmit beam, said arrays being approximately parallel to one another, at least one waveform generator, means for amplifying the transmit signals produced by the waveform generator or generators, and means for controlling the transmit signals produced by the waveform generator or generators, said control means feeding each radiating element with a transmit signal. The radiating elements being controlled for simultaneously carrying out electronic scanning of the transmit beam in elevation and for colored transmission in elevation. [A582]

"Method for cleaning signals for centralized antijamming"

The present invention relates to a method for cleaning signals for centralized antijamming. The invention makes it possible to provide as many cleaned antenna channels as sub-arrays with limited computational requirements. The method proceeds in two steps. Initially, an antijamming matrix is computed. This matrix depends on the noise covariance matrix, on a weighting vector representing the form of the desired antenna pattern on reception in an unjammed environment, and on constraints for preserving the shape of this antenna pattern. Subsequently, the signals arising from the antenna sub-arrays undergo a linear recombination effected by the antijamming matrix. The antijamming method is termed centralized since the data necessary for the antijamming processing are concentrated in the lone antijamming matrix. The invention applies notably to radar systems, notably to airborne radar systems. [A583]

"Multi-mode ground surveillance airborne radar"

Ground surveillance airborne radar device, characterized in that it reproduces a mapping of STRIPMAP type of an area of interest divided into bands (101) , the images of these bands being captured successively, each according to a technique of scan SAR type, the operations for processing the image of a band (101) being produced successively to the capture of the image of this band (101) and in a manner concomitant with the realization of at least one additional radar mode, before the capture of the image of the following band (101) . [A584]

"Method and device for determining the angle of bearing in a TACAN type radionavigation system"

Method making it possible to reconstruct a first signal taking the form of a series of pulses of width T, characterized in that it comprises a step in which a delay .tau. fixed with respect to the first signal to be reconstructed is introduced into a second signal having a sinusoidal shape and in that the porches of width T of the first signal at an instant t are substituted with portions of sinusoid of the second delayed sinusoidal signal corresponding to an instant t-1 so as to reconstruct a signal having a sinusoidal shape. [A585]

"Aircraft bird strike avoidance method and apparatus using transponder"

An aircraft avian radar is implemented using an existing aircraft transponder, Mode S, or TCAS installation as the radar transmitter. To eliminate self jamming of low level avian target signals by high level transmitter signals, the ending period of the transmission signal is digitized and cross correlated with the ending period of reflected avian target signals received after the transmission signal has ended. In a first implementation, the current transponder antenna is used for both transmission and reception. In a second implementation, an external receive only antenna is mounted in a position that maximizes the transmit antenna to receive antenna isolation. In a third implementation, a signal canceller and sample of the transmit signal are used to cancel or null out as much transmit signal as possible that couples directly to the receive antenna. [A586]

"Viewing device for an aircraft comprising means for displaying aircraft exhibiting a risk of collision"

The general field of the invention is that of viewing systems of the synthetic vision type SVS, for a first aircraft, the said system comprising at least one cartographic database of a terrain, position sensors, for the said aircraft, an air traffic detection system calculating the position and the danger rating of at least one second aircraft exhibiting a risk of collision with the said first aircraft on the basis of data originating from sensors or systems such as TCAS or ADS-B, an electronic computer, a man-machine interface means and a display screen, the computer comprising means for processing the various items of information originating from the database, sensors and interface means, the said processing means arranged so as to provide the display screen with a synthetic image of the terrain comprising a representation of the said second aircraft. The said representation comprises a first symbol representing in a stylized manner the said second aircraft and a second symbol, situated to the right of the first symbol when the second aircraft is facing towards the first aircraft and situated to the left of the first symbol when the second aircraft is facing away from the first aircraft. [A587]

"Single channel semi-active radar seeker"

The disclosed approach provides a low-cost approach by employing a single channel receiver for a direction-finding missile, rather than a conventional four-channel system. It employs interferometry techniques. The proposed approach leverages orthogonal waveforms and pseudorandom noise (PN) codes. This is a low-cost approach for a single channel direction finding system by leveraging orthogonal waveforms and interferometric techniques. [A588]

"Integrated airport domain awareness response system, system for ground-based transportable defense of airports against manpads, and methods"

Embodiments of an apparatus and method for defending a physical zone from airborne and ground-based threats are disclosed. In the various embodiments, an apparatus includes a detection component configured to detect and track a ground-based or airborne threat proximate to the physical zone, an integration component to receive data from the detection component and process the data to determine a threat assessment. A defensive component receives the determined threat assessment and disables the ground-based and airborne threat based upon the determined threat assessment. A method includes detecting an object proximate to the physical zone to be protected, identifying the object as a hostile threat, determining at least one of a path and a point-of-origin for the object, and actuating a defensive system in response to the hostile threat. [A589]

"Interactive synthetic aperture radar processor and system and method for generating images"

A system for generating images may include an interactive SAR processor for generating an image using SAR data. The system may also include a module associated with the SAR processor for allowing a user to interactively select different settings for each of a group of parameters for generating different images by the interactive SAR processor using the SAR data. [A590]

"Monopulse angle determination"

Modern tactical radars frequently use phase shifters to electronically specify or steer the spatial position of the antenna beam without requiring mechanical motion of the antenna. These phase shifters can only be set correctly for a specific frequency. If a waveform is transmitted through the antenna which consists of multiple segments which differ in frequency or modulation from that frequency used to steer the position of the beam, errors are introduced into the monopulse measurement. These monopulse errors are reduced or eliminated by correction factors. The monopulse errors are corrected by pre-computed factors or terms which result from the differences in frequency and modulation used in the waveform from the frequency used to steer or position the beam. Correction is also provided for radar altitude. These correction factors are easily pre-computed and applied only when needed to minimize the computational requirements. [A591]

"Covert long range positive friendly identification system"

The present invention pertains to a portable repeater device for use by friendly forces in a combat theater. The repeater device includes a sensor that receives an interrogator signal, coded or un-coded, from a friendly interrogator, such as an airborne attack or search and rescue vehicle, and a transmitter that transmits a coded or uncoded beacon at a covert wavelength outside the typical night-vision spectrum back to the interrogator in response. Because the transmission wavelength of the repeater signal is covert and outside typical night-vision capabilities, the system limits the ability of enemy forces to locate friendly forces employing such signaling beacons through typical night-vision equipment. [A592]

"Onboard radar device and program of controlling onboard radar device"

An onboard radar apparatus includes a transmission wave generating unit configured to generate a transmission wave, a vertically polarized wave transmitting antenna configured to vertically polarize and transmit the transmission wave, a horizontally polarized wave transmitting antenna configured to horizontally polarize and transmit the transmission wave, a receiving antenna configured to receive a reflection wave, a switch control unit configured to perform a switching between the vertically polarized wave transmitting antenna and the horizontally polarized wave transmitting antenna, and a receiving unit configured to receive one of the reflection waves based on receiving levels of the reflection waves, which have been received by the receiving antenna before and after the switching is performed by the switch control unit. [A593]

"Cell clustering and optimization for space partitioning"

A partitioning system includes a decomposer module, a supply and cell commonality computation module, a network structure setup module, a seed selection module, an optimization setup module, a solver module, and a boundary creation module. A network structure is created by connecting each cell to each of its neighboring cells using bi-directional arcs. Each bi-directional arc is assigned a flow value and a cell commonality metric. The optimization program is solved to determine the flow value for each bi-directional arc and to determine a plurality of open seeds. Each determined seed represents one partition. Partition boundaries are created by grouping cells when they are connected to each other via one of the updated set of bi-directional arcs into cell clusters. Cells within cell clusters are merged to create the predetermined number of contiguous partitions. [A594]

"Radar altimeter antenna performance monitoring via reflected power measurements"

Systems and methods for radar altimeter antenna performance monitoring via reflected power measurements are provided. In one embodiment, a single antenna radar altimeter comprises: an antenna, a circulator coupled to the antenna, a transmitter coupled to the circulator, a receiver coupled to the circulator, wherein the circulator provides coupling of the transmitter and the receiver to the antenna while providing isolation between the transmitter and the receiver, a reflected power monitor positioned between the circulator and receiver, and a processor coupled to the reflected power monitor via a first analog-to-digital converter, the processor configured to compute and track reflected power measurement statistics from data generated by the reflected power monitor and provide a performance output indicating when one or more of the reflected power measurement statistics exceed a predetermined deviation threshold. [A595]

"Device, system and method of protecting aircrafts against incoming threats"

Device, system and method of protecting aircrafts against incoming threats. for example, a system for protecting an aircraft against an incoming threat includes: one or more electro-optic sensors to substantially continuously search for the incoming threat, and to generate a signal indicating that a possible incoming threat is detected, one or more radar sensors to be activated in response to the signal, and to search for the incoming threat, and a central computer to determine whether or not the incoming threat exists, based on a sensor fusion algorithm able to fuse data received from the one or more electro-optic sensors and data received from the one or more radar sensors. [A596]

"Radar device for detecting or tracking aerial targets fitted to an aircraft"

A radar device includes means for emitting microwave-frequency signals, means for receiving signals reflected by a target, computation means, a plurality of antenna systems disposed around the aircraft, an antenna system comprising a set of emission antennas coupled to the emission means and a set of reception antennas coupled to the reception means, each antenna system being dedicated to the coverage of a given angular sector .OMEGA., for a given antenna system, the antenna beam on reception being formed by CBF by the computation means on the basis of the signals received by the reception antennas and the antenna beam on emission is pointed by an electronic scanning system in a number greater than or equal to two of directions inside the given angular sector .OMEGA.. The invention applies notably in the field of airborne radars, in particular radars with large angular coverage and short range that are necessary for example for carrying out a function of the "see and avoid" type on drones, which function is also commonly called "Sense & Avoid". [A597]

"Synthetic aperture radar hybrid-quadrature-polarity method and architecture for obtaining the stokes parameters of radar backscatter"

A synthetic aperture radar hybrid-quadrature-polarity method and architecture comprising transmitting both left and right circular polarizations (by alternately driving, at the minimum (Nyquist) sampling rate, orthogonal linear feeds simultaneously by two identical waveforms, +/-90.degree. out of phase) , and receiving two orthogonal linear polarizations, coherently. Once calibrated, the single-look complex amplitude data are sufficient to form all Stokes parameters, which fully characterize the radar backscatter. [A598]

"Method for protecting location privacy of air traffic communications"

Methods of protecting location privacy of air traffic communications from unauthorized monitoring of aircraft locations in an uncontrolled airspace include designating a bounded region of uncontrolled airspace, ceasing transmission of a traffic beacon by each aircraft of a plurality of aircraft upon the aircraft entering the bounded region, and updating a unique identifier associated with each of the aircraft while the aircraft is traversing the bounded region. [A599]

"System and method for generating a reference signal for phase calibration of a system"

A two-element array antenna system includes a first antenna element and a second antenna element. The first and second antenna elements respectively include first and second frequency multipliers. A transmitting, receiving, and processing (TRP) system is coupled to the first and second antenna elements via, respectively, a single first transmission element and a single second transmission element. The TRP system is configured to transmit to the first antenna element a first input signal at a sub-multiple of a first frequency, receive from the first frequency multiplier a first calibration signal based on the first input signal, transmit to the second antenna element a second input signal at a sub-multiple of the first frequency, receive from the second frequency multiplier a second calibration signal based on the second input signal, and determine, based on the calibration signals, a relative phase difference between the first and second transmission elements. [A600]

"Systems and methods for enhancing situational awareness of an aircraft on the ground"

A delineated collision avoidance system may comprise a processor for executing one or more instructions that implement one or more functions of the collision avoidance system, a transceiver for transmitting information from and receiving information for the host aircraft, and memory for storing the one or more instructions for execution by the processor to implement the one or more functions of the collision avoidance system to: receive from the transceiver information from another aircraft, generate from the received information a track for the other aircraft, and determine whether the track will intersect within a predefined period of time a region of interest around the host aircraft. In a variation, the system may include a display and the memory may include instructions to: determine whether a predefined condition is satisfied and change an appearance of a symbol shown on the display to indicate that the predefined condition is satisfied. [A601]

"Multipath SAR imaging"

Disclosed is a method for removing the distortions produced by multipath Synthetic Aperture Radar (SAR) imaging. Conventional SAR systems assume that the returned signal consists of only direct scatterings, in practice however, the returned signal consists of multiple scattering events. Multiple or multipath scattering occurs when part of the surface reflects energy to at least one other part of the surface before the signal is scattered back to the receiver. Multipath scattering distorts the SAR image by superimposing blurring artifacts that diminish the resolution of the radar image. We exploit the phase change introduced by the "half Nyquist" frequency points of Fourier space to remove the effects of multiple scattering. The reflectivity function of the scene is recovered while retaining the resolving power of single scattering SAR. [A602]

"High fidelity simulation of synthetic aperture radar"

Methods and systems for generating a raster file in a raster file format for use in a Digital Radar Landmass Simulator (DRLMS) . A file in the raster file format defines synthetic aperture radar (SAR) scenery for use in generating a runtime database. The raster file contains a plurality of texture elements (texels) that define the SAR scenery. Each texel may have a material identifier, which identifies a material composition of a respective surface region of the SAR scenery, a surface height identifier, which identifies a surface height with respect to a bare earth elevation (BEE) value of the respective surface region, and a BEE identifier, which identifies a BEE of the respective surface region. A method for determining surface height identifiers based on digital surface model (DSM) elevation data is also provided. [A603]

"Tracking coordinator for air-to-air and air-to-ground tracking"

A method and system for coordinating air-to-air tracking and air-to-ground tracking for an airborne tracked target that is landing or performing an airdrop. Air-to-air tracking data is analyzed to detect if the tracked target is landing, and a predicted landing location is computed. An air-to-ground sensor is activated, via a separate air-to-ground tracking module or via a mode change, and the air-to-ground tracking is initiated at the predicted landing location of a detected target. Both automated and manually-assisted air-to-ground activation are supported. [A604]

"Three quarter spatially variant apodization"

A new spatially variant apodization (SVA) algorithm that uses a 3/4 filled aperture prior to two dimensional discrete Fourier transform (2-D DFT) to form the image. The algorithm can be used, for example, to improve contrast and resolution on synthetic aperture radar (SAR) imagery, with a lower degree of oversampling (and thus, fewer pixels) than other algorithms require. This can translate into more efficient use of radar displays and processor memory. Additional efficiencies of memory and computing power may be realized when Automatic Target Recognition (ATR) algorithms operate on this imagery. Embodiments of this invention use convolution kernels at two different spacings, which are better tuned to the local phase relationships of mainlobe and sidelobes with a 3/4 filled aperture. As such, these embodiments suppress sidelobes without sacrificing resolution, at an aperture-filling ratio of 3/4, rather than 1/2, as is usually used. [A605]

"Multilateration system and method"

A multilateration system and method includes a plurality of receiver stations for receiving signals from an aircraft, and a controller that derives the position of the aircraft by applying a multilateration process to outputs from the receiver stations. for this purpose, the controller determines the altitude of the aircraft and selects a multilateration process that is to be used for position determination, based on the determined altitude. [A606]

"Method and system of reducing friendly fire in anti-aircraft engagements"

A method and system provide for confirmation of friendly aircraft as a backup to conventional IFF (identification, friend or foe) telecommunication systems and methods. An IFF secondary radar signal is generated and directed to an aircraft. When no confirming response is received within a pre-determined time period, the invention provides for generating and transmitting a pre-arranged modulated signal to the aircraft. In response to receiving the pre-arranged modulated signal, the aircraft notifies the aircrew to execute a pre-arranged kinematic maneuver that is detected by the systems using radar means to confirm that the aircraft is a friendly aircraft. [A607]

"Inverse synthetic aperture radar image processing"

According to one embodiment, inverse synthetic aperture radar (ISAR) image processing includes receiving an ISAR image from an inverse synthetic aperture radar. A standard deviation profile is generated from the ISAR image, where the standard deviation profile represents a standard deviation of the ISAR image. The standard deviation profile is normalized to form a normalized standard deviation profile. A mean value profile is generated from the ISAR image, where the mean value profile represents a mean value deviation of the ISAR image. The mean value profile is normalized to form a normalized mean value profile. The normalized standard deviation profile and the normalized mean value profile are combined to form a sum normalized range profile. The sum normalized range profile may be processed to classify a target in the ISAR image. [A608]

"Method for predicting collisions with obstacles on the ground and generating warnings, notably on board an aircraft"

The invention notably relates to a method of detecting obstacles on the ground receiving an obstacle clearance sensor and a zone for extracting map data. The method comprises the following steps: extraction from an obstacle database of a list of pointlike obstacles, extraction from an obstacle database of a list of linear obstacles, determination, according to the obstacle clearance sensor, of the risks associated with the extracted pointlike obstacles and generation of a warning, determination, according to the obstacle clearance sensor, of the risks associated with the extracted linear obstacles, and generation of a warning. In particular, the invention applies to the calculation of the warnings relating to the risks of collision with pointlike or linear obstacles taking into account the path of the aircraft and the altitude of the obstacles. [A609]

"System and method for enabling determination of a position of a transponder"

There is provided a method and system for positioning a transponder, the system comprising an antenna array of at least two spaced-apart antennas coupled to a common generating and switching unit. The generating and switching unit is configured for generating a periodic signal and switching the signal between said at least two antennas, constituting a positioning signal transmitted to the transponder. The system comprises a receiver for receiving a returned signal and a phase difference estimator coupled to the receiver and operable to measure phase differences between portions of the returned signal. The system further comprises a positioning utility coupled to said phase difference estimator and configured to determine the position of the transponder relative to the positioning system. [A610]

"Systems and methods for improving relevant weather determination"

Systems and methods for improving relevant weather determination for aircraft at altitude. An exemplary system includes a weather radar component and memory that stores weather radar data in a three-dimensional (3D) buffer. A processor calculates vertically integrated reflectivity using the stored weather radar data at a predefined reference altitude at one or more locations from the aircraft. The processor then adjusts a lower boundary of a relevant weather envelope from a first value to a second value, if the vertically integrated reflectivity is greater than a predefined threshold. The range of the adjusted lower boundary of the envelope is associated with the weather radar data having the calculated vertically integrated reflectivity greater than the predefined threshold. A display device displays the weather radar data located within the envelope in a first manner and displays the weather radar data located outside of the envelope in a second manner. [A611]

"Systems and methods for aircraft to aircraft exchange of radar information over low bandwidth communication channels"

Systems and methods communicate weather information between aircraft using low bandwidth communication transceivers. An exemplary embodiment receives weather information from a weather radar system on board a remote aircraft, processes the received weather information into weather radar image information that is displayable on at least a display, processes the weather radar image information into a reduced size dataset, and communicates the reduced size dataset to an installation aircraft over the low bandwidth communication channel, wherein the low bandwidth communication channel is generated by a low bandwidth communication transceiver on board the remote aircraft. [A612]

"Using doppler radar images to estimate aircraft navigational heading error"

A yaw angle error of a motion measurement system carried on an aircraft for navigation is estimated from Doppler radar images captured using the aircraft. At least two radar pulses aimed at respectively different physical locations in a targeted area are transmitted from a radar antenna carried on the aircraft. At least two Doppler radar images that respectively correspond to the at least two transmitted radar pulses are produced. These images are used to produce an estimate of the yaw angle error. [A613]

"Method of processing a radar image, obtained in particular from an airborne radar, with evaluation of the altitude of the 0.degree. C. isotherm"

The invention targets a method of processing a radar image obtained from a radar. It comprises an automatic evaluation of the altitude of the isotherm at zero degrees Celsius, called zero isotherm, using a processing of the reflectivity information (rf (px)) conveyed by pixels (px) forming all or part of the radar image. [A614]

"UAV trajectory determination method and system"

A method for determining a corrected UAV trajectory for a UAV having an on-board synthetic aperture radar (SAR) and a programmed trajectory includes the SAR obtaining observed radar range profile curves associated with point scatterers, calculating an error objective function based on the observed radar range profile curves to obtain a perturbation path, and applying the perturbation path to the programmed trajectory to obtain the corrected UAV trajectory input back into the SAR. Optimal parameter values applied to the UAV motion model then constitute an improved estimate of the UAV trajectory. A system for computing the corrected UAV trajectory also includes an on-board UAV inertial navigation system and an on-board processor having a machine-readable storage media capable for storing the software instructions for applying the subject algorithm via the processor that then applies the corrected trajectory to the SAR. [A615]

"Radar image generation system"

According to one embodiment, a synthetic aperture radar includes a back projection processor that is configured to receive multiple return signals from the radar as the radar is moved with respect to an object, wherein the return signals are representative of electro-magnetic radiation reflected from the object. The back projection processor generates a dynamic image of one or more internal features of the object from the return signals by varying a squint angle of the plurality of return signals in which the squint angle varied by modifying a back projection filter. Once generated, the back projection processor displays the dynamic image on a display. [A616]

"Computationally efficent radar processing method and sytem for SAR and GMTI on a slow moving platform"

A method and system for processing radar data from a movable platform comprising passing a radar signal through a low noise amplifier, down converting the signal to a lower frequency, filtering out harmonics, sampling using A/D converter at or above Nyquist frequency, determining a scene center, performing a two stage averaging scheme of the received signals with a variable window function based upon the velocity, acceleration of the platform and scene center, coherently averaging N pulses to create an average pulse, performing an inverse Fourier transform, compensating to the scene center by multiplying by a complex exponential based upon GPS and inertial navigational system, summing the average pulses using a low pass filter, repeating the determination of an average pulse for a time period that is less than the Nyquist sample time interval to generate second average pulses, and performing a 2D inverse Fourier transform to obtain SAR image. [A617]

"Method and system for maintaining spatio-temporal data"

A system and method for maintaining spatio-temporal data for a given area (e.g., an airspace) containing a given node (e.g., an aircraft) and one or more other nodes (e.g., aircraft) . The given aircraft may break the given airspace into a first plurality of smaller airspaces, and may also break the given airspace into a second plurality of smaller airspaces. The given aircraft may then detect local spatio-temporal data for each smaller airspace located within its detectable range. The aircraft may also receive remote spatio-temporal data for the smaller airspaces from the one or more other aircraft. Thereafter, the aircraft may update stored spatio-temporal data based on the aircraft's navigation data, the local spatio-temporal data, the remote spatio-temporal data, and/or a reliability of the data. Further, the aircraft may transmit the stored spatio-temporal data for receipt by the one or more other aircraft. [A618]

"Method and system for forming very low noise imagery using pixel classification"

A method and system for generating images from projection data comprising inputting first values representing correlated positional and recorded data, forming an image by processing the projection data utilizing a pixel characterization imaging subsystem to form the SAR imagery utilizing one of a back-projection algorithm or range migration algorithm, integrating positional and recorded data from many aperture positions, comprising: forming the complete aperture A.sub.0 comprising collecting the return radar data, the coordinates of the receiver, and the coordinates of the transmitter for each position k along the aperture of N positions, forming an imaging grid comprising M image pixels, selecting and removing a substantial number of aperture positions to form a sparse aperture A.sub.ifor L iterations, classifying each pixel in the image into target class based on the statistical distribution of its amplitude across L iterations, otherwise, the pixel is given the value of zero. [A619]

"Aircraft collision avoidance alarm"

The present invention provides an aircraft collision alarm system and method. The method includes the steps of collecting aircraft position information for aircraft in a given area and digitally encoding this aircraft position information. This aircraft position information is then transmitted on an audio sub-carrier over the voice communications channel of a VOR to the aircraft. The aircraft receives and processes the digitally encoded information and alerts the pilot if a collision alarm situation is present. [A620]

"Simplifying and cost-effective IR-RF combat identification friend-or-foe (IFF) system for ground targets"

Combined IR-RF combat identification friend-or-foe (IFF) system for a ground targets, such as dismounted soldiers, vehicles or military platforms comprising IR-RF interrogator mounted on a firearm and IR-RF transponder mounted on a friendly target. RF channel operates in Ka-band providing brief information about friendly targets that could be in attacked area, and if they are, develop alert signal: "Friendly soldiers are in the area". The interrogator additionally contains RF channel receiving reflected signal that allows recognize armed foe. IR channel of the system prevents friendly fire in the case of direct sighting to a friendly soldier. [A621]

"Radar system for aircraft"

Radar system for providing an aircraft with a facility for in use at least detecting another aircraft in at least one monitorable zone within a region surrounding of that aircraft, wherein the system comprises for each monitorable zone at least one subsystem comprising one transmitter for sending an electro-magnetic probe signal and at least one receiver for receiving a reflection of that probe signal, wherein the transmitter is arranged to send the probe signal in a direction that is static with respect to that aircraft. [A622]

"High altitude platform deployment system"

A communication system for supporting communications with a target market area. The system includes one or more solar-powered aircraft maintained in, or successively passing through, flight stations or flight patterns around the market area. Each of the aircraft targets limited beamwidth communication antennas on a substantial portion of the target market area. The control system is configured to fly selective flight patterns depending on the aircraft characteristics and the flight conditions. The flight patterns may emphasize high-power-generation patterns such as flying away from the sun for aircraft with wing-mounted solar cells. [A623]

"Image processor and image processing method for synthetic aperture radar"

An image processor and an image processing method for a synthetic aperture radar searching for a target are provided. A high resolution processing unit performs high resolution processing up to an area equivalent to a small target or smaller to thereby acquire information held by the small target. Next, a maximum value filter processing unit develops the information of the small target acquired through the high resolution processing in one pixel of low resolution processing with a maximum value. Then, a display unit displays the minimum area of the low resolution processing as one pixel on a screen. Since the information originally held by the small target can be displayed without damaging it as described above, it is easily distinguishable from the background information, enabling to improve the detection capability as a radar. [A624]

"Location identification of a mobile terminal by employing radio frequency identification"

The location of a mobile terminal may be determined in response to signals received from a plurality of RFIDs. Information from a plurality of RFIDs for determining a location of a mobile terminal is received by the mobile terminal. The mobile terminal may maintain an in-range list that comprises all the RFIDs in which the mobile terminal is currently within their coverage range. The location of the mobile terminal is calculated in response to the received information for determining a location by calculating the common coverage area of the RFIDs in the in-range list. [A625]

"Device for imaging test objects using electromagnetic waves, in particular for inspecting people for suspicious items"

To depict test objects using electromagnetic waves, particularly to check people for suspicious articles, an apparatus is provided having: an antenna which emits electromagnetic waves, particularly millimetric waves, means for concentrating the emitted waves in three dimensions, and means for manipulating the waves at the point of high concentration such that this point serves as a moving virtual antenna for SAR evaluation. Whereby the means for three-dimensional concentration contain a rotatably mounted, focusing or defocusing, quasi-optical element and the means for manipulating the waves at the point of high concentration contain a reflector. In accordance with the invention, the quasi-optical element and the reflector are rotatably mounted about a common rotary axis and at the same angular velocity. [A626]

"Dynamic weather selection"

The different advantageous embodiments provide a system comprising a weather band selection process and a processor unit. The processor unit is configured to run the weather band selection process. The weather band selection process identifies a flight trajectory associated with an aircraft, identifies weather information for the flight trajectory, and identifies a weather band selection for the aircraft using the flight trajectory, aircraft information and the weather information. [A627]

"Quantity smoother"

In an embodiment, a quantity smoother includes a first stage and a second stage. The first stage is operable to receive a sequence of raw samples of a quantity and to generate from the raw samples intermediate samples of the quantity, the intermediate samples having a reduced level of fluctuation relative to the sequence of raw samples. The second stage is coupled to the first stage and is operable to generate from the intermediate samples resulting samples of the quantity, the resulting samples having a reduced level of fluctuation relative to the sequence of intermediate samples. for example, such a quantity smoother may be part of a target-ranging system on board a fighter jet, and may smooth an error in an estimated target range so that the fighter pilot may more quickly and confidently determine in his head a range window within which the target lies. [A628]

"Multi-transmitter interferometry"

Systems and methods for obtaining target elevation information are disclosed. The systems and methods use multiple vertical transmitters and one or more receivers to infer changes in the elevation plane and the height of objects. Changes in elevation and heights of objects are inferred from path length differences between the transmitters and a particular backscattering point. Using known geometric information regarding the configuration of the transmitters, propagation time differences can be estimated via time delay estimation methods in either the time or frequency domain. Appropriate modulation schemes are used such that the multiple signals transmitted are separable upon reception. [A629]

"Method for examining an ice region or dry region using radar echo sounding"

To suppress cross-ambiguities in the examination of an ice region or dry region by means of aircraft- or aerospace-supported radar echo sounding, the region to be examined is overflown by a radar sensor (6) by multiple compatible radar sensors of the same operating wavelength on multiple spatially separated, substantially parallel paths, wherein the radar signal data received on each path are recorded. The radar signal data recorded for each of the different paths are summed coherently and using a weighting to form a radargram, wherein an adaptive complex-valued weighting for each of the individual paths is performed using a geometrical model which takes into account the topography of the environment of the region to be examined. The weighting for every depth of the examined region is determined by solving a system of linear equations from which is calculated a synthetic antenna pattern which has zeros in the direction of the ambiguities. Implementation in radar systems for echo sounding in ice and in dry regions on earth or other planets and extraterrestrial objects. [A630]

"Stability monitoring using synthetic aperture radar"

A stability monitoring system is described that provides an accurate, automated, and remote way of monitoring small movements over a large surface area without the need to pre-place reflective targets using a mobile SAR.

The stability monitoring system allows the rapid, automated identification and measurement of small surface movements over a wide field of view from a safe standoff distance without the need for personnel working in hazardous zones. Using this data, authorities can more accurately identify hazard areas and efficiently allocate mitigation resources. [A631]

"Tornado detection network"

A tornado disarming network includes a command center, tornado detection systems, and tornado busting missile launch sites in communications with the command center. Tornado busting missiles are at the tornado busting missile launch sites. Each tornado busting missile includes a radar, a guidance system and a solid rocket motor for propelling the missile toward the tornado. A thruster control system causes the tornado busting missile to travel upward within the tornado upon reaching the tornado. An explosive discharge system explodes within the tornado to generate heat for causing the air within the tornado to expand, thereby weakening the tornado. [A632]

"System, method, and software for performing dual hysteresis target association"

In certain embodiments, a method includes receiving first track information comprising data for a particular aircraft track. The method further includes receiving a first radar plot comprising first location information corresponding to first aircraft identification information and first location information corresponding to second aircraft identification information. The method further includes associating the first aircraft identification information with the particular aircraft track. The method further includes accessing historical association information comprising a first association history variable corresponding to one or more previous associations between the first aircraft identification information and the particular aircraft track and a second association history variable corresponding to one or more previous associations between the second aircraft identification information and the particular aircraft track. The method further includes updating the first association history variable in response to the association of the first aircraft identification information with the particular aircraft track. [A633]

"Security systems and methods relating to travelling vehicles"

There is provided a method for identifying, at the moment of verification, the situation of a threat to a protected ground, airspace and/or sea limits by an approaching ground vehicle, aircraft or sea-going vessel. The method includes an authorized driver/pilot/captain to select first state in which the vehicle, aircraft or sea-going vessel is not considered to present a threat and a second state in which the vehicle, aircraft or sea-going vessel is considered to present a threat. The method further provides entering the first and second PIN codes into a smart card for generating a One Time Indicia (OTI) for each of the PIN codes and disclosing the state associated with each of the first and second OTI codes to at least one control center. Upon the control center receiving an OTI code, the control center obtains positive identification of the driver/pilot/captain and the degree of the threat that the vehicle, aircraft or sea-going vessel presents. [A634]

"Multilateration system and method"

A multilateration system and method includes a plurality of receiver stations for receiving signals from an aircraft, and a controller that derives the position of the aircraft by applying a multilateration process to outputs from the receiver stations. for this purpose, the controller determines the altitude of the aircraft and selects a multilateration process that is to be used for position determination, based on the determined altitude. [A635]

"Kinematic algorithm for rocket motor apperception"

A method, Kinematic Algorithm for Rocket Motor Apperception (KARMA) , for processing radar returns for identifying the type of a missile target includes generating tracks representing the missile, and applying the tracks to a set of plural template-based filters, each representing one missile hypothesis, to generate plural sets of missile states, one set for each hypothesis. The missile states are processed to generate kinematic parameter likelihood values (LLHs) . The LLH values for each filter hypothesis are normalized and weighted. A weighted maximum likelihood value (WMLH) is calculated for each hypothesis. The correct hypothesis is deemed to be the one having the maximum WMLH, thus identifying the missile type. [A636]

"Step frequency ISAR"

A step frequency inverse synthetic aperture radar (ISAR) includes a transmitter configured to transmit a transmission pulse at a transmission frequency to a near earth object (NEO) , the transmission frequency having a frequency range comprising a starting frequency, an ending frequency, and a step size, a receiver configured to receive a pulse response from the NEO, the pulse response corresponding to the transmission pulse, and a computer configured to determine a 3-dimensional image of the interior of the NEO from the pulse response. [A637]

"Systems and methods for terrain and obstacle detection by weather radar"

A method is provided for controlling an aircraft-mounted radar system configured to project radar beams and to receive radar returns relating to the projected radar beams. The method includes providing at least one output to the radar system that causes the radar system to sweep the radar beam horizontally to create a horizontal sweep set. The method further includes providing at least one output to the radar system that causes the radar system to conduct two vertical sweeps during the horizontal sweep set, the two vertical sweeps offset from a center horizontal location by at least one beam width, and wherein each of the two vertical sweeps are on opposite sides of the center horizontal location. [A638]

"Synthetic aperture radar process"

A continually adapted pulse-to-pulse shift, performed in the azimuth direction, of the phase center which is electrically active on the side of the transmitting antenna (Tx, Tx.sub.1, Tx.sub.2, Tx.sub.3) , in connection with the SAR antenna control of a multi-aperture SAR system is designed such that, in the case of an existing pulse repetition frequency (PRF) due to the likewise shifted position of the effective phase center of the entire antenna (Tx, Tx.sub.1, Tx.sub.2, Tx.sub.3, Rx, Rx.sub.1, Rx.sub.2, Rx.sub.3) , a compensation or complete correction of non-equidistant scanning in the azimuth direction is achieved. The principle of the pulse-to-pulse shift of the position of the effective phase center of the antenna for achieving the best possible equidistant scanning can be expanded to the side of the receiving antenna (Rx, Rx.sub.1, Rx.sub.2, Rx.sub.3) and to multi-aperture antennas. The technological solution proposed by the invention can be advantageously combined with a subsequent digital beam formation on the receiving antenna side. [A639]

"System and method for bistatic change detection for perimeter monitoring"

A method for monitoring an area that involves transmitting a first electromagnetic wave signal from a mobile platform moving over a ground surface, toward the ground surface. A receiver is used that is located remote from the mobile platform to receive the first electromagnetic wave signal after the signal is reflected from the ground surface. The first electromagnetic wave signal is processed to form a first synthetic aperture radar (SAR) image. Subsequently the receiver is used to receive a second electromagnetic wave signal transmitted from the mobile platform at a time subsequent to transmission of the first electromagnetic wave signal. The second electromagnetic wave signal is then processed to obtain a second SAR image. The first and second SAR images are then coherently analyzed to determine areas of non-correlation between the images. [A640]

"Template updated boost algorithm"

A method and a system for sensing a boosting target missile, estimate position and velocity and boost acceleration parameters of the target missile, and control an interceptor missile to the target missile. A boost-phase missile target state estimator estimates at least acceleration, velocity, and position using an acceleration template for the target vehicle. The nominal template is incorporated into an extended Kalman filter which corrects the nominal template acceleration with the filter states to predict future thrust acceleration, velocity and position. The correction can compensate for motor burn variations and missile energy management (lofted/depressed trajectory) . [A641]

"System and method for target signature calculation and recognition"

The present invention is directed to a system and method for the identification of a target object in PCL radar applications. The disclosed embodiments describe the systems and methods used in the identification of a target object from the collection of data representing specific target object features, such as velocity, altitude, fuselage length, wing length, or wing sweepback angle, and the comparison of selected target object features with a database of known aircraft features. The present invention also provides for the calculation of feature dimensions, such as the fuselage length, wing length, or wing sweepback angle from measurements associated with a peak signal lobe as a function of a bistatic aspect angle. [A642]

"Bi-static radar processing for ADS-B sensors"

A system and technique to derive a position of a non-ADSB equipped aircraft using ADS-B information provided from an ADSB equipped aircraft and bi-static radar processing techniques. [A643]

"System and method for reducing incidences of friendly fire"

The invention provides a system and method for reducing the instance of friendly fire by having the weapon aiming system include means for emitting an optical signal encoded with the identity of the targeting soldier. The encoded optical signal is received by an optical receiver on a targeted soldier where it is converted into a low power RF signal which is transmitted to a local repeater that retransmits it, optionally using at least one intermediate repeater, to a central monitoring station equipped with a computerized database. If the monitoring station determines that the doubly encoded signal includes the identities of two friendly troops, it transmits a "hold fire" signal back to the aiming system, and a suitable signal, such as a red LED indicative of a "hold fire" order is illuminated. [A644]

"Polarimetric synthetic aperture radar signature detector"

A method is provided for processing an acquired polarimetric synthetic aperture radar (SAR) image of a region to identify a candidate pixel that correlates to a target representation. The polarimetric SAR image is composed of a plurality of pixels, and the candidate pixel corresponds to a position in the region that contains a candidate object.

The process includes deconstructing J parameter components each sample, obtaining acquired values for the image from select parameter components, acquiring reference values that characterize said parameter components for the target representation, determining distance values each reference value and each acquired value, comparing the distance values against a classification criterion to determine whether the candidate pixel conforms to the target representative. The process may further include extracting N sub-apertures from the polarimetric SAR image, and combining the distance values for the sub-apertures together to obtain distance summations for comparison. The process may additionally include multiplying the distance summations with their corresponding weighting factors to obtain weighted results and combining these to produce a weighted log-likelihood function that identifies whether the pixel conforms to the target. Determining a difference may further include subtracting reference values from their respective acquired values to respectively obtain set of differences, assigning normalized defaults to the differences in response to the difference having a specified relation to parameter thresholds, and otherwise normalizing the difference, and determining natural logs of unity minus said each difference to obtain their distance values. [A645]

"Methods, apparatuses and systems for locating non-cooperative objects"

Measurements of the differential and/or absolute time-of-arrival of separable signals transmitted from a set of spatially-distributed (SD) transmitters are obtained by one or more receivers. The signals transmitted by each transmitter are made separable by encoding them in a manner that enables each signal to be distinguished from the others by the receiver or receivers. An accurate time-of-arrival of each signal at the receiver is determined, from which the path lengths from the transmitters to the receiver and from the receiver to the object are determined based on the known propagation speed of the signals. Any Doppler frequency shifts in each signal can also be determined from this information. From all of this information, the receiver is able to determine its own position, motion and orientation (roll, pitch and yaw) , as well as the position and motion of the moving object being tracked by the receiver. [A646]

"Systems and methods for obtaining aircraft state data from multiple data links"

Systems and methods are delineated that may provide for a system for use in a merging and spacing application for an aircraft. An exemplary system may comprise a TCAS and a processor for executing the merging and spacing application using ADS-B data and data received by the aircraft in response to an interrogation of another aircraft from the TCAS. In a disclosed embodiment, a lead aircraft responds to the TCAS interrogation from a following aircraft to provide EHS heading and/or speed of the lead aircraft to the following aircraft, which uses the received EHS data as well as ADS-B data to determine merging and spacing control parameters for the following aircraft. [A647]

"Ground penetrating synthetic aperture radar"

A method and system for examining subsurface targets utilizing an elevated or airborne platform. A broad spectrum of frequencies is transmitted from the platform and is directed at the various subsurface targets. A plurality of chirp signals would be utilized to transmit the entire frequency range. These signals are reflected from the various subsurface targets and are received by the platform. The received chirp signals are combined in a manner to allow the visualization of the subsurface target. [A648]

"Systems and methods for infering hail and lightning using an airborne weather radar volumetric buffer"

A weather radar system for improving output of potential lightning and hail weather conditions. An exemplary system includes a processor that receives and stores the weather radar reflectivity values into a three-dimensional buffer, receives an outside air temperature value, and determines freezing level based on the received outside air temperature value. The processor generates lightning icon (s) when a reflectivity value stored at cell (s) of the three-dimensional buffer above determined freezing level is greater than a first threshold amount. Also, the processor adds 1.6 km to the determined freezing level and generates hail icon (s) when a reflectivity value stored at cell (s) at the determined freezing level plus 1.6 km are greater than a second threshold amount. The display device displays the hail and lightning icons when an altitude value that corresponds to the cells associated with the generated lightning icons has been selected for display. [A649]

"Distance measuring equipment and distance measuring equipment monitor system"

A transponder (12) transmits a reply in response to an interrogation input thereto, the interrogation including twin pulses, and a monitoring processor (13) transmits to the transponder a pseudo interrogation identical in format to the interrogation, receives from the transponder a reply responding to the pseudo interrogation, and monitors a performance of the transponder, the monitoring processor (13) including a pulse spacing adjuster (131c) operable to adjust a pulse spacing of twin pulses along with generation of the pseudo interrogation, and a monitor (134b) operable to output an alarm in response to a failed reception or a delayed reception of a reply from the transponder after transmission of a pseudo interrogation with a compliant pulse spacing, and further to output an alarm in response to a reception of a reply from the transponder after transmission of a pseudo interrogation with an uncompliant pulse spacing. [A650]

"Mode 5 detection process using phase and amplitude correlation"

A receiver in a mode 5 air traffic control system provides amplitude and phase signal outputs a digital data stream containing preamble and flight information from data transmitted from an aircraft. A signal splitter divides the amplitude and phase signal outputs between an odd channel and an even channel that carry odd-numbered pulses and even-numbered pulses, respectively. An odd channel data decoder connected to the signal splitter extracts signals encoded in the odd channel and forms an odd data stream and an even channel data decoder connected to the signal splitter extracts signals encoded in the even channel and forming an even data stream. A preamble correlator correlates the odd and even data streams with a predefined preamble mask to detect potential valid preambles, and preamble decision logic processes signals output from the preamble correlator to identify which of the preambles actually are actually valid. [A651]

"Self-configuring ADS-B system"

Techniques are described that allow information to be acquired by an ADS-B system of an aircraft without the installation of ADS-B dedicated flight crew controls or wired data interfaces in the aircraft. In one or more implementations, a receiver is associated with the ADS-B system in the aircraft. The receiver is configured to receive transmissions from a transponder of the aircraft, such as a radar transponder of a Traffic Collision Avoidance System (TCAS) , or the like. Information used by the ADS-B system is extracted from the received transmissions and furnished to the ADS-B transceiver for broadcast over the ADS-B datalink. [A652]

"Secondary surveillance radar"

A transmitter 122 transmits interrogations to aircraft airborne in a coverage, a receiver 123 receives signals transmitted from aircraft airborne in the coverage, reply analyzers 132b and 133b analyze a reply responding to an interrogation transmitted from the transmitter, as the reply is detected from signals received by the receiver, and a squitter analyzer 132d analyzes an extended squitter, as the extended squitter is detected from the signals received by the receiver. [A653]

"Method of strip-map synthetic aperture radar auto-focus processing"

A strip-map Synthetic Aperture Radar (SAR) auto-focus image generation process is provided. Batches of raw radar return data are processed in order to form batch images which each have a valid region between invalid regions. The process determines an estimate of the first derivative of a phase error at an end of the valid region, determines a time-shift corresponding to that estimate and uses that information in determining a starting point for the next batch of raw radar return data. [A654]

"Time-compressed clutter covariance signal processor"

The time compression processor coding methodology gives rise to an exceedingly fast clutter covariance processor compressor (CCPC) . The CCPC includes a look up memory containing a very small number of predicted clutter covariances (PCCs) that are suitably designed off-line (e.g., in advance) using a discrete number of clutter to noise ratios (CNRs) and shifted antenna patterns (SAPs) , where the SAPs are mathematical computational artifices not physically implemented. The on-line selection of the best PCC is achieved by investigating for each case, e.g., each range bin, the actual CNR, as well as the clutter cell centroid (CCC) , which conveys information about the best SAP to select. The advanced CCPC is a `lossy` processor coder that inherently arises from a novel practical and theoretical foundation for signal processing, namely, processor coding, that is the time compression signal processing dual of space compression source coding. [A655]

"Weather radar system and method using data from a lightning sensor"

A weather radar system or method can be utilized to determine a location of a weather hazard for an aircraft. The weather radar system can utilize processing electronics coupled to an antenna. The processing electronics can determine presence of the hazard in response to data related to returns received by the weather radar antenna and data from a lightning sensor. The system can include a display for showing the hazard and its location. [A656]

"Through air radar sensor"

There is disclosed a process instrument comprising a housing and an antenna secured to the housing. A process adaptor is associated with the antenna and housing for securing the instrument to a process vessel to define a process seal. A control in the housing generates or receives a high frequency signal. The control comprises an electromagnetic radiating element. A body supports the radiating element in the housing proximate the antenna for rotation at any angular orientation without affecting the process seal. [A657]

"Target ranging using information from two objects"

In an embodiment, an apparatus includes a detector, direction finder, receiver, and range finder. The detector is operable to detect a target, and the direction finder is operable to determine a first direction to the target from the apparatus. The receiver is operable to receive a second direction to the target from a remote object, and the range finder is operable to determine from the first and second directions a range of the target from the apparatus. for example, the apparatus may be a first fighter jet, and the remote object may be a second fighter jet. By using directional information from both the first and second jets, a computer system onboard the first jet may compute a range to the target from the first jet more quickly and more accurately than by using directional information from only the first jet. [A658]

"System and method for aircraft altitude measurement using radar and known runway position"

A method of and system for determining the altitude of an aircraft can use a relative altitude estimate using information from an onboard radar. The altitude can be referenced to a runway for landing operations. The radar can produce relative altitude information from the range to the landing point and a precision estimation of the vertical angle to the landing point. The vertical angle estimate can be made with a phase processing antenna/radar system. [A659]

"Pulse detecting equipment"

A pulse detecting equipment includes a log compression processor (105) for logarithm-converting signal levels of a reception signal received at an antenna and input therefrom, with maintained frequency components of the reception signal as input, an AD converter (106) for converting the reception signal as logarithm-converted in signal level, from an analog form into a digital form, a first detector (110) for limiting the reception signal as converted into the digital form to a band of a prescribed first frequency, to obtain a signal, to detect signal levels thereof, a second detector (111) for limiting the reception signal as converted into the digital form to a band of a prescribed second frequency smaller than the first frequency, to obtain a signal, to detect signal levels thereof, and a pulse detector (113) for use of a result of comparison between signal levels detected at the first detector and signal levels detected at the second detector, to detect pulses of a prescribed frequency as a signal transmitted to own equipment. [A660]

"Pulse pattern for weather phenomenon and incursion detection system and method"

An aircraft radar system includes a radar antenna and a processing device. The processing device receives returns from the radar antenna associated with the scan. The processing device uses the returns from the scan for use in both incursion detection and weather phenomenon detection. A method for using the returns from the scan for both incursion detection and weather phenomenon detection is also disclosed. [A661]

"Passive detection apparatus"

A passive detection device is disclosed comprising a plurality of antennas, receivers, and a digital beamformer, wherein the antennas and receivers are adapted to receive radiation of millimeter wavelengths from a near field region, to process and digitize it. The beamformer is adapted to process the received information and to generate static image information relating to the region. An indication means is provided to indicate the presence of objects of interest. The beamformer is preferentially adapted to generate information simultaneously in a plurality of planes at different distances from the apparatus. The indication means may comprise an array of pixels along the length of the apparatus to display image information, and may use the multi-planar information to construct images of the region comprising data from a plurality of planes. The invention has utility in security scanning applications such as at airports or other locations where security detection equipment is employed. [A662]

"Method and system for automatic classification of objects"

A new method has been developed as an attempt to improve speed and robustness of existing ISAR classification methods. The new method produces a set of silhouettes of possible models in a 3D model database. The set of silhouettes of each model views the model from various viewing angles, as the target dimensions will vary as it is viewed from different angles. The silhouettes are stored as a training set. Classification is done by comparing the silhouette of the target with the set of silhouettes in the training set. The silhouettes are calculated prior to the silhouette matching. [A663]

"Active improvised explosive device (IED) electronic signature detection"

The present invention provides an apparatus and method of detecting, locating, and suppressing electronic devices, specifically IEDs. This RF emission measurement device in some embodiments can also be considered a system for RF emission measurement, location, and suppression. In some embodiments the apparatus comprises a high sensitivity receiver for receiving and analyzing electronic emissions. In other embodiments the apparatus comprises a high sensitivity receiver and an electromagnetic source for illuminating, and/or suppressing an electromagnetic device. The electromagnetic source could be any electromagnetic emitter known in the art, for example a magnetron or an adjustable wideband electromagnetic emitter. [A664]

"Altimetry method and system"

An altimetry method comprising: providing a signal receiver (RX) on a first platform (S1) flying above a portion of the Earth surface (ES) , for receiving a temporal series of signals emitted by a second flying platform (S2) and scattered by said portion of the Earth surface, and computing altimetry waveforms, indicative of an elevation profile of said portion of the Earth surface, by processing the received signals, characterized in that said step of computing altimetry waveforms comprises: cross-correlating the received signals with a plurality of locally-generated frequency-shifted replicas of the emitted signals, introducing a frequency-dependent temporal shift to the correlation waveforms in order to compensate for range delay curvature, and incoherently summing the temporally shifted correlation waveforms (CXC) corresponding to signals scattered by a same region of the Earth surface at different times during motion of said first platform. [A665]

"Radar device for maritime surveillance"

The present invention relates to a radar device for maritime surveillance, intended to be installed on a vehicle moving at very high altitude, generally on a satellite. The invention consists more precisely in a partial synthetic aperture radar with a low repetition frequency, making it possible to provide quality maritime surveillance and guaranteeing good performance in terms of target detection probability and ability to process vast maritime expanses. [A666]

"Methods and devices of an aircraft crosswind component indicating system"

A system for providing crosswind component information to a pilot of an aircraft is disclosed. The system is comprised of a navigation system, datalink system, devices for manual input of data, a crosswind component module consisting of, in part, a processor and database, and an indicating system consisting of, in part, a tactical display unit system of an aircraft. A navigation system may provide flight parameters for measured and intended flight data as inputs. Other data may also be provided from manual input devices and a datalink system as inputs. The processor of the crosswind component module receives the data, retrieves runway direction data, and determines the data of the crosswind components. An indicating system receives the data of the crosswind components and displays this information. [A667]

"Systems and methods for preparing ground-based weather radar information for use in an installation vehicle"

Systems and methods prepare ground-based supplemental weather radar information for integration with onboard weather radar information. An exemplary embodiment receives ground-based weather radar information from a ground-based weather radar station, the ground-based weather radar information referenced in a first coordinate system, generates supplemental weather radar information from the received ground-based weather radar information, wherein the supplemental weather radar information is referenced to a second coordinate system based upon at least latitude and longitude, and communicates the supplemental weather radar information, wherein the communicated supplemental weather radar information is integrated with weather radar information of an onboard weather radar system of an installation vehicle. [A668]

"Determination of the three-dimensional location of a target viewed by a camera"

A method for determining, in three dimensions, the location of a moving ground object observed in a region by a video camera. A terrain map supplies altitude for the latitude and longitude of each terrain point. The terrain information is combined with camera location, field of view, and orientation to produce a computed terrain map relative to the camera. A video analytics step processes the video and locates moving target (s) in two Cartesian coordinates. The coordinates are processed with the camera information to produce target location in terms of azimuth and elevation angle. The computed map information is combined with the angular target location to produce latitude, longitude, and altitude of the target. The target location information is used for further investigation or to attack the target. Also, a method for determining the third dimension of a 2-D radar track to cue a camera or fuse with camera data. [A669]

"Method for processing TOPS (terrain observation by progressive scan) -SAR (synthetic aperture radar) -raw data"

Sub-aperture processing is carried out. Within each sub-aperture, range compression and a correction for the target range variation are carried out. Baseband azimuth scaling is used for processing the azimuth signal, wherein a long azimuth reference function and thus a wide azimuth dimension are prevented. The scaling range is not constant and depends on the range, which is not equal to the original range vector. It is calculated such that, in combination with a subsequent derotation step, constant azimuth scanning is achieved for all ranges. The selected derotation function, which is applied in the azimuth time domain, makes it possible for all the targets to be in base band, in this way varying the effective chirp rate. Since the phase is purely quadratic because of the azimuth scaling step, it is thus possible to use an optimal filter which takes account of the effective chirp rate. IFFT results in a focused image, and a final phase function in the time domain allows phase maintenance. Application for SAR, SONAR and seismic raw data processing in the TOPS mode, as well as other modes which make use of the antenna polar diagram being scanned in the azimuth and/or elevation direction. [A670]

"High accuracy radar altimeter using automatic calibration"

A method of compensating for component errors within a radar altimeter is described. The method includes periodically switching transmit pulses from a transmit antenna to a programmable delay device, calculating an altitude based on a transmit pulse received from the programmable delay device, comparing the calculated altitude to an expected altitude, the expected altitude based on a pre-set delay through the programmable delay device, and compensating an altitude measured by the radar altimeter, based on transmit pulses output through the transmit antenna, by an error correction amount based on a difference between the calculated altitude and expected altitudes. [A671]

"Vehicular surveillance system using a synthetic aperture radar"

According to one embodiment, a system for gathering intelligence, surveillance, and reconnaissance information comprises a synthetic aperture radar that is housed within an enclosure coupled to a land vehicle. The synthetic aperture radar includes an antenna array that transmits and receives electro-magnetic radiation for generating images of objects around the land vehicle while the land vehicle is in motion. [A672]

"Method for selecting aircraft access point into a lateral free evolution area"

This method facilitates the joining, by an aircraft, of a secure zone, without constraint of deployment in the horizontal plane, in particular when the latter is threatened by a risk of collision with the ground or by a risk of penetration into a forbidden zone which cannot be resolved by a purely vertical avoidance maneuver. It consists in selecting a point for joining a zone of free lateral deployment by means of a criterion of minimum cost of the initial maneuver of turning at the start of the trajectory for joining the possible points of access to the zones of free lateral deployment. [A673]

"Systems and methods for enhanced ATC overlay modulation"

Embodiments of the present invention disclose systems and methods for providing an enhanced data link using overlaid modulation. Through embodiments of the present invention, existing ATC (or other) modulated signals using existing standard frequencies may be utilized to transmit (e.g., from an aircraft transponder) additional information in a manner that does not render the transmitted signal unrecognizable by legacy ATC equipment. Legacy equipment will be able to demodulate and decode information that was encoded in the transmitted signal in accordance with preexisting standard modulation formats, and updated equipment can also extract the additional information that was overlaid on transmitted signals. [A674]

"Range and azimuth resolution enhancement for real-beam radar"

Disclosed is a method, means for and computer program for enhancing range and azimuth resolution in a two-dimensional (2D) image generated by a frequency modulated continuous-wave (FMCW) radar for providing enhanced situational awareness in autonomous approach and landing guidance (AALG) system by forming and displaying a two-dimensional (2D) model of landing conditions from received range and azimuth real beam radar (RBR) signals by rendering one or more target locations and amplitudes in both range and azimuth, selecting a region of interest from the displayed 2D model to enhance the one or more target locations in the selected region of interest, selectively applying range and azimuth resolution enhancement using a first and second beamforming approach or applying azimuth only resolution enhancement by using just the second beamforming approach to obtain an one or more accurate target location estimations and combining the enhanced one or more target locations to render an enhanced 2D image. [A675]

"Airborne radar notably for a drone"

The present disclosure relates to an airborne radar notably for a drone. In at least one embodiment, the airborne radar has a first structure and a second structure. The first structure is mechanically attached to an aircraft carrying the radar. The first structure has a degree of rotational freedom relative to the aircraft on a first axis. The second structure is attached to the first structure. The second structure has a degree of rotational freedom relative to the first structure on a second axis converging with the first axis. An antenna is attached to the second structure and configured to receive and send electromagnetic waves. An electronic module configured to process the electromagnetic waves sent or received by the antenna is attached to the second structure. [A676]

"Methods for two-dimensional autofocus in high resolution radar systems"

Provided are two-dimensional autofocus methods in a synthetic aperture radar (SAR) system which include: (1) two-dimensional pulse pair product algorithm including shear PGA, eigenvector phase history ("EPH") , shear PGA/EPH) , (2) two-dimensional optimization algorithms including parametric one-dimensional estimate/two-dimensional correction, parametric two dimensional estimate/two-dimensional correction, unconstrained two-dimensional nonparametric and constrained two-dimensional nonparametric methods, (3) a two-dimensional geometry filter algorithm, (4) a two-dimensional prominent point processing algorithm, (5) a one-dimensional phase estimate of higher order two dimensional phase errors, and, (6) a fast SHARP parametric autofocus algorithm. [A677]

"Elevation null command generator for monopulse radar airborne missile guidance systems"

There is disclosed an elevation null command generator (ENCG) for use in airborne monopulse radar, and a novel missile guidance system made possible by use of the ENGC. The ENCG provides an accurate means of directing the elevation monopulse plane of a radar antenna at a patch of ground defined by a range signal generated within the radar or its associated equipment. It is shown that within the system range can define the elevation angle of concern. The ENCG includes a central range gate centered at the command range and a plurality of pairs of range gates, the two gates of each pair being time spaced before and after the central range gate, and has circuit means for normalizing the output of the range gates to eliminate the bias effects of strong targets adjacent to the monopulse null plane and ground surface intersection. [A678]

"Integrated system for aircraft vortex safety"

The invention relates to systems for preventing off-normal situations when there is a possibility that an aircraft penetrates into a dangerous area of the vortex shedding of a vortex generator. The inventive system consists of information sub-systems for recording and storing information on the expected relative position of the aircraft and trailing vortex areas in line with danger criteria which are specified by a user and concern dangerous aerodynamic forces and torques effecting the aircraft and induced by the trailing vortex of vortex generators, and for conveying said information to said user, who can be the aircraft crew and/or flight attendants, at a preventive distance from the aircraft and at a forecast moment. Said information can be visualised in a human-readable form and in a volume sufficient for forming a directive signal for carrying out a flight manoeuvre by the aircraft in order to move away from the dangerous trailing vortex area. [A679]

"Estimation and correction of error in synthetic aperture radar"

Methods, systems, and computer-readable media are disclosed for correcting synthetic aperture radar data to correct for gain errors in fast time. According to an embodiment, input data is received from a synthetic radar system representing returned data from an individual pulse. Data entropy optimization is performed to identify a gain correction configured to adjust the input data to minimize image intensity entropy to generate focused output data. The gain correction is applied to the input data to adjust data values in the input data to generate the focused output data. [A680]

"Method for determining the position, notably in terms of elevation, of a target flying at very low altitude"

The present invention relates to a method for determining the position notably the elevation of a target flying at very low altitude. An electromagnetic detection system extracts the measurement of the elevation on the basis of the amplitude of the interference signal produced by a signal emitted directly by the target and by a signal emitted by the target towards the ground then reflected by the ground towards the radar. Embodiments of the invention can notably be used within the framework of the guidance of drones in the final landing phase. [A681]

"Clock phase ranging methods and systems"

A system and method for estimating the range between two devices performs two or more ranging estimates with subsequent estimates performed using a clock that is offset in phase with respect to a prior estimate. The subsequent estimate allows estimate uncertainties due to a finite clock resolution to be reduced and can yield a range estimate with a higher degree of confidence. In one embodiment, these additional ranging estimates are performed at n/N (for n=1, . . . N-1, with N>,1 and a positive integer) clock-period offset introduced in the device. The clock-period offset can be implemented using a number of approaches, and the effect of clock drift in the devices due to relative clock-frequency offset can also be determined. To eliminate the bias due to clock-frequency offset, a system and method to estimate the clock-frequency offset is also presented. [A682]

"Scanning array for obstacle detection and collision avoidance"

This scanning array scans an area around the array for nearby objects, collision obstructions, and terrain topography. The scanning array can scan for sounds emitted by objects in the vicinity of the scanning array, passive energy receipt sources, or it can also send out an energy beam and scan for reflections from objects within the energy beam. The energy beam can be optical, laser, radar or other energy emitting sources. The scanning array of the invention can be used for helicopter detection and avoidance of collision risk and can be used for other scanning purposes. Scanning of an entire hemisphere or greater is accomplished by manipulating the scanner platform through the coordination of either linear actuators or gimbals so as to produce nutation without rotation. This motion allows transceivers to be directly coupled to transmitting and sensing modules without the losses associated with slip rings and other coupling devices. [A683]

"Systems and methods for assessing weather in proximity to an airborne aircraft"

Dynamic weather model systems and methods are operable to assess weather in proximity to an airborne aircraft. An exemplary embodiment receives a radar return from the weather, determines reflectivity information from the received radar return, retrieves a weather model from a weather model data base, compares the weather with the retrieved weather model and the determined reflectivity information, predicts a characteristic of the weather based upon the comparison of the weather and the weather model, and determines if the predicted characteristic is potentially hazardous to the airborne aircraft. The weather model is defined by at least one weather modeling algorithm, and is defined by at least one of a parameter and a variable parameter range residing in a weather characteristics database. [A684]

"Distributed and cable reduced TCAS"

A direction finding antenna system for determining the relative bearing of a second aircraft from a first aircraft in conjunction with Distance Measuring Equipment (DME) . The system includes a first antenna and a second antenna located on a top surface of the first aircraft, spaced apart along a first axis, as well as a third antenna and a fourth antenna located on a bottom surface of the first aircraft, spaced apart along a second axis orthogonal to the first axis. The system further includes a transmitting, receiving, and processing system coupled to the first, second, third, and fourth antennas, wherein the transmitting, receiving, and processing system is configured to transmit DME interrogations, receive DME replies, and process the DME replies to determine the relative bearing of the second aircraft from the first aircraft. [A685]

"Time-of-flight ranging systems using coarse and fine measurements"

A time-of-flight ranging system, such as a keyless access Control system, comprises a first part and a second part, e.g., a portable device such as a key fob. Both parts have a transceiver for effecting communication with each other. At least the first part includes a device, e.g., a processor, for determining the distance between the two parts based on time-off-light. To save power, when the two parts are a relatively great distance apart, a time-of-flight measuring device computes the time based on a relatively coarse algorithm, and when the parts are relatively close, the computation is carried-out using a more precise algorithm. The clock frequency may be reduced when the two parts are a relatively great distance apart, and increased when they are closer. Further the transmitter power may be reduced when the two parts are relatively close together and increased when they are a relatively great distance apart. [A686]

"Method and apparatus for creating and processing universal radar waveforms"

A new approach to radar imaging is described herein, in which radar pulses are transmitted with an uneven sampling scheme and subsequently processed with novel algorithms to produce images of equivalent resolution and quality as standard images produced using standard synthetic aperture radar (SAR) waveforms and processing techniques. The radar data collected with these waveforms can be used to create many other useful products such as moving target indication (MTI) and high resolution terrain information (HRTI) . The waveform and the correction algorithms described herein allow the algorithms of these other radar products to take advantage of the quality Doppler resolution. [A687]

"System and method for using a radar to estimate and compensate for atmospheric refraction"

An aircraft weather radar system includes an input for receiving data associated with weather radar returns received by an antenna. The aircraft weather radar system further includes processing electronics for performing a routine to analyze radar returns associated with terrain. The processing electronics are configured to determine atmospheric refraction characteristics based on a range and/or an angle to terrain. The routine is based on the determination of atmospheric refraction characteristics. [A688]

"Transponder-based beacon transmitter for see and avoid of unmanned aerial vehicles"

A transponder-based beacon transmitter system in an unmanned aerial vehicle is provided. The transponder-based beacon transmitter system comprises a global positioning system interface communicatively coupled to receive position information indicative of a current location of the unmanned aerial vehicle, a message formatter communicatively coupled to the global positioning system interface, and a transponder-based beacon transmitter. The message formatter formats vehicle identification of the unmanned aerial vehicle and the position information indicative of the current location of the unmanned aerial vehicle into an automatic dependent surveillance broadcast mode-select squitter message. The message formatter operates in one of a military mode, a National Airspace System mode, and a combined military/National Airspace System mode. The transponder-based beacon transmitter transmits the automatic dependent surveillance broadcast mode-select squitter messages from the unmanned aerial vehicle. Receivers in the vicinity of the unmanned aerial vehicle receive unsolicited vehicle identification and location of the unmanned aerial vehicle. [A689]

"Aircraft tracking using low cost tagging as a discriminator"

A simplified multilateration and ADS-B Surveillance System is used, to perform tagging for the FAA Low Cost Ground Surveillance program. This system may also be used as the foundation for a full multilateration system, if a customer wants to upgrade. The present invention uses just one active transmitter/receiver unit as opposed to multiple passive receivers. The present invention captures UF 5 and DF 5 data, thus providing Mode A identification, which then acts as the key to obtaining the call sign from a data fusion packages--thus making it an affordable and marketable product for small to medium-sized airports. [A690]

"Forward-looking radar system, module, and method for generating and/or presenting airport surface traffic information"

A present novel and non-trivial system, module, and method for generating and/or presenting airport surface traffic information presenting using a forward-looking aircraft radar system are disclosed. A runway awareness zone is established and traffic data is acquired by a forward-looking aircraft radar system. In one embodiment, a runway awareness zone is own-ship-based. In another embodiment, a runway awareness zone is based upon data received from a navigation reference data source. An advisory data set is generated using track alignment correction information and airport surface traffic located within the runway awareness zone. Navigation data is used to determine the location of airport surface traffic. Track alignment correction information may be calculated using traffic data or navigation data. Advisory data set is provided to one or more avionics systems including a presentation system and an external communication system. Advisory data set could include visual, aural, and/or tactile information. [A691]

"Systems and methods for air traffic surveillance"

A collision avoidance system according to one aspect of the present invention comprises a user interface, a plurality of sensors, and a computer system in communication with the user interface and the plurality of sensors. The computer system includes a processor and a memory storing instructions that, when executed by the processor, cause the processor to receive data pertaining to a target from one or more sensors of the plurality of sensors, determine a position of the target based on the data from the one or more sensors, and present (through the user interface) the position of the target using one or more visual indicators that identify the one or more sensors. [A692]

"Method and apparatus for the detection of objects using electromagnetic wave attenuation patterns"

A method for detecting an object, comprising the steps of defining expected characteristics of scattered electromagnetic radiation to be received at a receiver, attenuating at least a portion of electromagnetic radiation received at the receiver by a presence of an object within a path of electromagnetic information, and detecting the attenuation to indicate a presence of the object. The object may be a low radar profile object, such as a stealth aircraft. The electromagnetic radiation is preferably microwave, but may also be radio frequency or infrared. By using triangulation and other geometric techniques, distance and position of the object may be computed. [A693]

"Radiobased locating system provided with a synthetic aperture"

The invention relates to a method for increasing the accuracy of a measurement of a radio-based locating system comprising a mobile station and at least one fixed station, wherein the movement of a mobile station from an initial position is detected by way of measuring data of an absolute sensor system and a relative sensor system, a virtual antenna is embodied in the form of synthetic aperture by way of measuring data and the mobile station is focused on the fixed station and/or vice versa by using the synthetic aperture. [A694]

"Methods and apparatus for detection/classification of radar targets including birds and other hazards"

Methods and apparatus for processing data from a low beam channel, a high beam channel and a weather channel to perform an altitude estimation based upon a target amplitude ratio between the low beam channel and the high beam channel and target range, and for performing target detection based upon data from the weather channel. In one embodiment, migrating birds can be more accurately detected and classified than with conventional systems. [A695]

"Methods and apparatus for countering a projectile"

Methods and apparatus for countering a projectile according to various aspects of the present invention may operate in conjunction with a countermeasure system. The countermeasure system may comprise a beam source adapted to generate an electromagnetic beam. The countermeasure system may further include a beam control system adapted to aim the electromagnetic beam at the projectile according to a fire control solution. The beam heats at least a portion of the projectile to a disruption temperature to deflagrate the projectile. [A696]

"System and method for identifying incursion threat levels"

An aircraft weather radar system for displaying an indication of a threat level presented by an obstacle to the aircraft on an electronic display. The weather radar system includes a radar antenna configured to receive radar returns from a radar sweep. The weather radar system additionally includes processing electronics configured to determine a movement vector of the obstacle using the radar returns. The processing electronics are further configured to determine the threat level of the obstacle to the aircraft based on the determined movement vector, to generate parameters for an indication based on the determined threat level and to cause the indication to be displayed on an electronic display. [A697]

"RFI suppression in SAR"

A filter scheme for broadcast interference cancellation that is computationally efficient and numerically robust Airborne Low Frequency Synthetic Aperture Radar (SAR) operating in the VHF and UHF bands has been shown. At least interference Doppler filtering or interference cancellation is utilized. The interference cancellation involves prediction of the interference for each particular reception interval of mixed interference and radar ground response. This prediction is then coherently subtracted from the incoming signal. [A698]

"Application of time reversal to synthetic aperture imaging"

A method and apparatus for target focusing and ghost image removal in synthetic aperture radar (SAR) is disclosed. Conventional SAR is not designed for imaging targets in a rich scattering environment. In this case, ghost images due to secondary reflections appear in the SAR images. We demonstrate, how, from a rough estimate of the target location obtained from a conventional SAR image and using time reversal, time reversal techniques can be applied to SAR to focus on the target with improved resolution, and reduce or remove ghost images. [A699]

"Phased array radar antenna having reduced search time and method for use thereof"

A phased array radar antenna includes at least two antennas (11, 12, 13, 14) adapted for simultaneous operation at different non-mutually interfering frequencies. The phased array radar antenna may be fitted to an aircraft having a fuselage supporting first and second radar side antennas (11, 12) on opposite sides thereof, a nose portion supporting a first radar end antenna (13) , and a tail portion supporting a second radar end antenna (14) . Respective radomes cover the first and second radar end antennas so as to provide a smooth aerodynamic contour, and a radar control unit (15) is disposed within the fuselage and coupled to the first and second radar side antennas and to the first and second radar end antennas for operating the first or second radar side antenna simultaneously with the first or second radar end antenna at respective first and second different frequencies. [A700]

"System, method, and apparatus for remote measurement of terrestrial biomass"

A system, method, and/or apparatus for remote measurement of terrestrial biomass contained in vegetative elements, such as large tree boles or trunks present in an area of interest, are provided. The method includes providing an airborne VHF radar system in combination with a LiDAR system, overflying the area of interest while directing energy toward the area of interest, using the VHF radar system to collect backscatter data from the trees as a function of incidence angle and frequency, and determining a magnitude of the biomass from the backscatter data and data from the laser radar system for each radar resolution cell. A biomass map is generated showing the magnitude of the biomass of the vegetative elements as a function of location on the map by using each resolution cell as a unique location thereon. In certain preferred embodiments, a single frequency is used with a linear array antenna. [A701]

"System and method for on-board adaptive characterization of aircraft turbulence susceptibility as a function of radar observables"

A turbulence data circuit for use in an aircraft. The aircraft can include a radar system configured to transmit a first radio frequency wave and receive a second radio frequency wave and a display for receiving a display signal representative of turbulence. The aircraft can further include a flight management system configured to determine a phase of flight, an aircraft inertial/air data system configured to determine an altitude and an airspeed. The turbulence data circuit can include an interface for coupling to the radar system, the display, the flight management system, and the aircraft inertial/air data system. The turbulence data circuit can be configured to determine the display signal representative of turbulence based on at least one of the phase of flight, the altitude, the airspeed and the second radio frequency wave. [A702]

"Doppler beam-sharpened radar altimeter"

Systems and methods for Doppler beam sharpening in a radar altimeter are provided. In one embodiment, a method comprises receiving a return signal at a radar altimeter receiver and applying a first gate to the return signal to select at least a first component of the return signal. Spectral analysis is performed on the first component of the return signal to generate a plurality of frequency bins, wherein each frequency bin is centered around a different frequency across a Doppler shift frequency spectrum for the first component of the return signal. The method further comprises tracking the first component of the return signal, selecting a first frequency bin of the plurality of frequency bins based on the Doppler shift frequency of the first component of the return signal, and outputting a portion of the first component of the return signal falling within the first frequency bin for further processing. [A703]

"Compact active phased array antenna for radars"

A radar system, including: a compact, active phased array antenna for transmission and reception of a focused radiation beam, circuits for providing signals to produce or detect a radiation beam by the phased array antenna and to control or detect the direction of the radiation beam, and wherein the radar is adapted to be mounted on a missile and scan a selected area proceeding the direction of motion of the missile. [A704]

"Land use compatibility planning software"

A land use compatibility software module uses an existing suite of airport management programs to generate exception reports for FAA Part 77 land use compatibly surveys. Land use compatibility management is a manually intensive and time-consuming process. The noise officer may have to compute whether a proposed structure violates FAA's obstruction clearance criteria as set out in FAA's standard for obstacle clearance zones (Part 77) . With these three-dimensional zone shapes entered into AirScene.TM., the user may enter lat/long and height data for potential obstructions, such as cellular telephone towers as mentioned in the above example. The system will plot the potential obstructions on the map and will determine whether or not the height and proposed position of the tower violates the FAA's obstruction criteria for that runway. The system may be used to generate "exception reports" for proposed structures. [A705]

"Aircraft guidance system"

A guidance system includes a device to generate an alphanumeric identification characteristic, enabling identification of a data item which is used for a selected guidance mode of an aircraft. The system also includes a display unit which automatically shows the alphanumeric identification characteristic on a display screen. [A706]

"Method and device for simulating radio navigation instruments"

The device (405) for behavior simulation of a radio navigation system, without the latter being installed on an aircraft, comprising a means (410) for determining a position of the aircraft, characterized in that it further comprises: a means (415) for automatically determining at least one radio navigation beacon of a station on the ground depending on said position of the aircraft, and for selecting a radio navigation beacon of an automatically determined station on the ground, a means (420) for calculating at least one physical quantity value linked to the relative position of the aircraft relative to the selected beacon and a means (425) for presenting, on a display means of the aircraft cockpit, each calculated physical quantity value and the identifier of the selected beacon. [A707]

"Interferometric signal processing"

Systems and methods of error handling in interferometric signal processing for a ground based slope monitoring system are described. Uncorrected movement data is extracted from interferometric radar measurements of a relatively stable reference. The movement data is corrected for changes in atmospheric conditions as a function of changes in a refractive index of the air and an offset induced at zero range. [A708]

"System and method for processing imagery from synthetic aperture systems"

A method of processing a temporal sequence of base images from a synthetic aperture system such as a synthetic aperture radar is provided that simplifies the task of identifying moving objects. The method comprises the steps of firstly temporally filtering a plurality of the base images to form a reference image, and secondly normalising the reference image with a base image to form a change detection image. The change detection image has the property that all moving objects are emphasised. Further processing can optionally be performed on the change detection image to remove false targets based on characteristics of the highlighted areas or on a temporal track taken over a plurality of change detection images. The invention allows detection of moving objects without requiring a Doppler return from a target. The invention extends to a system adapted to implement the method, and a computer program. [A709]

"Dynamic replanning algorithm for aircrew display aid to assess jam effectiveness"

The invention generally relates to the field of computer software particularly to an improved method of providing aircrew decision aids for use in determining the optimum placement of an Electronic Attack (EA) aircraft. The core of the invention is a software program that will dynamically provide the EA flight crew situational awareness regarding a threat emitter's coverage relative to the position of the EA aircraft and to the position of any number of protected entities (PE) . The software program generates information to provide visual cues representing a Jam Acceptability Region (JAR) contour, a Jam Assessment Strobe (JAS) and text for display on a number of flexibly configurable display formats posted on display units. The JAR and JAS graphics and text will aid the EA aircrew in rapidly assessing the effectiveness of a given jamming approach. It is emphasized that this abstract is provided to comply with the rules requiring an abstract that will allow a searcher or other reader to quickly ascertain the subject matter of the technical disclosure. It is submitted with the understanding that it will not be used to interpret or limit the scope of the claims. [A710]

"Pulsed radar level detection system using pulse dithering to eliminate inaccuracies caused by tank rattle"

A through air level measurement instrument for use in minimizing tank rattle comprises a housing and an antenna secured to the housing. A process adaptor is associated with the antenna and the housing for securing the instrument to a closed tank with the antenna directed into an interior of the closed tank. A control in the housing generates and receives a high frequency signal using an electromagnetic radiating element proximate the antenna. The control comprises an equivalent time sampling circuit including a main oscillator driving a timing circuit controlling timing between transmitted and sample pulses. A noise generator is operatively associated with the main oscillator to randomly modulate timing of the main oscillator. The control minimizes inaccuracies caused by tank rattle. [A711]

"Radial gap measurement on turbines"

Radial gap measurement on turbines by a microwave measuring method and an evaluation of a Doppler effect which varies according to the size of the radial gap is described. At least one radar sensor embodied as a transmission and reception unit is provided in the wall of a turbine housing which is radially oriented towards the centre of the turbine. The relative speed of an outer end of a turbine blade, dependent on the size of the radial gap, is evaluated many times in relation to the radar sensor during the passage of the blade end past the same, and the course of the relative speed over time on the zero crossing constitutes a measure for the radial gap on the basis of the relation between the absolute value of the relative speed and the incline thereof in the zero crossing. [A712]

"System and method for tracking and identifying aircraft and ground equipment"

In accordance with one or more embodiments of the present disclosure, systems and methods disclosed herein provide for tracking of objects, aircraft, vehicles, and ground equipment in a tracking area, such as an airspace and/or an airport terminal area. One embodiment of a tracking system of the present disclosure comprises a signal monitoring component adapted to communicate with an object, such as an aircraft, when the object enters the tracking area. The signal monitoring component is adapted to transmit a monopulse beacon query signal to the object and receive a monopulse beacon response signal from the object. The tracking system further comprises an interface component adapted to process the received monopulse beacon response signal from the object, initialize a beacon transponder on the object, and assign a network address to the object. [A713]

"Mmw contraband screening system"

An inspection system that can detect contraband items concealed on, in or beneath an individual's clothing. The system employs millimeter wave radiation to detect contraband items. The system is described in connection with a check point security system that includes temperature controlled walls to enhance imaging of contraband items. Also, a millimeter wave camera is used in conjunction with a visible light camera that forms images. To address privacy concerns of displaying images of people made with millimeter wave cameras that effectively "see through" clothes, the millimeter wave images are not displayed directly. Rather, computer processing produces indications of suspicious items from the underlying raw millimeter wave images. The indications of suspicious items are overlaid on the image formed by the visible light camera. [A714]

"Radar system and a method relating thereto"

A radar system comprising a platform movable along a path in relation to a ground surface portion and carrying a positioning device, a timing device and a radar equipment. It is adapted to implement synthetic aperture radar (SAR) for imaging the ground portion. It includes recording means for collecting radar raw data comprising radar echo amplitudes annotated with distance and the moment of time of collection and being intertwined with platform position measurement data annotated with the respective moment of time of collection thereof. [A715]

"Automatic dependent surveillance system secure ADS-S"

An air traffic control automatic dependent, WAAS/GPS based, surveillance system (ADS) , for operation in the TRACON airspace. The system provides encryption protection against unauthorized reading of ADS messages and unauthorized position tracking of aircraft using multilateration techniques. Each aircraft has its own encryption and long PN codes per TRACON and transmit power is controlled to protect against unauthorized ranging on the ADS-S aircraft transmission. The encryption and PN codes can be changed dynamically. Several options which account for available bandwidth, burst data rates, frequency spectrum allocations, relative cost to implement, complexity of operation, degree of protection against unauthorized users, system capacity, bits per aircraft reply message and mutual interference avoidance techniques between ADS-S, ADS-B Enroute and Mode S/ATCRBS TRACON are disclosed. ADS messages are only transmitted as replies to ATC ground terminal interrogations (no squittering) . Derivative surveillance backup systems provide an anti-spoofing capability. [A716]

"Aircraft collision sense and avoidance system and method"

A collision sense and avoidance system and method and an aircraft, such as an Unmanned Air Vehicle (UAV) and/or Remotely Piloted Vehicle (RPV) , including the collision sense and avoidance system. The collision sense and avoidance system includes an image interrogator identifies potential collision threats to the aircraft and provides maneuvers to avoid any identified threat. Motion sensors (e.g., imaging and/or infrared sensors) provide image frames of the surroundings to a clutter suppression and target detection unit that detects local targets moving in the frames. A Line of Sight (LOS) , multi-target tracking unit, tracks detected local targets and maintains a track history in LOS coordinates for each detected local target. A threat assessment unit determines whether any tracked local target poses a collision threat. An avoidance maneuver unit provides flight control and guidance with a maneuver to avoid any identified said collision threat. [A717]

"Method and apparatus for compressing SAR signals"

A method compresses synthetic aperture radar (SAR) data by sampling the SAR data into blocks and transforming each block to a corresponding block of transform coefficients. Each block of transform coefficient is quantized according to a quantization parameter to obtain a corresponding block of quantized transform coefficients, which are demultiplexed into sets of blocks of quantized transform coefficients. The quantized transform coefficients in the blocks in each set are arithmetically encoding in parallel according to a probability model to produce an intermediate bitstream for each set of blocks. The encoding of the quantized transform coefficients of one block is independent of the quantized transform coefficients of a successive block. The intermediate of bitstreams are then multiplexed to a compressed bitstream, which can be transmitted, or stored, for subsequent decoding to construct an SAR image. [A718]

"Antenna back-lobe rejection"

A method of for processing signals in a radar system is shown comprising an antenna system having at least two antenna elements, a beam forming arrangement (ABF_RX, ABF_TX) for selectively steering the directivity of the antenna system in a given selected direction, the directivity of the antenna system having a main lobe in the selected direction and a back lobe (BL) in another direction and of a lower magnitude than the main lobe. By utilizing various scale and subtract processing both noise levels and ghost signals can be considerably reduced. A SAR radar apparatus has moreover been shown. [A719]

"Method and apparatus for making airborne radar horizon measurements to measure atmospheric refractivity profiles"

A method for determining a refractivity profile of an atmosphere of the Earth. The method may involve: generating radar signals from a radar device located above the Earth's surface toward the Earth's surface, measuring a time of flight and a reflected intensity of reflected radar signals received back at the radar device, using the measured time of flight and the reflected intensity of the reflected radar signals received by the radar device to determine a distance to a radar horizon where the radar signals are tangent to the Earth's surface, and using the distance to the radar horizon to determine a refractivity profile of the atmosphere through which the radar signals and the reflected radar signals have travelled. [A720]

"Ground vehicle collision prevention systems and methods"

The present invention comprises systems and methods for preventing collisions between aircraft and ground vehicles. In one embodiment, a system includes a proximity detection unit and a transducer proximate to a selected structural portion of an aircraft, the proximity detection unit being operable to emit ranging signals through the transducer and to receive reflected signals through the transducer to determine the position of an object within a ranging area adjacent to the structural portion. The system further includes an alarm device coupled to the proximity detection unit that is responsive to a signal generated by the proximity detection unit. In another embodiment, a method includes determining a distance between the ground service vehicle and a selected structural portion of the aircraft when the vehicle is positioned in a ranging area about the aircraft. The method further includes generating a proximity alarm based upon the distance. [A721]

"Surveillance and warning system"

A system and method for providing entry-point, boundary-line, and presence intrusion detection by means of an intelligent controller process capable of driving both field alert/alarm systems and security station monitoring devices and for providing occupancy warnings and critical status alerts, one embodiment providing runway occupancy warnings and critical runway status alerts to both flight crew approaching an airfield and air traffic controllers managing ground traffic, the system including: a detection system, airfield output devices (including all FAROS, GAROS and CTAF Runway Occupancy Radio Signals (RORS)) , an airfield communications network, a centralized data processing unit that contains all of the algorithms to drive light control, logging, and an optional administrative network layer that hosts a graphical user interface. [A722]

"Systems and methods for multi-sensor collision avoidance"

An embodiment of the present invention provides a collision avoidance system for a host aircraft comprising a plurality of sensors for providing data about other aircraft that may be employed to determine one or more parameters to calculate future positions of the other aircraft, a processor to determine whether any combinations of the calculated future positions of the other aircraft are correlated or uncorrelated, and a collision avoidance module that uses the correlated or uncorrelated calculated future positions to provide a signal instructing the performance of a collision avoidance maneuver when a collision threat exists between the host aircraft and at least one of the other aircraft. [A723]

"System and method for a terrain database and/or position validation"

An aircraft weather radar system can be used with a terrain avoidance system. The aircraft weather radar system is coupled to an antenna. A processor receives radar returns received by the antenna. The processor determines terrain elevation estimates for use with the terrain avoidance system from the radar returns. The terrain elevation estimates are compared to stored terrain elevation data used with the terrain avoidance system to verify position or to check the integrity of the stored elevation data. The processor can be part of a terrain avoidance system, a weather radar system, a navigation system, or can be a standalone system. [A724]

"Method and device for detecting an environning aircraft"

A radar unit on board an aircraft scans a scan area of surrounding space relative to a runway to detect any nearby aircraft and a unit presents to a pilot an indication of such detection of the presence of at least one nearby aircraft. The technique involves determining: a heading of the aircraft, positions of thresholds of the runway, an orientation of the runway, a maximum relative bearing, a minimum relative bearing, a maximum elevation, a minimum elevation, a slant range for scanning the scan area from the heading, thresholds and orientation, predetermined vertical and horizontal angles of an approach center line of the runway, a predetermined length of edges of the scan area, and the scan commands enabling the radar to scan said scan area using the maximum relative bearing, the minimum relative bearing, the maximum elevation, the minimum elevation and the slant range. The radar unit is an air-air mode radar configured to detect a nearby aircraft that is in flight, and the scan area has at least one vertical area of space which is situated to one side of the runway and defined relative to a center line of the runway. [A725]

"Program to generate an aircrew display aid to assess JAM effectiveness"

The invention generally relates to the field of computer software particularly to an improved method of providing aircrew decision aids for use in determining the optimum placement of an Electronic Attack (EA) aircraft. The core of the invention is a software program that will dynamically provide the EA flight crew situational awareness regarding a threat emitter's coverage relative to the position of the EA aircraft and to the position of any number of protected entities (PE) . The software program generates information to provide visual cues representing a Jam Acceptability Region (JAR) contour, a Jam Assessment Strobe (JAS) and text for display on a number of flexibly configurable display formats posted on display units. The JAR and JAS graphics and text will aid the EA aircrew in rapidly assessing the effectiveness of a given jamming approach. [A726]

"Half aperture antenna resolution system and method"

A system and method for sensing elevation terrain using an airborne weather radar. Method techniques include sampling first and second radar returns from a weather radar at two portions of an antenna. First radar returns are removed from second radar returns to generate third radar returns for a third portion of the antenna. The third portion of the antenna is included in the second portion but not the first portion. Changes in the third radar return are analyzed to sense elevation of the terrain. [A727]

"Methods for two-dimensional autofocus in high resolution radar systems"

Provided are two-dimensional autofocus methods in a synthetic aperture radar (SAR) system which include: (1) two-dimensional pulse pair product algorithm including shear PGA, eigenvector phase history ("EPH") , shear PGA/EPH) , (2) two-dimensional optimization algorithms including parametric one-dimensional estimate/two-dimensional correction, parametric two dimensional estimate/two-dimensional correction, unconstrained two-dimensional nonparametric and constrained two-dimensional nonparametric methods, (3) a two-dimensional geometry filter algorithm, (4) a two-dimensional prominent point processing algorithm, (5) a one-dimensional phase estimate of higher order two dimensional phase errors, and, (6) a fast SHARP parametric autofocus algorithm. [A728]

"Method and apparatus for monitoring the RF environment to prevent airborne radar false alarms that initiate evasive maneuvers, reactionary displays or actions"

Rather than costly modifications to existing radars, a small, low cost radar warning receiver is used to monitor the RF environment. This add-on receiver can provide situational awareness including RF signal levels and angle of arrival, and recommend or provide antenna scanning synchronization, blanking inputs or gated reactionary outputs to or for the airborne radar. Utilization of this information can be used to reduce false alarms and improve system performance. [A729]

"System for detecting obstacles in the vicinity of a touchdown point"

A method of detecting obstacles on board an aircraft while in the vicinity (44) of a touchdown point (27, 42) , includes the following operations: selecting/determining a path (41) to be followed by the aircraft overflying the touchdown point, the aircraft overflying the touchdown point following the overflight path, and during the overflight recording signals/data delivered by an on-board rangefinder observing a portion of space extending below the aircraft, analyzing the rangefinder data to detect the presence of obstacles and to determine their positions in a terrestrial frame of reference, where appropriate to determine their dimensions, and recording the detected obstacle position data, and dimensions, if any, in a memory. [A730]

"Radar cable detection system"

Ground clutter is effectively separated from true signals echoed by a cable in the flight path of an aircraft, by encoding a transmitted pulse wave in a radar system with at least one transmit (TX) coding sequence, so that received signals echoed by the cable on which the pulse is incident and associated ground clutter are orthogonal or separable from one another. The TX coding sequence is altered into two receive (RX) coding sequences one of which corresponds to the cable and the other to the ground clutter. The two RX coding sequences are then correlated with the received signals, thereby separating the true signals echoed by the cable from the associated ground clutter. [A731]

"Man-portable counter mortar radar system"

The present invention is a man-portable counter-mortar radar (MCMR) radar system that detects and tracks enemy mortar projectiles in flight and calculates their point of origin (launch point) to enable and direct countermeasures against the mortar and its personnel. In addition, MCMR may also perform air defense surveillance by detecting and tracking aircraft, helicopters, and ground vehicles. MCMR is a man-portable radar system that can be disassembled for transport, then quickly assembled in the field, and provides 360-degree coverage against an enemy mortar attack. MCMR comprises an antenna for radiating the radar pulses and for receiving the reflected target echoes, a transmitter that produces the radar pulses to be radiated from the antenna, a receiver-processor for performing measurements (range, azimuth and elevation) on the target echoes, associating multiple echoes to create target tracks, classifying the tracks as mortar projectiles, and calculating the probable location of the mortar weapon, and a control and display computer that permits the operation of the radar and the display and interpretation of the processed radar data. [A732]

"History or image based methods for altitude determination in a radar altimeter"

Methods and apparatus for determining an altitude with an altimeter is provided. One method includes transmitting a signal having a fixed modulation period towards a ground target and then detecting reflected signals off the ground target. The method then implements a single Fast Fourier Transform (FFT) on the detected signals for each modulation period that computes all possible altitudes in real time. A short history of the real time altitude calculations is collected and then the altitude based on the short history of the real time altitude calculations is determined. [A733]

"Method with a system for ascertaining and predicting a motion of a target object"

Method, tracking system, and intercept missile for tracking highly maneuverable target objects. The method includes estimating the motion of the at least one target object via a mathematical method that includes a filter method relating to a model assumption for estimating at least one of the motion and an orientation of the target object. The filter method includes a semi-martingale algorithm for estimating motion. [A734]

"Synthetic aperture radar, compact polarimetric SAR processing method and program"

To provide a synthetic aperture radar for achieving a compact polarimetric SAR easily by using a general-purpose phased array antenna for vertical and horizontal polarizations. An antenna section is a phased array antenna for vertical and horizontal polarizations capable of switching to the vertical or horizontal polarizations in transmission at every transmission/reception module, and receiving two of the horizontal and vertical polarizations simultaneously. The control system divides electrically the phased array antenna in the elevation direction in transmission to set one of them for horizontal polarization transmission and the other for vertical polarization transmission, and sets the antenna for dual polarization simultaneous reception to receive the horizontal and vertical polarizations. The SAR processor takes complex data of horizontal and vertical polarization receiving data as a target vector, and obtains a calculation result corresponding to a covariance matrix of a target vector in full polarimetry so as to perform polarimetric SAR processing. [A735]

"Constant altitude plan position indicator display for multiple radars"

A system and a method to receive radar data from a plurality of radars and to reduce the data from the plurality of radars to a common universal latitude-longitude coordinate frame. The plurality of radars may be positioned at separate geographical locations and may have one or more overlapping regions. The data may be combined in the one or more overlapping regions. [A736]

"Collision avoidance for vehicle control systems"

A method and apparatus for at least semi-autonomously controlling a vehicle so as to avoid collisions are provided. A sensor is utilized to scan an area proximate the vehicle for a potential object of collision. The apparatus calculates navigational states of the potential object of collision relative to the vehicle to determine that the vehicle is on a course to enter within a predetermined miss distance relative to the potential object of collision. The apparatus alters the course of the vehicle based on the calculated navigational states. [A737]

"Synthetic aperture radar (SAR) imaging system"

One embodiment of the invention includes a synthetic aperture radar (SAR) system. The system comprises a radar transmitter configured to transmit a combined signal, the combined signal comprising a first signal that is a modulated SAR radar signal and a second signal that is a modulated signal. The system also comprises at least one radar receiver configured to receive a reflected combined signal that comprises a reflected first signal and a reflected second signal, and to demodulate the reflected first and second signals. The reflected first and second signals can correspond to the first and second signals having been reflected from a target. The system further comprises a radar image processor configured to generate a radar image of the target based on signal parameters associated with the reflected first signal and based on information comprised within the reflected second signal. [A738]

"Methods for rapid target acquisitions in range measurement systems"

A method for acquiring targets within a search area using an electronic device is disclosed. The method involves partitioning a first acquisition time period into a plurality of range gates, simultaneously positioning one or more of the range gates within the search area during a search mode, and transmitting an energy pulse train. Upon receipt of a reflection of the transmitted pulse train, the method records a signal level of the reflected energy pulse train within the first acquisition time period. Based on the recorded signal level, the method advances one or more of the range gates by a prescribed outbound movement increment until the signal level within at least one of the range gates is above a prescribed acquisition signal level threshold. [A739]

"Millimeter wave (MMW) screening portal systems, devices and methods"

A millimeter-wave (MMW) based screening system is provided that may operate with an active sensor, a passive sensor, or in a dual mode using both the active and passive sensors. One or more such sensors are mounted so as to rotate along an axis that passes through a target region of detection, in which a person or object is positioned for screening. A reflector is disposed radially outward from the one or more rotating sensors to reflect MMW radiation between the sensors and the target region. The system may be employed as a portal screening system, and may include a structure having a wall and a roof, for rapidly screening persons for concealed objects. Algorithms may be employed to provide data output that avoids privacy issues. [A740]

"Method and apparatus for creating and processing universal radar waveforms"

A new approach to radar imaging is described herein, in which radar pulses are transmitted with an uneven sampling scheme and subsequently processed with novel algorithms to produce images of equivalent resolution and quality as standard images produced using standard synthetic aperture radar (SAR) waveform and processing techniques. The radar data collected with these waveforms can be used to create many other useful products such as moving target indication (MTI) and high resolution terrain information (HRTI) . The waveform and the correction algorithms described herein allow the algorithms of these other radar products to take advantage of the quality Doppler resolution. [A741]

"System for estimating the speed of an aircraft, and an application thereof to detecting obstacles"

The invention relates to a method of determining an estimated speed of an aircraft relative to ground being overflown by the aircraft, in which use is made of the sum of an acceleration measurement of the aircraft plus a difference value, the difference value being obtained from observation data or signals relating to a region of the ground. [A742]

"Determination of the outline of an elevated object"

A method and apparatus determines the shape of an orbiting or airborne object. A radar determines the general location and a telescope is directed toward the object to form an image of background stars, which will be occluded by the object. The image is compared with a memorized star map, to identify the region of the image in the map. Stars visible in the map which are not visible in the image are listed. The invisible stars are paired with next adjacent visible stars to form star pairs. The midpoints are identified of lines extending between star pairs. Segment lines are drawn between a midpoint and the next closest midpoint. The segment lines define an outline of the object. [A743]

"Systems and methods employing active TCAS to enhance situational awareness"

A method according to the present invention includes transmitting a Mode S interrogation and receiving a response from an aircraft that has received the Mode S interrogation. A range to the aircraft is determined based on a time period between transmitting the Mode S interrogation and receiving the response. The method further includes receiving information from one or more data sources and determining at least one of a bearing to the aircraft and a position of the aircraft using the determined range and the information from the one or more data sources. Information can be received from any number (or type) of data sources, such as ADS-B-equipped aircraft. [A744]

"Combined runway obstacle detection system and method"

An incursion detection system can be utilized with an aircraft. The incursion detection system can be utilized to determine a possible presence of obstacles associated with a runway, taxi-way, or other path of an aircraft. The incursion detection system preferably utilizes a sensor, such as a radar system, and a signal received on a wireless receiver. The wireless receiver can be part of an ADS-B system. A processing device determines a presence of at least one obstacle in a path based upon first data derived from the wireless receiver and/or second data received from the sensor. [A745]

"Mobile millimeter wave imaging radar system"

A short range millimeter wave imaging radar system. The system includes electronics adapted to produce millimeter wave radiation scanned over a frequency range of a few gigahertz. The scanned millimeter wave radiation is broadcast through a frequency scanned transmit antenna to produce a narrow transmit beam in a first scanned direction (such as the vertical direction) corresponding to the scanned millimeter wave frequencies. The transmit antenna is scanned to transmit beam in a second direction perpendicular to the first scanned direction (such as the horizontal or the azimuthal direction) so as to define a two-dimensional field of view. Reflected millimeter wave radiation is collected in a receive frequency scanned antenna co-located (or approximately co-located) with the transmit antenna and adapted to produce a narrow receive beam approximately co-directed in the same directions as the transmitted beam in approximately the same field of view. Computer processor equipment compares the intensity of the receive millimeter radar signals for a pre-determined set of ranges and known directions of the transmit and receive beams as a function of time to produce a radar image of at least a desired portion of the field of view. In preferred embodiment the invention is mounted on a truck and adapted as a FOD finder system to detect and locate FOD on airport surfaces. [A746]

"Radar altimeter with forward looking radar and data transfer capabilities"

A navigation system having a radar altimeter is disclosed. The navigation system comprises a signal processing unit and one or more antennas in operative communication with the radar altimeter and the signal processing unit. The system further comprises a forward looking radar communicatively coupled to the radar altimeter. The forward looking radar and the signal processing unit are configured to provide forward looking radar measurements, radar altitude measurements from the radar altimeter, and datalink communications within a single forward looking radar scanning sequence. [A747]

"Celestial body mapping systems and methods"

Systems and methods for mapping a surface of a celestial body containing objects and terrain are provided. One system includes a Synthetic Aperture RADAR (SAR) module configured to capture a high-resolution image of the terrain of at least a portion of the surface and a map module configured to store map data representing the portion of the surface. The system also includes a fusion module configured to combine the high-resolution image and the map data to generate a high-resolution map of the portion of the surface. A method includes orbiting the celestial body, capturing, via the SAR module, a high-resolution image during each orbit, and fusing the captured high-resolution image with a low-resolution map of the surface to generate a high-resolution map of the surface. A computer-readable medium for storing instructions that cause a processor to perform the above method is also provided. [A748]

"Comparing range data across the slow-time dimension to correct motion measurement errors beyond the range resolution of a synthetic aperture radar"

Motion measurement errors that extend beyond the range resolution of a synthetic aperture radar (SAR) can be corrected by effectively decreasing the range resolution of the SAR in order to permit measurement of the error. Range profiles can be compared across the slow-time dimension of the input data in order to estimate the error. Once the error has been determined, appropriate frequency and phase correction can be applied to the uncompressed input data, after which range and azimuth compression can be performed to produce a desired SAR image. [A749]

"Methods and applications utilizing signal source memory space compression and signal processor computational time compression"

A method and apparatus for a simplified approach for determining the output of a total covariance signal processor. A single set of offline calculations is performed and then used to estimate the output of the total covariance signal processor. A simplified approach for performing matrix inversion may also be used in determining the output of the total covariance processor. [A750]

"Wireless, ground link-based aircraft data communication system with roaming feature"

A flight information communication system has a plurality of RF direct sequence spread spectrum ground data links that link respective aircraft-resident subsystems, in each of which a copy of its flight performance data is stored, with airport-located subsystems. The airport-located subsystems are coupled by way communication paths, such as land line telephone links, to a remote flight operations control center. At the flight operations control center, flight performance data downlinked from plural aircraft parked at different airports is analyzed. In addition, the flight control center may be employed to direct the uploading of in-flight data files, such as audio, video and navigation files from the airport-located subsystems to the aircraft. [A751]

"Synthetic aperture radar incorporating height filtering for use with land-based vehicles"

According to one embodiment, a synthetic aperture radar includes an image former coupled to a pair of antennas that are oriented at differing elevational angles relative to one another. The antennas are configured in a land-based vehicle that moves horizontally relative to a target having one or more internal features. The image former receives signals from the antennas that are indicative of electro-magnetic radiation reflected from a target and generates images according to the signals. The image former then generates a final image by filtering the amplitude component of the imagery from a first antenna against the amplitude component of the imagery from a second antenna. [A752]

"Method and system of three-dimensional positional finding"

The present invention is an RF system and methods for finding a target T in three dimensional space configured to have a transponder disposed on the target T, a monitoring unit configured as a transceiver for determining or monitoring the location of the target T and an RF wireless communication system configured with a processor to repeatedly determine position, communication and other values between the transponder and monitoring unit and so as to generate a measured distance between units in three dimensional space by determining the measured distance of the target T by a spherical virtual triangulation relationship when successive values of said position information has a predetermined logical relationship relative to said previous values between said monitoring unit and transponder and/or slave unit disposed on the target T. [A753]

"Decreasing range resolution of a SAR image to permit correction of motion measurement errors beyond the SAR range resolution"

Motion measurement errors that extend beyond the range resolution of a synthetic aperture radar (SAR) can be corrected by effectively decreasing the range resolution of the SAR in order to permit measurement of the error. Range profiles can be compared across the slow-time dimension of the input data in order to estimate the error. Once the error has been determined, appropriate frequency and phase correction can be applied to the uncompressed input data, after which range and azimuth compression can be performed to produce a desired SAR image. [A754]

"Methods and apparatus for assignment and maintenance of unique aircraft addresses for TIS-B services"

Methods and apparatus for assigning a pseudo address to an aircraft not equipped with an ADS-B transponder and maintaining the assigned pseudo address over a number of regions each supported by different TIS-B systems. In an exemplary embodiment, each TIS-B system is assigned a range of addresses particular to the region in which the TIS-B system is located. [A755]

"Target maneuver detection"

The present invention includes, in its various aspects and embodiments, a method and apparatus for determining whether a moving target is maneuvering. The method comprises determining an expected motion for the target assuming the target is not maneuvering, determining an upper bound and a lower bound for the expected motion, and determining whether the actual motion exceeds at least one of the upper and lower bounds of the expected motion. In one aspect, the apparatus is a program storage medium encoded with instructions that, when executed by a computing apparatus, perform such a method. In another aspect, the apparatus is a computing apparatus programmed to perform such a method. [A756]

"Atmosphere model"

The invention relates to a time and location dependent atmosphere model and especially determining the altitude of a mobile terminal based on this model and the measured barometric pressure at the location of the terminal. The atmosphere model provides a long term, wide area barometric pressure model estimate. [A757]

"Method for detecting atmospheric turbulence by an embedded electromagnetic sensor, notably on board an aircraft"

An aim of the invention is to allow the detection of turbulence in the absence of tracers. A radar is embedded aboard an aircraft (21) and implements the following steps: searching for the upper part of a convective system (1) situated outside the given zone, reflecting the electromagnetic waves, searching for divergence zone (7) inside the convective system by searching for a divergence profile, reckoning the appearance of turbulence in the given zone as a function of observable meteorological phenomena in the divergence zone (7) by applying fluid mechanics properties. [A758]

"Aircraft cockpit display device for information concerning surrounding traffic"

An aircraft cockpit display device for information concerning surrounding traffic includes devices to receive information coming from outside the aircraft, to know the flight parameters of the aircraft, to calculate projected trajectories of the aircraft and of a detected aircraft in the immediate vicinity, and to display a representation of the surrounding traffic through symbols and potential messages based on instructions received. A display command device is connected to an on-board calculator to know the flight phase of the aircraft. The display command device has a filtering device to define for each flight phase and/or crew task the nature and the level of information to be displayed. [A759]

"DME ground apparatus"

The transponder unit provided in a DME ground apparatus detects the transmission rate at which to transmit the pulse-pairs constituting a response signal. The threshold of the reception level of the pulse detection unit provided in the transponder unit is raised as the transmission rate increases. [A760]

"Mode S secondary surveillance radar"

A transmitter (13) operates in an immediate scan after an initial acquisition or detection of an altered aircraft ID by a changed flight status, to transmit to an aircraft a sequence of interrogation signals requesting an aircraft ID transmission, a verifier (17) operates upon acquisition of a reply signal including an aircraft ID transmitted from a transponder on the aircraft, to store in a memory (17a) a mode S address assigned to the aircraft and the aircraft ID in an associating manner, and upon an occurrence of a storage of aircraft IDs associated with the mode S address in the memory (17a) , to determine whether or not the aircraft ID is correct, depending on whether or not the aircraft IDs have a match therein, and a report generator (18) operates upon a determination for the aircraft ID to be correct, to prepare a target report using the aircraft ID. [A761]

"Synthetic aperture radar hybrid-polarity method and architecture for obtaining the stokes parameters of a backscattered field"

A synthetic aperture radar hybrid-polarity method and architecture comprising transmitting circular polarization (by driving the orthogonal linear feeds simultaneously by two identical waveforms, 90.degree. out of phase) , and receiving horizontal (H) and vertical (V) linear polarizations, coherently. Once calibrated, the H and V single-look complex amplitude data are sufficient to form all four Stokes parameters, which fully characterize the observed backscattered field. [A762]

"Radar tracking system"

An angle tracking radar system particularly for a missile with a steerable antenna and gyros strapped down to the missile body--a `partially strapdown` system. The body rate signals, body acceleration signals where provided, and target position signals are converted into an electronic reference frame which is controlled to align with the target sightline, the above body and target signals being employed to produce estimates of target direction, sightline rate and sightline acceleration for use in controlling the missile. [A763]

"Method and apparatus for detection of moving objects by SAR images"

A method for the detection of moving objects by SAR images envisages the steps of: generating a pulse-repetition frequency signal starting from a radar signal, and generating a sequence of SAR images starting from the pulse-repetition frequency signal. In particular, SAR images with low azimuth resolution are generated by of coherent integration of the pulse-repetition frequency signal for a sub-aperture time shorter than an aperture time. In addition, the method envisages generating difference images through point-to-point difference between subsequent low azimuth resolution SAR images, and recognizing patterns associated to moving objects in the difference images. [A764]

"Method for using a dynamic mission replanning algorithm as an aid to assess jam effectiveness"

The method generally relates to the field of computer software particularly to an improved method of providing aircrew decision aids for use in determining the optimum placement of an Electronic Attack (EA) aircraft. The core of the method is a software program that will dynamically provide the EA flight crew situational awareness regarding a threat emitter's coverage relative to the position of the EA aircraft and to the position of any number of protected entities (PE) . The software program generates information to provide visual cues representing a Jam Acceptability Region (JAR) contour, a Jam Assessment Strobe (JAS) and text for display on a number of flexibly configurable display formats posted on display units. The JAR and JAS graphics and text will aid the EA aircrew in rapidly assessing the effectiveness of a given jamming approach. It is emphasized that this abstract is provided to comply with the rules requiring an abstract that will allow a searcher or other reader to quickly ascertain the subject matter of the technical disclosure. It is submitted with the understanding that it will not be used to interpret or limit the scope of the claims. [A765]

"Collision and conflict avoidance system for autonomous unmanned air vehicles (UAVs)"

A collision and conflict avoidance system for autonomous unmanned air vehicles (UAVs) uses accessible on-board sensors to generate an image of the surrounding airspace. The situation thus established is analyzed for imminent conflicts (collisions, TCAS violations, airspace violations) , and, if a probable conflict or collision is detected, a search for avoidance options is started, wherein the avoidance routes as far as possible comply with statutory air traffic regulations. By virtue of the on-board algorithm the system functions independently of a data link. By taking into account the TCAS zones, the remaining air traffic is not disturbed unnecessarily. The system makes it possible both to cover aspects critical for safety and to use more highly developed algorithms in order to take complicated boundary conditions into account when determining the avoidance course. [A766]

"Method and apparatus for processing SAR images based on a complex anisotropic diffusion filtering algorithm"

A computer system for processing complex synthetic aperture radar (SAR) images includes a database for storing complex SAR images to be processed, and a processor for processing a complex SAR image from the database. The processing includes receiving a complex SAR data set for a SAR image comprising a plurality of pixels, and applying a complex anisotropic diffusion algorithm to the complex SAR data set. The complex SAR data set includes a real and an imaginary part for each pixel. [A767]

"System and method for generating weather radar information"

A weather radar system can be utilized on-board an aircraft. The weather radar system includes processing electronics for sensing weather. The processing electronics is configured to utilize sensed weather data to generate a vertical weather prediction for a given altitude in response to a range and an azimuth. The system can also include a display. The display provides visual indicia of the vertical weather prediction in response to the processing electronics. [A768]

"Active device for the reception and the emission of electromagnetic waves"

An active device includes a receiving antenna (6) that receives an electromagnetic (2) signal coming from a localisation system (3) and at least one emitting antenna (8) that resends said signal (2) to said localisation system (3) , and is characterised in that said device (4) includes a plurality of said emitting antennae (8) connected to at least one receiving antenna (6) in such a way that said emitting antennae (8) receive the electromagnetic (2) signal coming from said at least one receiving antenna (6) , with each of said emitting antennae (8) being the ones that resend the signal (2) to said localisation system (3) . This offers the possibility of creating artificial measuring points that are retained over time easily, cheaply and simply, whether in wooded zones, snow-covered zones or at sea. [A769]

"Method and system for maintaining spatio-temporal data"

A system and method for maintaining spatio-temporal data for a given area (e.g., an airspace) containing a given node (e.g., an aircraft) and one or more other nodes (e.g., aircraft) . The given aircraft may break the given airspace into a first plurality of smaller airspaces, and may also break the given airspace into a second plurality of smaller airspaces. The given aircraft may then detect local spatio-temporal data for each smaller airspace located within its detectable range. The aircraft may also receive remote spatio-temporal data for the smaller airspaces from the one or more other aircraft. Thereafter, the aircraft may update stored spatio-temporal data based on the aircraft's navigation data, the local spatio-temporal data, the remote spatio-temporal data, and/or a reliability of the data. Further, the aircraft may transmit the stored spatio-temporal data for receipt by the one or more other aircraft. [A770]

"Wide area high resolution SAR from a moving and hovering helicopter"

A hovering helicopter has a radar transmitter/receiver for transmitting radar pulses for illuminating a target for SAR imaging, and rotor blades for generating lift. Radar reflectors are on the rotor blades. The radar reflectors are oriented to reflect the radar pulses from the transmitter to the target as the rotor blades rotate. The radar pulses reflected by the moving reflector from the transmitter are timed to generate the synthetic aperture image using radar returns from the target. The receiver also receives blade returns directly reflected from the moving reflectors attached to the lift rotor blades. The receiver analyzes the blade returns to extract motion details of the reflectors and uses the motion details for motion compensation of target returns for SAR imaging. [A771]

"Antenna array for an inverse synthetic aperture radar"

According to one embodiment, an antenna array includes a plurality of racks that are each configured with a plurality of antenna elements. Each rack may be rotated relative to the other racks through an axis that is generally parallel to the axis of other racks. Each antenna element within each rack has an axial orientation that is generally similar to and has an elevational orientation that is individually adjustable relative to one another. [A772]

"Time-of-flight radar calibration system"

A time-of-flight calibration system for a radar-based measurement device is provided. The time-of-flight calibration system includes a target antenna and a waveguide, e.g. a coaxial cable. The waveguide is coupled at one end to the target antenna and terminated at its other end by a wave-reflecting impedance. [A773]

"Dual mode weather and air surveillance radar system"

A radar system having first and second modes of operation comprising a dual antenna assembly comprising first and second antennas having respective first and second antenna waveguides coupled to a waveguide switch operable to divert RF energy to or from either said antenna waveguide, said waveguide switch coupled to a common waveguide, said dual antenna assembly mounted to an antenna support assembly, said first and second antennas being designed for use in said first and second modes respectively and operable for coupling said RF energy to a transmit medium, and for coupling reflected RF energy from transmit medium to said first or second antenna waveguide, and a control processor configured with control logic operable to control the functions of said radar system wherein said first and second antennas are mounted generally perpendicularly in the vertical plane with respect to each other and wherein said radar system operates in only one of said modes of operation at any time. [A774]

"False lock filter for pulsed radar altimeters"

A false lock filter circuit for a pulsed altimeter is provided. The circuit includes a low pass filter having a relatively low bandwidth (LBW LPF) , a low pass filter having a relatively high bandwidth (HBW LPF) and a false lock controller. The LBW LPF has an input that is coupled to receive a detector output. The HBW LPF has an input that is coupled to receive the detector output. The false lock controller is coupled to receive outputs from the LBW LPF and HBW LPF. Moreover, the false lock controller is configured to sample an output of the HBW LPF and apply a statistical analysis on the samples to determine if a valid target has been detected. [A775]

"Non-statistical method for compressing and decompressing complex SAR data"

Provided is a non-statistical method for compressing and decompressing complex SAR data derived from reflected energy. The method includes selecting a first FFT to provide a target ratio of pixel spacing to resolution. A second FFT is then selected which is smaller than the first FFT. The data is zero-padded to fill the second FFT and transformed to provide at least one transfer frequency. This transfer frequency is then transferred to the at least one remote site. At the remote site the second FFT is inverted to restore the data from the received transfer frequency. The restored data is then zero-padded again to fill the first FFT. The first FFT is then used to transform the zero-padded restored data to provide a data set of points with the target ratio of pixel spacing to resolution. [A776]

"System and a method for automatic air collision avoidance"

A method and a system for avoiding collisions between aircraft. The method includes computing a default fly out maneuver regarding how the aircraft shall be maneuvered during a fly out action, predicting a fly away path including a prediction of the position of the aircraft during the fly out maneuver, sending information about the own fly away path to the other aircrafts, receiving information about fly away paths from the other aircrafts, detecting an approaching collision, and activating the fly out maneuver upon detecting an approaching collision. The method further includes carrying out the following steps after activation the fly out maneuver: receiving the current position of the aircraft, and calculating a compensated fly out maneuver for the aircraft based on the current position of the aircraft, the previously predicted position, and the default fly out maneuver. [A777]

"Mode S secondary surveillance radar system"

It is related to a mode S secondary surveillance radar system for carrying out a target (aircraft) surveillance with a high reliability, where a surveillance processor 39 produces a detection report of a acquisition surveillance by a scan of an antenna thereafter by adopting the mode A code information with coinciding code data among mode A code information acquired by scans of a plurality of times. In this way, the efficient utilization of RF channels during the roll-call period can be maintained while improving the reliability of a target detection report. [A778]

"Method and device for high-resolution imaging of test objects by electromagnetic waves, in particular for monitoring people for suspicious items"

In order to image test objects by electromagnetic waves, in particular millimetric waves, a test object is illuminated with the electromagnetic waves, the scattered waves are received, and are evaluated for a representation of the test object in the form of an image based on the principle of "synthetic aperture radar" (SAR) . In order to allow as large an area as possible to be imaged with high resolution in a short time, the phase centres of the transmitting and receiving antennas are, according to the invention, moved on a circular path parallel to the respective digital focus planes of the imaging system, and are at the same time shifted linearly in a further direction parallel to the respective focus plane. The method can be used for monitoring people for suspicious objects, for example for monitoring airline passengers at an airport. [A779]

"Synthetic aperture radar and processing method of reproducing synthetic aperture radar image"

A synthetic aperture radar to provide high resolution in the azimuth direction under the predetermined conditions of wide observation swathwidth in the range direction, stripmap observation and free PRF (Pulse Repetition Frequency) comprises a transmission antenna 102 for a single system and receiving antennae 104a, 104b for two systems. The beam width in the azimuth direction of a transmission beam 103 from the transmission antenna 102 is set equal to twice as wide as the beam width of each of the receiving antennae 104a, 104b. Moreover, a receiving antenna beam 105a is directed to the moving direction, while the other receiving antenna beam 105b is directed to opposite to the moving direction. The transmission antenna 102 and the receiving antennae 104a, 104b for two systems are used in common by dividing a single array antenna in the elevation direction to configure the receiving antennae 104a, 104b. The antenna size of the transmission antenna 102 in the azimuth direction is set to one half of the antenna size of the receiving antennae 104a, 104b by phase setting of each element of the array antenna or by electrical means when transmitting. [A780]

"Synthetic aperture radar"

A method of operating synthetic aperture radar in a low PRF mode, comprising generating a stream of radar pulses, imposing onto said stream a predetermined modulation of the Pulse Repetition Frequency (PRF) , directing said stream to a target area, and processing received pulses, comprising separating the received pulses as a sequence of sets, and superposing received radar pulses of said sets, whereby to enhance the central received lobe and to attenuate side lobes. [A781]

"Antenna system for a micro air vehicle"

An antenna for a micro air vehicle (MAV) takes the form of a wrap-around antenna (e.g., wrapped around a portion of the MAV) that selectively emits radio signals in different directions depending on a frequency selected by a radio altimeter in the MAV. The radar altimeter may be a pulsed or a frequency modulated continuous wave (FMCW) radar altimeter. The wrap-around antenna includes groups of radiating elements in which at least each group includes an average height that is different from an average height of an adjacent group. Further, the average height of the group determines which group will emit the signals most efficiently so that a desired sector of space may be covered by the signals emitted from the antenna. In one example, the center frequency of the radar altimeter may be controlled in a deterministic manner to cause the radiating elements to successively cover desired sectors of space. [A782]

"System and method for turbulence detection"

A system and method of displaying an indication of a hazard associated on an aircraft display in an avionics system provides first radar pulses at a first pulse repetition frequency or having a first compression signature or carrier frequency. The system and method also provides second radar pulses at a second pulse repetition frequency higher than the first pulse repetition frequency or having a second compression signature or carrier frequency. The system and method receive radar returns associated with the first radar pulses and the second radar pulses and provide a turbulence assessment in response to the radar returns. [A783]

"Data compression system and method for a weather radar system"

An airborne weather radar system is coupled to a display on an aircraft and a radar antenna attached to the aircraft. The airborne weather radar system includes a processing system for receiving weather radar returns from the radar antenna. The radar returns resulting from radar signals are transmitted from the radar antenna. The processing system is configured to compress radar data representing graphical images actually provided on the display on the aircraft. The graphical images are provided in response to the weather radar returns. The radar data is compressed to provide compressed data. The compressed data has reduced spatial resolution when compared to the radar data, wherein the processing system is disposed on the aircraft. [A784]

"Bullet approach warning system and method"

A system and method for warning a helicopter of an approaching bullet using existing sensor systems is disclosed. The disclosed method including the steps of: detecting and providing bearing information for detected small arms weapon firing locations near the helicopter, determining a detection area and detection time window for the fired bullet, determining the antennas of the RF transmitting and RF receiving systems covering the bearing of the detected weapon firing, determining a timing sequence and allocating time segments for transmitting and receiving RF signals during the detection time window, commanding the RF emitting system to emit and the RF receiving system to receive RF signals during their allocated time segments, processing RF signals received and determining whether reflected RF signal pulses from the emitted RF signal pulses are present, and outputting a warning where reflected RF signal pulses are detected. [A785]

"Millimeter wave imager with visible or infrared overlay for brownout assist"

An imaging system for a rotary aircraft having a millimeter wave imager with visible or infrared overlay. The system includes an active millimeter wave imaging system comprising a millimeter wave transmitter and a millimeter wave phased array receiver for producing millimeter wave images of a landing region, a second imaging system operating at visible or infrared wavelengths to produce visible or infrared images of the landing region, and a processor programmed with a see and remember algorithm for overlaying the visible or infrared images and the millimeter wave images and to save at least one good high-resolution visible or infrared image in case of a brownout event begins to obscuring the visible or infrared images wherein in case of the brownout event the millimeter wave images are overlaid on the at least one good visible or infrared image and not obscured visible or infrared images. [A786]

"Volumetric direction-finding system using a Luneberg Lens"

Disclosed is an Radio Frequency (RF) receiving system methodology, utilizing an Luneberg Lens having a spherically shaped outer surface and a semi-spherical shaped focal surface composed of near-equally spaced frequency-independent antenna elements disposed uniformly to cover the semi-spherical focal surface of the Luneberg Lens, and radio frequency (RF) power splitters and combiners for combining the RF energy received by the antenna elements, forming rows and columns, thereby reducing the number of required RF receiver channels for subsequent processing, where the maximum row/column and differential amplitude comparison is used for deriving volumetric direction finding (DF) of intercepted signals, as part of a robust signal detection and direction-finding (DF) system, for detecting and processing a plurality of signals emanating from surface and airborne platforms within the hemisphere, where each surface and airborne platform include transmitters for transmitting navigation, communication and radar signals. [A787]

"Display of high-cruise-altitude weather"

A method implementable in a weather-radar system of an aircraft, the weather-radar system configured to generate to a display device, in response to radar return information indicating reflectivity levels below a predetermined reflectivity threshold, an image in a first presentation format. The method includes determining if the altitude of the aircraft is above a predetermined threshold altitude, and, if the altitude of the aircraft is above the threshold altitude, displaying, in response to radar return information indicating reflectivity levels below the predetermined reflectivity threshold, the image in a second presentation format different from the first presentation format. [A788]

"Method for determining types of precipitation in the atmosphere"

A method for determination of precipitation types in the atmosphere is described, wherein an output signal, in particular a radar signal, having a transmitting frequency spectrum is transmitted, reflection signals formed by reflection of the output signals at precipitation particles at at least two atmospheric levels and having a reflection spectrum are detected, and wherein finally the characteristics of the reflection signals are analyzed. The method according to the invention is characterized in that on analyzing characteristics of the reflection signals a course of a difference frequency spectrum formed by transmission frequency and reflection frequency spectrum is analyzed resolved by altitude levels. [A789]

"DME ground apparatus"

A transponder unit of a DME ground apparatus receives an interrogation signal and converts the same to an IF signal. The unit performs analog-to-digital conversion on the IF signal, generating a digital interrogation signal. The unit calculates two detected outputs whose frequencies are .+-.900 kHz deviated with respect to the center frequency of the digital interrogation signal. Then, the transponder unit compares the two detected outputs and the digital interrogation signal in terms of magnitude, thereby to determine whether a response signal should be transmitted. [A790]

"System and method for displaying radar-estimated terrain"

A circuit for a display used on an aircraft causes the display to display a composite terrain image. The composite terrain image can be formed from first terrain data from a terrain database and second terrain data from a radar system. A display control circuit can generate a display signal for the composite terrain image. The display signal is received by the display. The composite terrain image can be viewed by a pilot. [A791]

"Pulse radar, car radar and landing assistance radar"

A pulse radar is provided with a filter for eliminating a transmission waveform interfered with an answering signal from a received waveform, and a harmonic detector or a phase delay detector for detecting arrival and end of the answering signal reflected on a target. [A792]

"Target tracking apparatus and method"

On adjusting a target specification data error predicted value so as to become larger on detecting maneuver of a target, the target specification data error predicted value is adjusted, in consideration of type of the maneuver and a course of the target, so as to make a direction of varying specification data large and to make a direction of constant specification data small. It is therefore possible to quickly recover a delay of the following of the varying specification data and to avoid increasing an error of the constant specification data. [A793]

"Dual mode weather and air surveillance radar system"

A radar system having first and second modes of operation comprising a dual antenna assembly comprising first and second antennas having respective first and second antenna waveguides coupled to a waveguide switch operable to divert RF energy to or from either said antenna waveguide, said waveguide switch coupled to a common waveguide, said dual antenna assembly mounted to an antenna support assembly, said first and second antennas being designed for use in said first and second modes respectively and operable for coupling said RF energy to a transmit medium, and for coupling reflected RF energy from transmit medium to said first or second antenna waveguide, and a control processor configured with control logic operable to control the functions of said radar system wherein said first and second antennas are mounted generally perpendicularly in the vertical plane with respect to each other and wherein said radar system operates in only one of said modes of operation at any time. [A794]

"Method for supporting low-level flights"

A method for supporting low-level aircraft flights in which a warning is provided for the pilot upon a reliable recognition of wire-like obstacles, even during extreme environmental influences, such as clutter, or even when such obstacles are seen against the sky. The method is performed upon the collection of information on the topography of the surrounding terrain by at least one sensor located on the aircraft, such information representing raw data, based upon which an image-like representation is calculated, such representation including a pixel quantity with pixels P (i, j) in columns j and lines i, which image-like representation is evaluated by calculating altitude values in a geodetic coordinate system using the flight condition from the aircraft, evaluating pixel quantity by comparing each pixel P (I, j) to threshold values or ranges of values, evaluating the image-like representation and highlighting each pixel as a picture element if any of various cases is present. [A795]

"System and method using airborne radar occultation for measuring atmospheric properties"

A method for estimating an atmospheric condition existing between a portion of the Earth's surface and an airborne mobile platform travelling over the portion of the Earth's surface. The method may involve emitting a radar signal beam toward the Earth's surface from the mobile platform and receiving back at least a portion of the radar signal beam reflected from the Earth's surface. The time of flight information of the radar signal beam is analyzed as a function of elevation angle to determine a specific time of flight value associated with a specific elevation angle of the radar signal beam. The specific time of flight value is used to determine a refractivity of the atmosphere through which the radar signal beam and the reflected radar signal has passed. The refractivity is used to determine the atmospheric condition. [A796]

"Secondary surveillance radar system, and ground system for use therein"

A secondary surveillance radar system comprising a including a ground system which observes an observation area where an aircraft equipped with a mode S transponder and an aircraft equipped with an ATCRBS transponder possibly coexist, wherein the ground system comprises includes a transmit processor which transmits to the observation area an all-call interrogation signal specific for mode S including an identification code of the ground system, a receive processor which receives a reply signal to the interrogation signal transmitted by the transmit processor, and a recognition processor which recognizes the reply signal as a processing target when identification information included in the reply signal received by the receive processor coincides with the identification code of the ground system, and wherein the recognition processor recognizes the reply signal as the processing target also when the identification information included in the reply signal received by the receive processor coincides with null information. [A797]

"Methods for two-dimensional autofocus in high resolution radar systems"

Provided are two-dimensional autofocus methods in a synthetic aperture radar (SAR) system which include: (1) two-dimensional pulse pair product algorithm including shear PGA, eigenvector phase history ("EPH") , shear PGA/EPH) , (2) two-dimensional optimization algorithms including parametric one-dimensional estimate/two-dimensional correction, parametric two dimensional estimate/two-dimensional correction, unconstrained two-dimensional nonparametric and constrained two-dimensional nonparametric methods, (3) a two-dimensional geometry filter algorithm, (4) a two-dimensional prominent point processing algorithm, (5) a one-dimensional phase estimate of higher order two dimensional phase errors, and, (6) a fast SHARP parametric autofocus algorithm. [A798]

"Foreign object detection system and method"

A system for detection of foreign objects on airport travel surfaces including a plurality of foreign object detector modules mounted on a corresponding plurality of existing aircraft travel surface lighting supports, the plurality of foreign object detector modules providing a corresponding plurality of detection outputs and a high speed detection output analyzer operative to receive at least one of the plurality of detection outputs and to provide a high speed output indication of foreign object presence. [A799]

"System and method for providing enhanced weather hazard alerting for aircraft"

The present invention is a method for providing hazard alerting for an aircraft via an airborne weather radar system. The method includes performing multiple weather radar scans at various tilt angles via the system and receiving radar returns via a receiver. The returns are stored in a memory of the system and merged with ground clutter suppression algorithms for eliminating ground returns from the stored returns and for creating a weather image based on remaining returns included in the stored returns. The image is provided via a weather radar display of the system, and includes an alert icon and an alert message when a hazard is present within an area proximal to the aircraft and is at or above a severity level threshold. The alert icon and alert message collectively indicate a type, severity level and location of the hazard in azimuth relative to a heading of the aircraft. [A800]

"System and method for coordinate mapping onto airport diagrams"

A bounded diagram having latitude and longitude points is identified. Two lines of latitude and two lines of longitude contained within the bounded diagram are identified. The points of where the lines of latitude and the lines of longitude intersect with the boundary of the bounded diagram are determined. Two latitude connecting lines and two longitude connecting lines are determined from the intersection. A latitude coordinate and a longitude coordinate of a latitude/longitude point is obtained. Latitude and longitude points corresponding to the latitude and longitude coordinates are determined along each of the connecting lines. Latitude and longitude position lines are determined by the points along the connecting lines. An intersection point of the latitude position line and the longitude potion line is determined and an object representing the latitude/longitude point is placed at the intersection point. [A801]

"Pseudo-random pulse interval generation in navigation-aiding devices"

An electronic circuit comprises a randomizing bit generator configured to generate a randomizing bit sequence based on a sequence selection input signal. The randomizing bit generator includes a counter operable to provide an individual starting count for the randomizing bit sequence and a parity generator responsive to an output of the counter. The circuit further comprises a pseudo-random number generator responsive to the randomizing bit generator. The pseudo-random number generator is operable to provide at least one pulsed signal based at least in part on the random bit sequence. The electronic circuit is operable to substantially eliminate interference in a series of pulsed signal transmissions comprising the at least one pulsed signal from each of two or more navigation devices, where each of the pulsed signals from each of the navigation devices is separated by an automatically adjustable time interval. [A802]

"Versatile constant altitude plan position indicator for radars"

A method and a system to process radar volume scan data along an azimuth angle of a radar, to interpolate the radar volume scan data taken from adjacent elevation angles along the azimuth angle of the radar to obtain radar data corresponding to a predetermined altitude along the azimuth angle, and to display the radar volume scan data obtained corresponding to the predetermined altitude on a PPI display. [A803]

"Synthetic aperture radar motion estimation method"

A target object motion estimation method using at least one subset of a complex SAR image. Coarse range cell alignment is performed on at least one subset of a complex SAR image. At least one subset is autofocused, thereby providing an estimated phase error function. The estimated phase error function yielded by autofocusing (or a manipulated version of the phase error function) may be analyzed to detect, characterize, and estimate target object motion. [A804]

"Method and apparatus for simultaneous synthetic aperture radar and moving target indication"

Method and apparatus for simultaneous synthetic aperture radar and moving target detection. A plurality of independent radio frequency signals are generated and applied to separate radiating/receiving antenna elements. Signals are generated as basis functions, such that moving target detection and synthetic aperture radar signals are constructed from individual waveform components in space, time, frequency, and coding. Waveform components are sorted and combined at reception. Received data is simultaneously processed to extract synthetic aperture radar images and moving target indication detections. [A805]

"DME ground apparatus"

In a DME ground apparatus, under the control of a transmission-rate monitoring control unit, the transponder unit decodes an interrogation signal it has received and generates a response signal. The transmission rate at which to transmit the response signal is monitored. If the result of the monitoring indicates that the transmission rate has reached a preset value, the response signal is transmitted from the DME ground apparatus. If the result of the monitoring indicates that the transmission rate has not reached a preset value, squitter pulses are transmitted from the DME ground apparatus. [A806]

"Microwave planar sensor using PCB cavity packaging process"

A microwave planar sensor for detecting the presence and movement of a target in a detection area, including a microwave board and a support board. The microwave board includes an oscillator/mixer layer, an antenna layer and a ground layer sandwiched between the oscillator/mixer layer and the antenna layer, when the oscillator/mixer layer and the antenna layer are bonded together. The oscillator/mixer layer includes an oscillator configured to generate at least one microwave signal and a signal mixer electrically coupled to the oscillator. The signal mixer is configured to combine a microwave signal generated by the oscillator and a reflected signal reflected by the target in the detection area, thereby generating an intermediate frequency signal having a Doppler frequency. The antenna layer includes a transmit antenna coupled to the oscillator for transmitting a microwave signal generated by the oscillator into the detection area and a receive antenna coupled to the signal mixer for receiving a reflected signal reflected by the target. The support board includes a top surface bonded to the microwave board through a first metal layer coated on the top surface. The support board further includes a continuous cavity extending from the top surface for accommodating the oscillator and the mixer of the oscillator/mixer layer, the surface of the cavity coated with a second metal layer. [A807]

"Method for storing measurements made by a radar"

The present invention relates to a method for storing measurements of a given type made by a radar, each measurement having been made at a position in a given coordinate system. The method comprises a step of accessing a structured data storage space, each location of which is addressable by a pair of positive integers and each location of which is able to store at least one evolution profile of the measurements of the given type as a function of altitude. It also comprises a meshing step which associates a ground position with a pair of positive integers allowing a location to be addressed. The method also comprises a step of modifying the content of the location with the pair of integers as its address by storing there an evolution profile such that for each ground position sufficiently close to the position associated with the pair and for which a measurement has been made at a certain altitude, the evolution profile provides approximately the measurement made at this altitude. [A808]

"Alignment correction engine"

A method for determining an adjusted position of a component of an aerial vehicle in response to a situational parameter is provided. The system includes a component mounted on an aerial vehicle, a control system operably coupled to the component, and a processor operably coupled to the control system. The control system adjusts a position of the component based on commands received from the processor. The processor receives positional data and a situational datum relating to the vehicle. The positional data is determined as a function of a situational parameter of the vehicle and is stored in a memory accessible by the processor. The processor determines an adjustment to the position of the component using the situational datum and the positional data and sends the determined adjustment to the control system. [A809]

"Monopulse radar signal processing for rotorcraft brownout aid application"

A method, system and computer program is disclosed for reducing range and angular ambiguities in a target data matrix output from a real beam monopulse radar sensor within a single beam for use in terrain morphing applications employed by brownout take-off and landing aid systems. One or more range bins are calculated to selectively determine one or more range segments from one or more targets of interest. Range resolution enhancement processing is employed to the selectively determined one or more range segments to obtain a range of target scatter locations. A monopulse angle bin is estimated from the obtained range of target scatter locations and one or more control inputs. Elevation and azimuth angular binning is applied to the estimated monopulse angle bin to obtain a smaller coverage area among one or more possible target areas. One or more shortest-range bins in a two-dimensional (2D) azimuth and elevation grid is selected from the smaller coverage area, which generate the target data output matrix from the selected one or more shortest-range bins in the two-dimensional (2D) azimuth and elevation grid. [A810]

"Weather data aggregation and display system for airborne network of member aircraft"

A weather data aggregation and display system for displaying weather radar information to a pilot of a member aircraft of an airborne network of member aircraft. The weather data aggregation and display system includes an airborne network system (ANS) positioned on the member aircraft adapted to receive incoming geo-referenced weather data regarding Significant Meteorological Systems (SMS) from associated airborne network systems positioned on other member aircraft. A data processing system (DPS) is coupled to the airborne network system for generating the member aircraft's perspective of the SMS, based on the incoming weather data and the member aircraft's navigation and attitude information. The DPS provides DPS output weather data. An airborne display system (ADS) is positioned on the member aircraft and coupled to the data processing system. The airborne display system is adapted to receive the DPS output weather data and in response thereto display desired weather imagery of the Significant Meteorological Systems. The ANS is adapted to re-transmit the incoming geo-referenced weather data to associated airborne network systems positioned on other member aircraft. [A811]

"Non-scanning radar for detecting and tracking targets"

Radar for detecting and tracking short range airborne targets using a non-scanning beam to illuminate the entire search space, and processing the return signals from a plurality of spaced apart receive antennas. Target angle in one plane may be determined by coherent processing of the returns from the plurality of receive antennas. Spacing the receive antennas apart in three dimensions allows determining of two angles, such as azimuth and elevation. Processing of the returns may be coherent or noncoherent, or returns may be processed both coherently and noncoherently. Programmability of the processing algorithms and parameters provide flexibility in applications, as well as flexibility based on such things as the target type and its range. Exemplary applications are disclosed. [A812]

"Disruptive media dispersal system for aircraft"

A disruptive media dispersal system for aircraft which absorbs and scatters directed energy weapon beams such as tracking lasers and high energy lasers (HELs) is disclosed. The system may include laser detectors, laser beam propagation disruptive media and a dispersal system. When attacked by a directed energy weapon such as a laser, the laser detector system or vehicle operator deploys the disruptive media. The disruptive media is released by a feeder and dispersal system into the air in the path of the tracking and/or HEL weapon. for example, the dispersal system may be located onboard the aircraft near the front of the fuselage. [A813]

"System and method for synthesizing localizer and glide slope deviations from weather radar"

The present invention is a method for obtaining a localizer deviation and a glide slope deviation for an aircraft. The method may include directing electromagnetic signals from a weather radar system of an aircraft towards a runway. The method may further include receiving return signals in response to the directed signals. The method may further include, based on the received return signals, determining an azimuth angle for the aircraft relative to the runway, determining an elevation angle for the aircraft relative to the runway, and determining a range for the aircraft relative to the runway. The method may further include based on the azimuth angle, the elevation angle, and the range, calculating the localizer deviation and the glide slope deviation for the aircraft. [A814]

"Methods and apparatus to contact aircraft"

Methods and apparatus to alert a pilot in an aircraft of certain conditions, such as airspace violations. In one embodiments a system uniquely identifies aircraft and send a message to alert the pilot to contact air traffic control on a selected frequency. [A815]

"Reducing scattering center data using magnitude-based reduction"

A method to reduce scattering centers (SC) includes receiving a set of SC data points representing an object. The method also includes reducing SC data points associated with a first region based on magnitudes of intensity of the SC data points associated with the first region, reducing SC data points associated with a second region based on magnitudes of intensity of the SC data points associated with the second region, combining the reduced SC data points associated with the first region and the second region to form a reduced set of SC data points, comparing the reduced set of SC data points with the received set of SC data points to determine if the reduced set of SC data points meets a set of comparison metrics and if the reduced set of SC data points meets the set of comparison metrics, performing another iteration of the reducing. [A816]

"Mode S radar"

Disclosed is a Mode S radar which specifies an aircraft by transmitting interrogations to an aircraft A equipped with a Mode S transponder, and by then receiving and decoding replies corresponding to these interrogations. In the Mode S radar, detection reports on the aircraft A are generated in a manner that: for a Mode A code necessary for generating detection reports, when identicalness between the Mode A codes obtained in a plurality of scans after the initial acquisition of the aircraft A has been found to exist, the Mode A code thus found identical is adopted without carrying out a Mode A code interrogation (UF=5) thereafter. Accordingly, the Mode S secondary surveillance capable of generating more highly reliable detection reports is achieved. [A817]

"Radar derived perspective display system"

An aircraft-based terrain display system includes a radar system configured to measure terrain data in proximity to an aircraft. The system further includes a memory coupled to the radar system and configured to store terrain data associated with the terrain data collected from the radar system. A processor is coupled to the memory and configured to use the terrain data stored in memory to generate a terrain image having a perspective view. An aircraft display coupled to the processor is configured to display the terrain image. [A818]

"Multiple signal receiver"

The present invention is an apparatus and method for simultaneously processing multiple communication and navigation signals. An apparatus of the present invention may comprise a single receiver with a direct radio frequency (RF) sampling front end, a single analog to digital converter, a digital downconverter and a digital signal processor. In an embodiment of the invention, the receiver of the present invention may simultaneously process navigation signals in the 108-118 MHz band and communication signals in the 118-137 MHz band. [A819]

"Reducing scattering center data using multi-volume aggregation"

In one example, a method to reduce scattering centers (SC) includes receiving a set of SC data points associated with an object in three-dimensional space, partitioning the SC data points into a plurality of volumes, aggregating the SC data points within each volume based on an aggregate threshold and combining the aggregated SC data points associated with each volume to form a reduced set of SC data points. The method also includes comparing the reduced set of SC data points with the received set of SC data points to determine if the reduced set of SC data points meets a set of comparison metrics and if the reduced set of SC data points meets the set of comparison metrics, increasing the size of the volumes and performing another iteration of reducing the SC data points by volume. [A820]

"Systems and methods for monitoring transponder performance"

There are presented various approaches to monitor performance of RF systems and circuitry such as those used in aircraft transponders. Such monitoring may be designed to verify operational performance of transponders as set forth by FAA regulations, or may be used to periodically or continually monitor integrity of transponder performance. Data may be collected by such periodic or continual monitoring, and may be analyzed to identify potentially troublesome trends in transponder performance, allowing early intervention or repair, if warranted. [A821]

"Adaptive weather radar detection system and method used in continental and maritime environments"

A method of detecting weather using a weather radar onboard an aircraft. A range is selected at which weather is to be detected. A tilt angle of the weather radar is changed to detect weather below an altitude of the aircraft at a selected range when the selected range includes a maritime environment. [A822]

"Multi-spot inverse synthetic aperture radar imaging"

Providing multi-spot inverse synthetic aperture radar (ISAR) imagery is disclosed. Embodiments of techniques in accordance with the present disclosure may advantageously improve multiple target discrimination, detection, identification, and tracking using ISAR imaging. In an embodiment, an inverse synthetic aperture radar (ISAR) method for producing multiple ISAR images from a single waveform includes transmitting a chirp signal into a dwell surveyed by the antenna beamwidth. Multiple dechirp reference signals may be generated to demodulate return signals from the dwell at multiple selected intervals within a pulse repetition interval (PRI) to create demodulated signals. [A823]

"Method and apparatus for compression of SAR images"

A computer system for compressing synthetic aperture radar (SAR) images includes a database for storing SAR images to be compressed, and a processor for compressing a SAR image from the database. The compressing includes applying an anisotropic diffusion algorithm to the SAR image, and compressing the SAR image after applying the anisotropic diffusion algorithm thereto. Applying the anisotropic diffusion algorithm includes determining noise in the SAR, selecting a noise threshold for the SAR image based on the determined noise, and mathematically adjusting the anisotropic diffusion algorithm based on the selected noise threshold. [A824]

"Rotary wing aircraft proximity warning system with a geographically based avoidance system"

A safety enhancement warning system includes an avoidance system which communicates with a multiple of geographical positional systems. A geographic algorithm of the avoidance system utilizes a recursive algorithmic to determine if the aircraft will enter a sensitive area. If the aircraft distance to a sensitive area decreases below a predefined minimum threshold, then an audible and/or visual warning is issued. for certain sensitive areas, aircraft RF emissions are silenced or reduced in power when the predetermined minimum threshold breaches the sensitive area. The use of the avoidance system enables usage of relatively inexpensive UWB radar for the proximity sensor suite to assure avoidance of interference with particular delicate instruments and thereby meet regulations such as those propagated by the FCC. [A825]

"Level measurement arrangement"

A level measurement arrangement for measurement of a level of a product in a container, comprising: a level sensor, having: a mounting element, including a process connector, for mounting the mounting element on a mating counter connector on an opening of the container, and a conductive probe segment extending from the mounting element into the container, a conductive probe extension (19) , having a first end, which is permanently fixed to an inner wall of the container, and having a second end, which is detachably connectable to an end of the conductive probe segment extending into the container, and sensor electronics comprising elements for generating and sending short electromagnetic pulses down the probe segment and the probe extension, elements for reception of the echoes of the pulses reflected at a surface of the product elements for determining the level of the product in the container, based on a time of flight needed for a pulse to travel down the probe segment and the probe extension, and its echo to return. [A826]

"Frequency modulated continuous wave (FMCW) radar having improved frequency linearity"

A frequency modulated continuous wave (FMCW) radar is described that comprises a frequency sweep generator for producing a swept frequency signal. A discriminator receives a portion of the swept frequency signal and produces a reference difference-frequency signal. The discriminator comprises an optical delay means, which may comprises a laser diode, an optical fibre and a detector for producing a time displaced frequency swept signal from which the difference-frequency signal is derived. A transceiver is also described that generates the signal to be transmitted by the radar from the swept frequency signal and produces a target difference-frequency signal. An analogue-to-digital converter (80) samples the target difference-frequency signal at a rate derived from the frequency of the reference difference-frequency signal. Use of the radar in various applications, such as detecting foreign object debris on airport runways and perimeter security, are also described. [A827]

"Synthetic aperture radar systems and methods"

A method of determining a radar receiver path, comprising the steps of: obtaining a transmitter position, obtaining a target position and velocity, obtaining a radar receiver position and velocity, determining a transmitter aspect angle gradient, a transmitter aspect angle time derivative and a transmitter co-state vector time derivative, determining a target aspect angle gradient, a target aspect angle time derivative and a target co-state vector time derivative, generating a radar platform heading variable, and a group of differential variables over a defined time span, inputting the group of differential variables into a differential equation solver, receiving a group of possible headings for the radar receiver path, and finding an optimum radar receiver path from the group of possible headings. [A828]

"Distributed and Cable reduced TCAS"

A direction finding antenna system for determining the relative bearing of a second aircraft from a first aircraft in conjunction with a Traffic Alert Collision Avoidance System (TCAS) . The system includes a first antenna and a second antenna located on a top surface of the first aircraft, spaced apart along a first axis, as well as a third antenna and a fourth antenna located on a bottom surface of the first aircraft, spaced apart along a second axis orthogonal to the first axis. The system further includes a transmitting, receiving, and processing system coupled to the first, second, third, and fourth antennas, wherein the transmitting, receiving, and processing system is configured to transmit TCAS interrogations, receive TCAS replies, and process the TCAS replies to determine the relative bearing of the second aircraft from the first aircraft. [A829]

"Method and device for imaging test objects by means of millimeter waves, in particular for inspecting individuals for suspicious objects"

A method for imaging test objects by millimeter waves, especially for checking individuals for suspicious objects is provided, whereby the test object is gradually irradiated with millimeter waves along its circumference and the scattered waves are received and evaluated in order to display an image of the test object. A viewing direction of the transmitting area and a direction of reception of the receiving area extend at an angle of 15.degree. to 70.degree., preferably 20.degree. to 35.degree. to the longitudinal axis of the test object. for evaluation of the scattered waves in the direction of the longitudinal axis of the test object, a pulse radar or FMCW radar technology is used, and for evaluation at an angle to the longitudinal axis, SAR technology is used. [A830]

"Method of measuring the speed of air by doppler radar"

A method of measuring the speed of air in a zone of the atmosphere by the Doppler effect by means of a radar, the method comprising the steps of transmitting bursts of three pulses at different rates F.sub.1, F.sub.2, F.sub.3, determining respective speeds V.sub.1, V.sub.2, V.sub.3 of the air from the pulses received in return from the pulses in each burst, and calculating the speed V of the air from the speeds V.sub.1, V.sub.2, V.sub.3 determined for the returned pulses received for each burst. [A831]

"Integrated attitude altimeter"

An aircraft electronics system is provided that includes a radar system, a display, an embedded global positioning/inertial navigation system (EGI) and a processor. The radar system is configured to generate aircraft operational data. The display is configured to display the aircraft operational data. The EGI is configured to generate aircraft behavior components and the processor configured to override the aircraft operation data displayed on the display when at least one of the aircraft behavior components is beyond a defined limit, wherein potentially incorrect aircraft operational data affected by at least one of the aircraft behavior component is not displayed. [A832]

"Methods and systems for reducing interference caused by antenna leakage signals"

In one aspect, a method of radar altimeter operation including a time dependent gain control is described. The method comprises triggering a Sensitivity Time Control (STC) gain control signal at a pulse repetition frequency (PRF) of a transmit pulse to attenuate interference from at least one of an antenna leakage signal and a signal reflected from equipment. The method also includes shaping the STC gain control signal from no attenuation at a first time, before a transmitter sends the transmit pulse, to a stable maximum attenuation at the time the transmitter sends the transmit pulse, to no attenuation at a second time, after the transmitter sends the transmit pulse. The method also includes matching a bandwidth of an intermediate frequency (IF) amplifier to the pulse width of a transmitted pulse. [A833]

"Pulse pattern for weather phenomenon and incursion detection system and method"

An aircraft radar system includes a radar antenna and a processing device. The processing device receives returns from the radar antenna associated with the scan. The processing device uses the returns from the scan for use in both incursion detection and weather phenomenon detection. A method for using the returns from the scan for both incursion detection and weather phenomenon detection is also disclosed. [A834]

"High precision surveillance system by means of multilateration of secondary surveillance radar (SSR) signals"

A system able to locate and identify aircraft and vehicles based on the reception and processing, with novel means and methods, of signals emitted by the transponder of the secondary surveillance radar, shortly SSR. The system has a number of fixed stations distributed in the area of interest, e.g. in the airport area, any signal (the well known SSR reply/squitter) transmitted by the on-board transponder is received by four or more stations and the measurement of three or more differences of times of arrival (TOA) permits the reconstruction of the position of the transponder in spite of the fact that the transmission time is unknown. Suitable algorithms based on optimal estimation enhance both the accuracy of TOA measurements and the accuracy of the reconstructed position. The effects of possible overlapping of signal in time are avoided or mitigated by multiple source separation techniques based on least squares algebraic processing. [A835]

"Classification system for radar and sonar applications"

A system and method for target classification for an aircraft surveillance radar is provided. In one implementation, the track classifier provides tracks with an updated probability value based on its likelihood to conform to aircraft and non-aircraft target behavior. The track classifier identifies false tracks that may arise from weather and biological targets, and can detect aircrafts lacking Secondary Surveillance Radar (SSR) data. Various features and combinations of features are evaluated using a proposed clustering performance index (CPI) and used to discriminate between aircrafts and false tracks. [A836]

"System and method for estimating airborne radar antenna pointing errors"

Methods and systems for estimating and correcting airborne radar antenna pointing errors. The methods and systems include predicting expected received power from at least one scattering source using terrain elevation information, transmitting a radar signal to the at least one scattering source, measuring received power from the at least one scattering source, determining an antenna pointing error based on the predicted and measured received power, and adjusting an antenna angle, an input value, or other components based on the determined antenna pointing error. The methods and systems also include a radar processing and control unit for predicting expected received power from at least one scattering source using a model of the radar power measurement process that includes terrain elevation information, for measuring received power from the at least one scattering source, and for determining antenna pointing error based on the predicted and measured received power. [A837]

"Subsurface imaging radar"

The present invention can be summarized by use of a diffraction limited SAR giving large integration angle and a short depth of field which gives that energy from underground targets is focused independently at different depths to enable 3d imaging. The radar device according to the invention should be implemented by considering the following parameters: Choice of the appropriate illumination geometry, i.e. elevation angle .theta., and the appropriate use of low frequency diffraction limited SAR processing to obtain 3D imaging, and the choice of an appropriately low radar frequency. [A838]

"Method and device for determining a decision height during an autonomous approach of an aircraft"

The subject of the invention is a method of aiding the piloting of an aircraft (3) , which is intended to aid the piloting of the aircraft during an autonomous approach to a landing runway (P) for the purpose of landing, said aircraft comprising at least one locating means (10, 12) , wherein: a) an estimated instant of arrival of the aircraft on the runway is determined, b) a prediction of the performance of said locating means of the aircraft at least at this instant of arrival is determined, and c) on the basis of said performance of the locating means and of characteristics of said approach, at least one minimum decision height (Hmin) corresponding to this instant of arrival is determined, above which the aircraft is protected from the risks of collision with the environment when it is guided automatically onto an approach axis (A) corresponding to said approach. The invention also relates to a device for implementing this method. [A839]

"Multi-target-tracking optical sensor-array technology"

The multi-target tracking and discrimination system (MOST) fuses with and augments existing BMDS sensor systems. Integrated devices include early warning radars, X-band radars, Lidar, DSP, and MOST which coordinates all the data received from all sources through a command center and deploys the GBI for successful interception of an object detected anywhere in space, for example, warheads. The MOST system integrates the optics for rapid detection and with the optical sensor array delivers high-speed, high accuracy positional information to radar systems and also identifies decoys. MOST incorporates space situational awareness, aero-optics, adaptive optics, and Lidar technologies. The components include telescopes or other optical systems, focal plane arrays including high-speed wavefront sensors or other focal plane detector arrays, wavefront sensor technology developed to mitigate aero-optic effects, distributed network of optical sensors, high-accuracy positional metrics, data fusion, and tracking mounts. Field applications include space monitoring, battlefield artillery, battlefield management, ground defense, air defense, space protection, missile defense, gunfire detection, and the like. [A840]

"Flight path-driven mitigation of wavefront curvature effects in SAR images"

A wavefront curvature effect associated with a complex image produced by a synthetic aperture radar (SAR) can be mitigated based on which of a plurality of possible flight paths is taken by the SAR when capturing the image. The mitigation can be performed differently for different ones of the flight paths. [A841]

"RFI suppression in SAR"

A filter scheme for broadcast interference cancellation that is computationally efficient and numerically robust Airborne Low Frequency Synthetic Aperture Radar (SAR) operating in the VHF and UHF bands has been shown. At least interference Doppler filtering or interference cancellation is utilised. The interference cancellation involves prediction of the interference for each particular reception interval of mixed interference and radar ground response. This prediction is then coherently subtracted from the incoming signal. [A842]

"Obstacle sensor operating by collimation and focusing of the emitted wave"

An obstacle sensor operating by collimation and focusing of the emitted wave comprises: a device (I) for insulating the electromagnetic waves emitted by a generator (1) , a device for the automatic control (12, 12') of the transmitter and of the sensor status, a device (15'/15'") for amplifying the power of the signals emitted and/or received, different shapes of output lens (14'/14'") of the antenna, with or without peripheral lobes (16) , associated or non associated to microwave sensors (19) . The sensor is associable to passive and/or active obstacle warning reflectors with the possibility of discriminating them not only if front but also side and above and below the horizon central azimuth, for road, aircraft and naval applications. [A843]

"Adaptive clutter filtering to improve high sub-clutter visibility radar detection performance"

In an aircraft-mounted Doppler radar clutter rejection system, a flexible, sharp band pass filter uses Taylor weighting, an FFT and a module for selecting which of the Doppler cells are to be activated, thus to control the band pass characteristic and set the clutter line to the speed of the aircraft. [A844]

"Systems and methods for automatically disabling a TCAS broadcast"

Systems and methods for automatically disabling the TCAS Broadcast when aircraft join up in formation. A Traffic Collision Avoidance System (TCAS) determines if the aircraft is approaching formation flight with other aircraft or flying in formation with other aircraft and disables a TCAS interrogation signal if the aircraft is determined to be approaching a formation or flying in formation. The TCAS receives TCAS interrogation signals from one or more other aircraft and receives aircraft configuration information from one or more other aircraft systems. The TCAS determines the aircraft is approaching formation flight or flying in formation based on the received TCAS interrogation signals, a mode of TCAS operation, and/or the received aircraft configuration information. The TCAS also automatically switches into Traffic Advisory Only mode if the aircraft is determined to be approaching formation flight or flying in formation. [A845]

"Target detection device and its detection method"

This invention relates to a target detection device and its detection method, comprising: a transmitting unit for transmitting a detecting pulse to detect target which then reflects the detecting pulse to generate a reflected pulse, a plurality of measuring units, located at different positions respectively which receive said reflected pulse and generates measured values of distance and measured values of velocity according to the reflected pulse received, a plurality of two-stage linear Kalman filters, corresponding to said plural measuring units respectively, each of said plural two-stage linear Kalman filters proceeds an operation according to the measured values produced by corresponding measuring unit so as to generate respectively the estimation values of distance, velocity and acceleration, an arithmetic unit connecting to said plural two-stage linear Kalman filters, which proceeds a triangulation operation according to said estimation values so as to generate distance component values, velocity component values and acceleration component values with respect to the target. [A846]

"Method and system for predicting air-to-surface target missile"

A method and system for predicting a trajectory of an air-to-surface target missile is provided, including detecting a plurality of echo wave signals from the target missile through a plurality of sensors deployed at various locations relative to the target missile, extracting at least one range distance and at least one radial velocity, respectively, from the detected echo wave signals from the sensors by using a hybrid FSK/LFM unit, using a two-stage Kalman filter to filter the computed range distance and radial velocity to obtain a relative distance, a relative velocity and a relative acceleration, respectively, of the target missile, and finally applying trilateration on the relative distance, relative velocity and relative acceleration of the target missile from each two-stage Kalman filter to obtain a location, velocity and acceleration along the x, y, z directions. [A847]

"Automatic bright band detection and compensation"

A weather radar system has bright band detection and compensation. The weather radar system determines that high reflectivity in weather is a bright band and reduces an encoded return level from the bright band to compensate for it on a display. The weather radar system detects the presence of the bright band using an inference system that uses outside air temperature, aircraft altitude, and an assumed lapse rate to estimate the bright band location relative to the aircraft and uses antenna elevation to estimate bright band range to reduce the encoded radar return level on the display. The weather radar system may also detect the presence of the bright band using a detection system that uses radar estimates from normal reflectivity scan operation of the system. The weather radar system may also use an active detection process separate from a normal radar sampling process to detect the bright band. [A848]

"Adaptive ground clutter cancellation"

The present invention refers to an airborne radar device (1) comprising at least two antennas (2, 3) and clutter suppressing means (4) . The radar device is arranged, via the antennas (2, 3) to send out radar pulses focused in main lobes (5) and the antennas are arranged to receive reflecting pulses. The antennas (2, 3) are separated from each other vertically. The radar device (1) comprises means (6) for transforming the received radar pulses into complex video signals in the form sequences of range bins (R.sub.k) . The video signals are represented in a first channel (K.sub.1) and a second channel (K.sub.2) . [A849]

"Method and apparatus for decompression of SAR images"

A computer system for decompressing synthetic aperture radar (SAR) images includes a database for storing SAR images to be decompressed, and a processor for decompressing a SAR image from the database. The decompressing includes receiving the SAR image, performing a dynamic range compression on the SAR image, and quantizing the compressed SAR image. The quantized compressed SAR image is then decompressed by applying an anistropic diffusion algorithm thereto. [A850]

"Method and apparatus for a multifunction radio"

A multifunction radio for receiving radio signals from and sending transmissions to multiple radio systems comprises an antenna and a transmit/receive switch coupled to the antenna. The radio further comprises a receiver section coupled to the transmit/receive switch and configured to receive radio signals from one or more multiple radio systems. The receiver section includes a digital downconverter configured to digitally downconvert radio signals sent from one or more of the multiple radio systems and a digital signal processor coupled to the digital downconverter for processing the downconverted signals. A transmitter section is coupled to the transmit/receive switch and configured to generate a transmission signal for reception by one or more of the multiple radio systems. [A851]

"Airport safety system"

An airport safety system is disclosed, comprising surface movement radar for monitoring the movement of aircraft and land vehicles on an airport, said surface movement radar providing a signal input to a computer arranged to identify from the relative motions of aircraft and vehicles detected by the radar in accordance with a pre-programmed set of rules an aircraft at risk of collision. The computer is also programmed to cause transmission by radio of an audible alert signal when a risk is predicted, said radio transmission being at a standard aircraft communication frequency, such as the standard ground communication VHF radio channel. The alert signal can alternatively be transmitted by one of a plurality of message transmitting devices arranged at different locations adjacent to airport runways and taxiways, each message transmitting device comprising a radio transmitter connected to antenna means arranged to radiate a signal within a predetermined area at the location. The radio transmitters operate at standard Marker beacon frequency amplitude modulated by said alert signal. The computer is programmed to identify the transmitting device adjacent to said aircraft at risk of collision and to direct said alert signal to the transmitting device so identified for transmission thereby. In this way, the alert signal could be directed to only the aircraft involved. [A852]

"Method of determining the velocity field of an air mass by high resolution doppler analysis"

A high resolution Doppler analysis of a radiofrequency signal is exemplified by the analysis of air mass movement using meteorological radar. A high resolution spectral analysis method for a remotely sampled periodic radiofrequency signal, based on the application of a trellis autoregressive filtering Burg algorithm, is used to determine the natural frequencies of the received signal for each distance cell based on the determination of an optimum set of reflection coefficients of the signal. Reflection coefficients are the object of a regularization operation aiming to limit the numerical instabilities of the calculations. These regularized reflection coefficients are used to estimate the effective order of the identification model of the trellis filter, and to determine the natural frequencies of the signal by determining the arguments of the complex roots of the polynomial representing the transfer function of the trellis filter. [A853]

"Restoration of signal to noise and spatial aperture in squint angles range migration algorithm for SAR"

A moving radar generates a search mode synthetic aperture image of a patch having a principal scatterer. The boundaries of the patch are from R.sub.0 to R.sub.1 slant range and .theta..sub.0 to .theta..sub.1 azimuth angle. A computer motion compensates digital samples to obtain a motion compensated digital array. The motion compensated digital array is converted to a frequency array in the frequency domain K.sub.x, K.sub.y The frequency array has a rectangular aperture extending .DELTA.K.sub.x and .DELTA.K.sub.y. Available samples from the frequency array are computed using a Range Migration Algorithm including a Stolt interpolation. Usable samples are identified from the available samples using one or more criteria. Usable samples are removed from available samples to obtain incomplete samples. Features related to the patch having a principal scatterer are extracted from the usable samples. The features are used to extrapolate extrapolated samples from the usable samples. The extrapolated samples, the usable samples and the incomplete samples are combined to compute the image of the patch and principal scatterer. Incomplete samples are substituted where they overlap interpolated samples. [A854]

"Location identification"

The location of a mobile terminal may be determined in response to signals received from a plurality of RFIDs. Information from a plurality of RFIDs for determining a location of a mobile terminal is received by the mobile terminal. The mobile terminal may maintain an in-range list that comprises all the RFIDs in which the mobile terminal is currently within their coverage range. The location of the mobile terminal is calculated in response to the received information for determining a location by calculating the common coverage area of the RFIDs in the in-range list. [A855]

"Method and system for radar tracking of moving target from moving station"

A method and system is proposed for use by a moving station (such as a jetfighter) for radar tracking of a moving target (such as an air-to-air missile) . The proposed method and system involves the use of a hybrid FSK/LFM (Frequency Shift Keying & Linear Frequency Modulation) scheme for acquiring a collection of raw radar data, a first Gaussian-noise filter array of one-stage linear Kalman filters for S/N-enhancement of the raw radar data, a trilateration module, and a second Gaussian-noise filter array of one-stage linear Kalman filters for S/N-enhancement of the trilateration-resulted radar data. These features allow the radar tracking of moving objects to be more fast and accurate. [A856]

"Systems and methods for a terrain contour matching navigation system"

Systems and methods for terrain contour matching navigation are provided. In one embodiment, a method for terrain contour matching navigation comprises: receiving at least one sample point representing the position of an aircraft, the at least one sample point including a horizontal position and an altitude sample, correlating a first sample point of the at least one sample point across a reference basket array having a plurality of elements, determining a correlation quality, when the correlation quality does not achieve a pre-determined quality threshold, performing at least one additional correlation of an additional sample point of the at least one sample point across the reference basket array, and when the correlation quality does achieve a pre-determined quality threshold, calculating a position error based on the correlating of the first sample point and any additional correlations of any additional sample points. [A857]

"System and method for monitoring airspace"

A method for receiving data corresponding to an aircraft in a monitored airspace, comparing the data to rules, each rule corresponding to a threat posed by the aircraft and generating a threat indication based on at least one of the rules triggered by the data. A system having a rule set including a plurality of rules corresponding to potential threats in a monitored airspace and an airspace monitor receiving data corresponding to aircraft in the monitored airspace and comparing the data to the plurality of rules, the airspace monitor generating a threat indication when the data triggers at least one of the rules. [A858]

"Method and system of interference detection for radar altimeters"

A method of detecting interference noise at a radar altimeter. The method comprises periodically emitting a pulse from the pulsed radar altimeter, periodically detecting a noise level in a noise gate, and determining if the noise level detected during each noise-level-detection period exceeds a noise threshold. The period of emitting the pulse is a pulse repetition interval and the noise gate is offset from other gates in the altimeter. If the noise level detected during a noise-level-detection period is greater than the noise threshold, a counter value is incremented by a selected incremental value for that noise-level-detection period and it is determined if the counter value is greater than a count threshold. [A859]

"Method for developing and using an image reconstruction algorithm for multipath scattering"

Described herein is an implementation of the IRAMS processing based upon a multi-delay-resolution framework applied to SAR image data measured at different aspect angles. The power of this new embodiment of IRAMS is that it produces a good separation of immediate response scatterer and delayed response scatterer data for the case of anisotropic scattering events, i.e., those in which the scattering intensity depends upon the aspect angle. Two sources of delayed response scattering include multiple reflection scattering events and delayed responses arising from the physical material composition of the scatterer. That is, this multi-delay-resolution IRAMS processing separates immediate response and delayed response scattering for cases in which there exist delayed response scattering data in the original SAR image data at some aspect angles, but the intensity of these delayed response scattering data is weak or non-existent at different aspect angles. Thus, this IRAMS embodiment provides the additional information of the particular aspect angles at which delayed response scattering effects are most important, thereby improving both the estimates of the delayed response scattering data and the immediate response scattering data. [A860]

"Program to generate an aircrew display aid to assess jam effectiveness"

The invention generally relates to the field of computer software particularly to an improved method of providing aircrew decision aids for use in determining the optimum placement of an Electronic Attack (EA) aircraft. The core of the invention is a software program that will dynamically provide the EA flight crew situational awareness regarding a threat emitter's coverage relative to the position of the EA aircraft and to the position of any number of protected entities (PE) . The software program generates information to provide visual cues representing a Jam Acceptability Region (JAR) contour, a Jam Assessment Strobe (JAS) and text for display on a number of flexibly configurable display formats posted on display units. The JAR and JAS graphics and text will aid the EA aircrew in rapidly assessing the effectiveness of a given jamming approach. [A861]

"Weather radar detection system and method that is adaptive to weather characteristics"

A method of detecting weather on an aircraft uses a weather radar system. The method includes determining a classification of weather and automatically adjusting the weather radar system in response to the classification of the weather. The classification of the weather can relate to weather type and maturity levels. [A862]

"Weather radar system and method using data from a lightning sensor"

A weather radar system or method can be utilized to determine a location of a weather hazard for an aircraft. The weather radar system can utilize processing electronics coupled to an antenna. The processing electronics can determine presence of the hazard in response to data related to returns received by the weather radar antenna and data from a lightning sensor. The system can include a display for showing the hazard and its location. [A863]

"Method and apparatus for a frequency diverse array"

Method and apparatus for a frequency diverse array. Radio frequency signals are generated by a plurality of independent waveform generators and simultaneously applied to a transmit/receive module. A progressive frequency shift is applied to all radio frequency signals across all spatial channels. Amplitude weighting signals are applied for sidelobe control. Phase control is included for channel compensation and to provide nominal beam steering. The progressive frequency offsets generate a new term which cause the antenna beam to focus in different directions as a function of range. [A864]

"Aircrew display aid to assess jam effectiveness"

The invention generally relates to the field of computer software particularly to an improved method of providing aircrew decision aids for use in determining the optimum placement of an Electronic Attack (EA) aircraft. The core of the invention is a software program that will dynamically provide the EA flight crew situational awareness regarding a threat emitter's coverage relative to the position of the EA aircraft and to the position of any number of protected entities (PE) . The software program generates information to provide visual cues representing a Jam Acceptability Region (JAR) contour, a Jam Assessment Strobe (JAS) and text for display on a number of flexibly configurable display formats posted on display units. The JAR and JAS graphics and text will aid the EA aircrew in rapidly assessing the effectiveness of a given jamming approach. [A865]

"Method and apparatus for 3-D sub-voxel position imaging with synthetic aperture radar"

A method and apparatus for determining three dimensional sub-voxel positions using synthetic aperture radar. The apparatus includes at least four non-coplanar, phase-coherent synthetic aperture radar (SAR) platforms comprising a plurality of phase-synchronized local oscillators cohered to a common reference clock, a first SAR platform of the SAR platforms operable to transmit a radar waveform, and the SAR platforms operable to receive scattered energy waveforms resulting from the radar waveform and operable to generate two-dimensional (2-D) SAR images based on the received scattered energy waveforms. The apparatus also includes a synchronizing processor operable to communicate with the SAR platforms and operable to synchronize a plurality of SAR transmission and receiving intervals for the SAR platforms. Optionally, the apparatus also includes an image-coregistration processor operable to receive at least four 2-D SAR images from the SAR platforms, and operable to generate a 3-D SAR image having 3-D voxel positions by coregistering the 2-D SAR images. Optionally, the apparatus also includes a sub-voxel position processor operable to calculate sub-voxel positions of single point scatterers from differential phase measurements on a given voxel across all of the SAR platforms. [A866]

"Method and apparatus for processing SAR images based on an anisotropic diffusion filtering algorithm"

A computer system for processing synthetic aperture radar (SAR) images includes a database for storing SAR images to be processed, and a processor for processing a SAR image from the database. The processing includes determining noise in a SAR image to be processed, selecting a noise threshold for the SAR image based on the determined noise, and mathematically adjusting an anisotropic diffusion algorithm based on the selected noise threshold. The adjusted anisotropic diffusion algorithm is applied to the SAR image. [A867]

"Airborne biota monitoring and control system"

A method and system, which may be implemented in some embodiments as a video game, for identifying harmful airborne biota, particularly flying insects, and either killing or disabling the harmful airborne biota is disclosed. Lasers, radar, and other types of radiation may be used to illuminate objects in a detection region, with radiation returns detected and applied to a pattern classifier to determine whether the detected airborne biota are harmful, benign or beneficial. Tracking and classification information may be provided to a remotely located game participant who may be permitted to control measures taken to eliminate the harmful airborne biota, these measures including firing pulses of beamed energy or radiation of a sufficient intensity to at least incapacitate them, or mechanical measures such as flying a remotely-controlled miniature unmanned aircraft to engage and kill the pests. [A868]

"Mode S radar"

Disclosed is a Mode S radar which specifies an aircraft by transmitting interrogations to an aircraft A equipped with a Mode S transponder, and by then receiving and decoding replies corresponding to these interrogations. In the Mode S radar, detection reports on the aircraft A are generated in a manner that: for a Mode A code necessary for generating detection reports, when identicalness between the Mode A codes obtained in a plurality of scans after the initial acquisition of the aircraft A has been found to exist, the Mode A code thus found identical is adopted without carrying out a Mode A code interrogation (UF=5) thereafter. Accordingly, the Mode S secondary surveillance capable of generating more highly reliable detection reports is achieved. [A869]

"Synthetic aperture design for increased SAR image rate"

High resolution SAR images of a target scene at near video rates can be produced by using overlapped, but nevertheless, full-size synthetic apertures. The SAR images, which respectively correspond to the apertures, can be analyzed in sequence to permit detection of movement in the target scene. [A870]

"Method and apparatus to improve ADS-B security"

Security of ADS-B transmissions is improved in a first embodiment to detect position spoofing. The annunciated position source may then be compared with the derived source and a determination is made regarding the difference between the results. Any position difference greater than an amount significantly greater than the combination of the error sources is then a cause for concern and can be used to generate an alert. In a second embodiment, alerting may be based on identification spoofing. From these sources a correlated ID is available which will have an associated confidence based on the number of sources and the level of agreement on the information. Aircraft dynamics may be correlated with the announced ID for consistency. A priori information on the aircraft and location, such as schedule information, and normal operations, may be used to assist in the confidence of aircraft identity. In a third embodiment, alerting may be based on spoofing of identity and position. [A871]

"Single air traffic control (ATC) operator interface"

Systems and methods for communication using a plurality of data link standards through a common operator interface are disclosed. In one embodiment, the system includes components configured to select and establish communication with an air traffic control center using one of a plurality of data link standards. The system further includes components configured to format at least one downlink page to only allow appropriate data inputs based on one or more functionalities of the data link standard, and encode one or more entered data inputs based on the selected data link standard and transmit the inputs to the air traffic control center. In a particular embodiment, the system further includes a components configured to receive and display each of the decoded uplink data transmission in a text message on a corresponding uplink display page according to one or more message text conventions of the selected data link standard. [A872]

"Declutter of graphical TCAS targets to improve situational awareness"

Traffic collision and avoidance systems and methods for a host aircraft. The system receives traffic information from one or more target aircraft, determines threat levels of target aircraft associated with the received traffic information, generates one or more objects based on the determined threat levels and a pre-defined threat level, and displays the generated one or more objects that are associated with threat levels within the pre-defined threat level. A first indicator that indicates lateral position relative to the host aircraft and a second indicator that indicates vertical direction of travel of the associated target aircraft are also displayed. [A873]

"Airfield surface target detection and tracking using distributed multilateration sensors and W-band radar sensors"

An airport surface target detection, classification and tracking system using a network of multilateration (SSR) sensors and W-band radar sensors is used to provide automatic location and tracking information about ground moving aircraft or targets. The information from the distributed sensors are coordinated to provide accurate location and tracking information for coordination of surface traffic and navigation within an airport. [A874]

"Threat detection system"

An optical detection system for detecting launch of an offensive projectile. The detection system includes an image detector array, an optical arrangement for focusing on to the image detector array, and a processing system associated with the image detector array. The processing system is configured to derive a series of frames from the image detector, to process the series of frames to identify a flash event and to generate and output that indicates a direction of the flash event. [A875]

"Collision risk prevention equipment for aircraft"

This equipment is of the TCAS type. In order to improve its integrity and the reliability of its measurements, its computing unit is provided with a cross-checking function carrying out the comparison between two values of a same parameter, for example a relative distance with respect to an intruder, one of them generated by its own estimating means and the other communicated by another TCAS equipment installed on the intruding aircraft and generating a discordance alarm in the case of the observed difference exceeding a tolerance threshold. The computing unit is provided with fault locating means locating the aircraft whose TCAS is faulty when in the presence of several intruding aircraft, by examining the observed differences in pairs of values of a same parameter established for each intruding aircraft. [A876]

"Weather profile display system and method with uncertainty indication"

A weather radar system includes processing electronics. The processing electronics sense weather and determine an uncertainty factor. A display can provide visual indicia of the uncertainty factor for weather in response to the processing electronics. The display can be a vertical profile display. The weather radar system can be an avionic weather radar system. [A877]

"Automatic bright band detection and compensation"

A weather radar system has bright band detection and compensation. The weather radar system determines that high reflectivity in weather is a bright band and reduces an encoded return level from the bright band to compensate for it on a display. The weather radar system detects the presence of the bright band using an inference system that uses outside air temperature, aircraft altitude, and an assumed lapse rate to estimate the bright band location relative to the aircraft and uses antenna elevation to estimate bright band range to reduce the encoded radar return level on the display. The weather radar system may also detect the presence of the bright band using a detection system that uses radar estimates from normal reflectivity scan operation of the system. The weather radar system may also use an active detection process separate from a normal radar sampling process to detect the bright band. [A878]

"Methods and systems for producing an interpretive airborne radar map"

Systems and methods for identifying and uniquely displaying ground features (terrain/obstacles) that are shadowed from an aircrafts radar system. An example system includes one or more aircraft information, sources, a database that stores three-dimensional terrain/obstacle data, a display device, and a processor in data communication with the one or more aircraft information sources and the database. The processor receives aircraft position, heading and altitude information from the one or more aircraft information sources. The processor projects a vector in a three-dimensional digital space onto the three-dimensional terrain/obstacle data stored in the database based on the received aircraft position, heading and altitude information to determine if the projected vector intersects more than one terrain feature. If the feature is intersected by the vector and the feature is further away from the aircraft than another feature that is also intersected by the vector, it is uniquely displayed on the display device. [A879]

"Methods and systems for piecewise curve fitting or radar altimeter range gate data"

A method for compensating for range gate slide with respect to received returns within a radar altimeter is described. The method includes adjusting the amount of overlap between a range gate pulse and a radar return signal until an altitude output by the radar altimeter is within a desired tolerance, and incrementally increasing an amount of attenuation within the receiver circuit of the radar altimeter until the radar altimeter breaks track with the radar return signal. the method also includes recording a signal strength and altitude output at each increment of attenuation, determining an altitude error for each altitude output, and fitting the signal strength data against the altitude error using a plurality of variable length line segments. [A880]

"Adaptive weather radar detection system and method"

A method of detecting weather on an aircraft uses a weather radar system. The method adapts the weather radar system in accordance with a seasonal parameter, a time-of-day parameter, or a location parameter. The method includes determining the particular parameter and automatically adjusting the weather radar system to display the weather in response to the parameter. The system can be implemented in hardware or software and advantageously can more precisely predict and identify weather and/or weather hazards. [A881]

"Surface vehicle transponder"

Systems and methods for alerting surrounding aircraft if a ground-based unit is a threat. One example system is located on a ground-based unit. The system includes a position sensor that senses position of the ground-based unit, a memory that stores predefined threat zone information, a transmitter that transmits a predefined transponder signal, and a processor in data communication with the position sensor, the memory, and the transmitter. The processor instructs the transmitter to transmit the transponder signal based on the threat zone information and the sensed position of the ground-based unit. [A882]

"Method and system for elliptical-based surveillance"

A method and system are provided for performing elliptical-based and hybrid surveillance, performing false target detection and resolution, and performing integrity monitoring using one or more receiving and transmitting elements time synchronized to a common precision time reference, and a central workstation. Antennas for transmitting and receiving elements are located at known positions separated from one another. At a given time, one of the transmitting elements transmits an interrogation signal to one or more targets, which respond to the interrogation with a reply transmission, received by one or more receiving elements. The central workstation calculates each target's ellipse of position with respect to each receiving element, using the interrogator element time of interrogation measurement and each receiving element's time of arrival measurement for the corresponding reply transmission, and then fuses the elliptical line of positions for each receiving element to compute target positions or augment passive surveillance position. At a scheduled time, the one or more transmitting elements transmit a reference signal to the receiving elements (s) . The central workstation uses each of the receiving elements time stamped signals to perform integrity monitoring. [A883]

"Systems and methods for dedicating power to a radar module"

Systems and methods presented herein are generally directed to providing power to a radio frequency module of a radar antenna. for example, a system comprises a dedicated power cell that supplies a power signal and includes a dedicated solar power module that generates electrical energy for the power signal. The system also comprises a dedicated signal conditioner coupled to the power cell and to the radio frequency module, the signal conditioner conditioning the power signal for use by the radio frequency module. The radio frequency module receives conditioned power from the signal conditioner to use in processing a radio frequency signal. The radio frequency module may be a Synthetic Aperture Radar ("SAR") that comprises one or more radiating elements to transmit pulsed electromagnetic energy for use in radar processing. The SAR may also comprise a receiver that receives the pulsed electromagnetic energy reflected from a target. [A884]

"Built-in missile RADAR calibration verification"

Array antenna calibration verification coupling interrogator and responder with mode-related interrogation signal having a previous calibration phase angle, producing in responder a characteristic interrogation response. Conjugate signal is generated by reversing phase of interrogation signal, producing in responder a characteristic conjugate response. Interrogation and conjugate responses sensed and combined to determine difference characteristic for responder array element. Responder difference characteristic iteratively determined for elements in antenna array representative of present calibration verification state. Present and previous calibration verification states compared, with significant variation adapting array to desired calibration verification state. Verification processor controls interrogator, responders, and signals providing built-in missile RADAR calibration verification. [A885]

"Method and system of improving altimeter accuracy by use of a separate peak return signal tracking"

A method to control a track gate and a level gate in an altimeter tracking an altitude of an airborne vehicle comprising emitting signals, directed toward a terrain, from the airborne vehicle, receiving terrain echo signals, positioning the track gate to a selected reference amplitude on the rising edge of the terrain echo signals, positioning the level gate to within a selected range of the peak amplitude level of the terrain echo signals, measuring a change in a location of the peak amplitude between sequentially received terrain echo signals, and varying a separation between the track gate and the level gate based on the measured change in the location of the peak amplitude. The terrain echo signals comprise reflections of the emitted signals from the terrain, and each terrain echo signal has a rising edge and a peak amplitude. [A886]

"Panoramic warning system for helicopters"

A panoramic warning system for helicopters, for the purpose of detecting obstacles and the proximity of the ground by using a plurality of radar sensors connected to the fuselage structure of the helicopter and which operate on varying wavelengths, the signals of which, representing range information, which are provided with an individual identifier, are compared in a central identification-and-evaluation unit with predetermined warning thresholds and after the assignment to corresponding scan sectors are caused to be displayed on at least one cockpit display. [A887]

"Distributed radar data processing system"

A distributed radar data processing system for generating data to be supplied to air traffic control by processing radar data obtained from a radar device, comprises a plurality of data buses provided in accordance with types of flowing data, a plurality of applications which is distributed and allocated to each of a plurality of hierarchical layers separated by the plurality of data buses, and connected to two of the data buses configuring a particular layer to realize a predetermined function, and a distribution and integration interface for controlling a connection between the plurality of applications. [A888]

"Removing interfering clutter associated with radar pulses that an airborne radar receives from a radar transponder"

Interfering clutter in radar pulses received by an airborne radar system from a radar transponder can be suppressed by developing a representation of the incoming echo-voltage time-series that permits the clutter associated with predetermined parts of the time-series to be estimated. These estimates can be used to estimate and suppress the clutter associated with other parts of the time-series. [A889]

"Apparatus and method for adjusting optimum tilt of radar cover according to weather conditions"

There are provided systems and methods for adjusting the tilt of a radar cover in response to change of weather condition by calculating dielectric constant of external air, optimum thickness of radar cover, and then optimum tilt angle of radar cover, and adjusting the position of the radar cover. [A890]

"Method and system for developing and using an image reconstruction algorithm for detecting and imaging moving targets"

Image reconstruction approaches that use standard Cartesian-sampled, frequency-domain SAR data, which can be collected by a platform with a single radar antenna, together with its associated metadata as the input and generate an output comprised of a set of images that show the directions of moving targets, estimates of their motions, and focused images of these moving targets. [A891]

"Coupler with waveguide transition for an antenna in a radar-based level measurement system"

A mechanism for coupling a coaxial waveguide to another waveguide. The mechanism includes a lower or matching waveguide and an impedance transformer. A coaxial port couples the coaxial waveguide to the matching waveguide. The matching waveguide has a waveguide impedance which is close to the impedance of the coaxial waveguide. This arrangement allows matching between the coaxial waveguide and the matching waveguide over a wider frequency band. The impedance transformer couples the matching waveguide to the other waveguide. The impedance transformer comprises a single-stage, double-stage, or multi-stage transformer. The mechanism is suitable for coupling an antenna to a coaxial cable interface in a radar or microwave based level measurement or time of flight ranging systems. [A892]

"Methods and systems utilizing Doppler prediction to enable fusing"

A radar processor for controlling detonation of a munition and operable to receive a detonation altitude from an external source is provided. The radar processor is configured to set a first range gate and a reference range gate based on the received detonation altitude, and cause a radar transmitter to operate in a continuous wave mode, for a predetermined period, upon receipt of radar return signals through the first range gate. The radar processor calculates a velocity of the munition from continuous wave return signals, and calculates a time delay for outputting a detonation signal based on the received detonation altitude, the calculated velocity, and a reference altitude of the munition, the altitude of the munition calculated based upon receipt of radar return signals through the reference range gate. The radar transmitter operates in a pulse mode while the munition is outside the reference range gate. [A893]

"Method and apparatus for processing complex interferometric SAR data"

A computer system for processing interferometric synthetic aperture radar (SAR) images includes a database for storing SAR images to be processed, and a processor for processing interferometric SAR images from the database. The processing includes receiving first and second complex SAR data sets of a same scene, with the second complex SAR data set being offset in phase with respect to the first complex SAR data set. Each complex SAR data set includes a plurality of pixels. An interferogram is formed based on the first and second complex SAR data sets for providing a phase difference therebetween. A complex anisotropic diffusion algorithm is applied to the interferogram. The interferogram includes a real and an imaginary part for each pixel. A shock filter is applied to the interferogram. The processing further includes performing a two-dimensional variational phase unwrapping on the interferogram after application of the shock filter. [A894]

"Object detection method and apparatus"

Method and apparatus for detecting objects. In one embodiment, a person entering a secured zone is illuminated with low-power polarized radio waves. Differently polarized waves which are reflected back from the person are collected. Concealed weapons are detected by measuring various parameters of the reflected signals and then calculating various selected differences between them. These differences create patterns when plotted as a function of time. Preferably a trained neural network pattern recognition program is then used to evaluate these patterns and autonomously render a decision on the presence of a weapon. An interrupted continuous wave system may be employed. Multiple units may be used to detect various azimuthal angles and to improve accuracy. [A895]

"Systems and methods for handling information from wireless nodes, including nodes for communication with aircraft"

Systems and methods for handling information from wireless nodes, including nodes for communication with aircraft, are disclosed. A system in accordance with one aspect of the invention includes a sensor configured to sense information corresponding to a characteristic of a wireless node. The wireless node can be one of a plurality of wireless nodes configured to transmit and receive wireless signals. The wireless nodes can also be linked to a non-wireless network portion. The system can further include a transmitter configured to transmit the information via the network, and a receiver operatively coupled to the transmitter to receive the information via the network. Accordingly, the system can be used to automatically identify and track diagnostic information corresponding to the state of one or more wireless nodes. [A896]

"Method and system for calibrating radar altimeters"

A method for calibrating an altimeter is disclosed. The method comprises monitoring signal strength of one or more altitude measurements. Based on the signal strength, the method applies piecewise linear altitude correction to the one or more altitude measurements to generate altitude correction data. The method further determines a goodness-of-fit for the altitude correction data. The altitude correction data maintains a correct altitude measurement in the presence of variable signal strength. [A897]

"Precision pulse detection system for radar sensors"

A precision pulse detection system for time-of-flight sensors detects a zero axis crossing of a pulse after it crosses above and then falls below a threshold. Transmit and receive pulses flow through a common expanded-time receiver path to precision transmit and receive pulse detectors in a differential configuration. The detectors trigger on zero axis crossings that occur immediately after pulse lobes exceed and then drop below a threshold. Range errors caused by receiver variations cancel since transmit and receive pulses are affected equally. The system exhibits range measurement accuracies on the order of 1-picosecond without calibration even when used with transmitted pulse widths on the order of 500 picoseconds. The system can provide sub-millimeter accurate TDR, laser and radar sensors for measuring tank fill levels or for precision radiolocation systems including digital handwriting capture. [A898]

"Collision alerting and avoidance system"

A collision alerting and avoidance system for use in an aerial vehicle is presented herein. The system comprises a one low profile antenna array disposed on the aerial vehicle. A transmitter/receiver probe is coupled to the antenna array. The transmitter/receiver probe is configured to transmit electromagnetic waves and to receive an echo signal reflected from a threat obstacle. At least one transmitter/receiver module is coupled to the transmitter/receiver probe. The transmitter/receiver module is configured to produce electromagnetic waves for transmission and to receive the echo signal. A processor coupled to the plurality of transmitter/receiver modules controls the transmission of electromagnetic waves from the antenna array and processes the echo signal to provide an output signal containing information regarding the obstacle. [A899]

"Active phased array antenna for aircraft surveillance systems"

An active antenna is provided that includes an antenna element for transmitting RF transmit signals at a predetermined effective radiated power (ERP) . An antenna module is configured to be mounted to an aircraft, with the antenna element being mounted to the antenna module. A connector module is provided at the antenna module and is configured to be coupled to a communications link and receive electrical transmit signals from the communications link. A transmit path is provided within the antenna module and extends between the antenna element and the connector module. A power amplifier is provided on the antenna module along the transmit path. The power amplifier increases a power level of the electrical transmit signals, received from the communications link, by a predetermined amount sufficient to drive the antenna element to transmit the RF transmit signals at the predetermined ERP. [A900]

"Multipath resolving correlation interferometer direction finding"

Apparatus and a method utilizing correlation interferometer direction finding for determining the azimuth and elevation to an aircraft at long range and flying at low altitudes above water with a transmitting radar while resolving multipath signals. The signals from the radar are received both directly and reflected from the surface of the water using horizontally polarized and vertically polarized antenna arrays, are digitized and are stored in separate covariant matrices. Eigenvalues for the eigenvectors of the matrices processed on signal samples recorded on horizontally polarized X arrays are compared to the eigenvalues for the eigenvectors of the covariance matrices processed on signal samples recorded on vertically polarized X arrays. Incident field polarization is associated with the antenna array measurements that yield the strongest eigenvalue. The eigenvector and eigenvalues for the strongest signal are selected and used for subsequent signal processing. An initial global search assuming mirror sea-state reflection conditions using the signal eigenvector having the strongest eigenvalue is performed to yield an approximate elevation .alpha. and azimuth .beta. to the aircraft. The approximate values are then used as the starting point for a subsequent conjugate gradient search to determine accurate elevation .alpha. and azimuth .beta. to the aircraft. [A901]

"Combined aircraft TCAS/transponder with common antenna system"

The present invention is a combined aircraft TCAS/Transponder with common antenna system and transmitter. Common TCAS/Transponder multi-monopole top and bottom antennas may be connected to a top and bottom antenna modules, the top and bottom antenna modules being electrically coupled to the combined TCAS/Transponder transmitter/receiver block through connection lines. [A902]

"Controlling data collection to support SAR image rotation"

A desired rotation of a synthetic aperture radar (SAR) image can be facilitated by adjusting a SAR data collection operation based on the desired rotation. The SAR data collected by the adjusted SAR data collection operation can be efficiently exploited to form therefrom a SAR image having the desired rotational orientation. [A903]

"Millimeter wave imaging system"

A millimeter wave imaging system. The system includes at least one millimeter wave frequency scanning antenna for collecting frequency dependent beams of millimeter wave radiation from a narrow one-dimensional field of view, a millimeter wave amplifier for amplifying at the collected frequencies said millimeter wave radiation. A beam-former separates the amplified radiation to produce frequency dependent signals corresponding to the frequency dependent beam. The beam-former includes delay lines, a millimeter wave lens, and an array of millimeter wave power detectors for detecting the power in each frequency dependent beam. A sampling circuit reads out the frequency dependent signals to produce a one-dimensional image of the antenna field of view. A two dimensional image of a target may be obtained by moving the target across the field of view of the scanning antenna or by moving the antenna in order to scan its line of focus over the target. In preferred embodiments a 2.times.2 Dicke switch is provided to permit sampling a reference thermal source for gain control while continuing to collect image information. This 2.times.2 Dicke switch provides a square root of 2 improvement in temperature sensitivity over a single receiver version. Preferred embodiments also include features for focusing the antenna within a range of about 5 feet to infinity. [A904]

"Device and method for calibrating and improving the accuracy of barometric altimeters with GPS-derived altitudes"

In a combined GPS/altimeter device, the calibration and hence the accuracy of barometric altimeter measurements are enhanced with the aid of derived altitudes from a GPS. The device determines the need for calibration and perform the subsequent computations necessary to facilitate the calibration. Furthermore, the device determines a correction quantity that should be applied to barometric altitude readings, thereby allowing the device to be calibrated while in motion. Both of these features ultimately result in a more accurate determination of altitude. [A905]

"Aircrew aid to assess jam effectiveness"

The invention generally relates to the field of computer software particularly to an improved method of providing aircrew decision aids for use in determining the optimum placement of an Electronic Attack (EA) aircraft. The core of the invention is a software program that will dynamically provide the EA flight crew situational awareness regarding a threat emitter's coverage relative to the position of the EA aircraft and to the position of protected entities (PE) . The software program generates information to provide visual cues representing a Jam Acceptability Region (JAR) contour and a Jam Assessment Strobe (JAS) for display via designated aircraft cockpit processors and devices. The JAR and JAS will aid the EA aircrew in assessing the effectiveness of a given jamming approach. [A906]

"Spectral tracking"

A method of tracking a target. The method includes the steps of acquiring a first spectral image of a scene that includes the target, designating a spectral reference window, in the first spectral image, that includes a respective plurality of pixel vectors, acquiring a second spectral image, of the scene, that includes a respective plurality of pixel vectors, and hypercorrelating the spectral reference window with the second spectral image, thereby obtaining a hypercorrelation function, a maximum of the hypercorrelation function then corresponding to a location of the target in the scene. [A907]

"Method and apparatus for improving ADS-B security"

Security of ADS-B transmissions is improved in a first embodiment to detect position spoofing. The annunciated position source may then be compared with the derived source and a determination is made regarding the difference between the results. Any position difference greater than an amount significantly greater than the combination of the error sources is then a cause for concern and can be used to generate an alert. In a second embodiment, alerting may be based on identification spoofing. From these sources a correlated ID is available which will have an associated confidence based on the number of sources and the level of agreement on the information. Aircraft dynamics may be correlated with the announced ID for consistency. A priori information on the aircraft and location, such as schedule information, and normal operations, may be used to assist in the confidence of aircraft identity. In a third embodiment, alerting may be based on spoofing of identity and position. [A908]

"Method and system of three-dimensional positional finding"

The present invention is an RF system and methods for finding a target T in three dimensional space configured to have a transponder disposed on the target T, a monitoring unit configured as a transceiver for determining or monitoring the location of the target T and an RF wireless communication system configured with a processor to repeatedly determine position, communication and other values between the transponder and monitoring unit and so as to generate a measured distance between units in three dimensional space by determining the measured distance of the target T by a spherical virtual triangulation relationship when successive values of said position information has a predetermined logical relationship relative to said previous values between said monitoring unit and transponder and/or slave unit disposed on the target T. [A909]

"Method of operating a multibeam radar"

A method of operating a multibeam radar carried on a platform flying a mission over a prescribed flight path to obtain images of a plurality of target areas, the beams of said radar being the result of respective transmit pulses and beam returns being received by respective receive windows. A range of pulse repetition frequencies and pulse repetition frequency change rates are used in an iterative process to determine non-collision alignments of any combination of transmit pulses and receive windows. When a non-collision alignment is determined the particular arrangement producing that non-collision alignment is used in a simulated flight of the platform to determine dwell time before a collision occurs. An arrangement that produces sufficient dwell time to accomplish a mission is then used in an actual flight of the platform. [A910]

"Monopulse radar estimation of target altitude at low angles of elevation"

A monopulse radar operating at low angles of elevation (LOE) receives returns from a target by a direct path and by a path including a reflection from that portion of the Earth's surface lying between the radar and the target. The surface-reflected signal tends to cause errors in the estimate of the elevation of the target. A radar system directs at least upper and lower overlapping beams at LOE toward the target for receiving returns. The upper and lower beams may be sequential or simultaneous. Real and imaginary portions of the sum (.SIGMA.) and difference (.DELTA.) signals are generated for each beam. The monopulse estimates of elevation derived from the real portion of the .SIGMA. and .DELTA. signals are processed to produce correction signals for upper and lower beams. Each correction signal is weighted and summed to correct the estimate of elevation. [A911]

"Methods and apparatus for providing target altitude estimation in a two dimensional radar system"

Method and apparatus to track a contact using a sensor in a two-dimensional radar system, determine a closest point of approach (CPA) for the contact, determine a time to closest point of approach (TCPA) for the contact, and estimate an altitude for the contact from the closest point of approach (CPA) and a cross line of sight distance during the time to closest point of approach (TCPA) . [A912]

"Weather radar with significance determination"

A weather radar system includes processing electronics. The processing electronics sense weather and determine significant weather based upon the altitude of the weather. The altitude of the weather can be compared to a flight path to determine its significance. A display can provide visual indicia of the significant weather in response to the processing electronics. [A913]

"Removal of spurious aircraft detections on weather radar"

A weather radar detects and removes spurious aircraft from a weather radar display by using one of the methods of differentiating radar return length, estimating a vertical gradient of reflectivity, tracking radar returns into regions that are eliminated from the weather display to provide differentiation, tracking areas of radar returns that allow detection and removal of the spurious aircraft in relative geometries, differentiating Doppler velocity, and differentiating spectral width. The methods may be used individually or in combination to improve performance. [A914]

"Low frequency asset tag tracking system and method"

An apparatus and method for low frequency asset tracking includes a low frequency transmitter tag associated with a cargo container or other high value commodity, a plurality of receivers that detect low frequency signals, and a microprocessor that uses algorithms and/or data pertaining to the propagation characteristics of the signal to locate the position of the container or high value commodity. The tag may include sensors to monitor container properties or conditions, such as temperature, motion, intrusion, RF fields, or other properties of interest. Sensor data may be modulated on the low frequency transmitter signal. [A915]

"System for monitoring airport area"

A system is for recognizing obstructions and monitoring movements on or above an airport area (1) with sensors (2, 3, 4) . A sensor (2) is a radar device having a plurality of antenna elements (12, 14) , which are affixed to a curved surface (15) of an antenna carrier (2a) and are turned on, one after the other, in terms of time. Thus a first part of the antenna elements (14) is disposed on a first circular line (13) on the surface of the antenna carrier (2a) , and a second part of the antenna elements (12) is disposed on a circular line (15) perpendicular to the first circular line (13) . Therefore the data of the radar device (2) are evaluated in a first ROSAR process, to image the situation on the ground, and in a second ROSAR process, to image the heights of the flying objects to be observed. [A916]

"Maximum-likelihood rocket identifier"

A sensor suite determines location and velocity information relating to a missile threat, which is converted to missile or rocket state estimates. The state estimates are transformed into time-invariant dynamic parameters, unique for each missile type. Estimated rocket dynamic parameters are computed for each target type being considered, and compared with a reference set of rocket parameters representing different target types. The estimated rocket parameters are compared with the reference parameters in a maximum-likelihood sense, and combined using fuzzy logic to identify the rocket type and the likelihood. The identified rocket type and likelihood is used to aid in determining the future location of the missile so countermeasure can be applied. [A917]

"Systems and methods for presenting vertical weather information on plan view displays"

Systems and methods for presenting vertical weather information on plan view displays. An example method retrieves weather radar return information stored in a volumetric buffer and determines if a weather anomaly of the retrieved weather radar return information is above or below a predefined threshold from a present flight altitude of an aircraft. If a weather anomaly is determined to be above the threshold from the aircraft's present flight altitude, a first image is generated in a first geometric pattern and displaying the first image on a plan view display. If the weather anomaly is determined to be below the aircraft's present flight altitude, a second image is generated in a second geometric pattern and displaying the second image on the plan view display. The first geometric pattern is different from the second geometric pattern. [A918]

"Synthetic aperture radar (SAR) data compression"

A method of compressing phase history (PH) data includes (a) dividing PH data into multiple sub-apertures, (b) transforming the sub-apertures into multiple coarse resolution images, and (c) compressing each of the coarse resolution images. Compressing each of the coarse resolution images may include (i) selecting at least one image from the coarse resolution images to form a base image, (ii) differencing each of the coarse resolution images from the base image to form residual images, and (iii) quantizing the residual images. [A919]

"Method and device for determining a reference value of a response, in particular of a mode S response received by a secondary radar"

The present invention applies to the surveillance of, in particular civil, air traffic, and more particularly, to cooperative aircraft ground systems which make it possible to pinpoint in radial distance and in azimuth the aircraft present in a certain volume and to interrogate them. A method and a device which makes it possible to determine a reference value of a response contained in a reception signal of a secondary radar, doing so even in the presence of strong pollution, in particular in the event of nesting between mode S responses. for this purpose the position of the pulses present is tagged in the reception signal, potential positions of pulses of the response considered are determined, time windows are selected, each time window tagging in the reception signal a stable part of a pulse whose position has been tagged and whose tagged position coincides with a determined potential position, the reference value being the value taken predominantly by samples of the reception signal, these samples being situated in the selected time windows. [A920]

"Plume-to-hardbody offset compensation in boosting missiles"

A methodology determines the offset distance between a threat missile plume and its hardbody during boost phase to aid in guiding a kinetic weapon (KW) or interceptor missile to the threat missile hardbody using the KW infrared sensor of the interceptor missile in conjunction with a radar sensor. [A921]

"SAR image formation with azimuth interpolation after azimuth transform"

Two-dimensional SAR data can be processed into a rectangular grid format by subjecting the SAR data to a Fourier transform operation, and thereafter to a corresponding interpolation operation. Because the interpolation operation follows the Fourier transform operation, the interpolation operation can be simplified, and the effect of interpolation errors can be diminished. This provides for the possibility of both reducing the re-grid processing time, and improving the image quality. [A922]

"Correction of motion measurement errors beyond the range resolution of a synthetic aperture radar"

Motion measurement errors that extend beyond the range resolution of a synthetic aperture radar (SAR) can be corrected by effectively decreasing the range resolution of the SAR in order to permit measurement of the error. Range profiles can be compared across the slow-time dimension of the input data in order to estimate the error. Once the error has been determined, appropriate frequency and phase correction can be applied to the uncompressed input data, after which range and azimuth compression can be performed to produce a desired SAR image. [A923]

"Millimeter wave portal imaging system"

A millimeter wave portal imaging system for the detection of concealed weapons, explosives and other contraband items. A preferred millimeter wave imaging system includes a number (such as 64) of millimeter wave detection units each including a frequency scanning antenna and associated electronics. The units are mounted in four posts (16 per post) of a portal structure. Each unit collects frequency dependent beams of millimeter wave radiation from a narrow one-dimensional field of view. The collected radiation from each unit is amplified at the collected frequencies and the amplified signals are separated into frequency dependent bins with a tapped-delay beam-former. These bins are then sampled to produce a one-dimensional image of the antenna field of view. A two dimensional image of a portion of a person passing through the portal is obtained by moving the person (or having the person move) across the field of view of each of the frequency scanning antennas. The images from the antennas can be monitored separately or data from the antennas can be combined with a computer processor to form images of the person. [A924]

"Network system for onboard equipment"

An onboard equipment network system comprises a radar core device, a GPS core device, an echo sounder core device and a sonar core device and display devices which are connected to a network through a hub. Each core device includes a detecting section or a positioning section, as well as a control section, a power supply section and a data transmitter for transmitting detecting signals or positioning signals, while each display device includes a command section for transmitting command data to the individual core devices for setting their operating conditions and a display section for displaying image data received from the individual core devices. The command data is transmitted using Transmission Control Protocol (TCP) while the image data is transmitted using User Datagram Protocol (UDP) . [A925]

"Method and system for determining unwrapped phases from noisy two-dimensional wrapped-phase images"

A method converts an input image of noisy wrapped phases to an output image of absolute unwrapped phases. The noisy wrapped phases in the input image are represented as a set of re-wrapped phases and a set of phase shifts. The set of re-wrapped phases are partitioned into a first group and a second group. Integer differences between the phase shifts are optimized while holding the re-wrapped phases fixed. Then, the first group of re-wrapped phases are optimized, while holding the integer differences between the phase shifts, and the second group of re-wrapped phases fixed. The integer differences between the phase shifts are optimized again, while holding the re-wrapped phases fixed. Then, the second group of re-wrapped phases are optimized, while holding the integer differences between the phase shifts, and the first group of re-wrapped phases fixed. The optimizing steps are repeated until the re-wrapped phase converge. Then, the converged re-wrapped phases and integer differences between the phase shifts are output as an output image of absolute unwrapped phases. [A926]

"Multipath resolving correlation interferometer direction finding"

Apparatus and a method utilizing correlation interferometer direction finding for determining the azimuth and elevation to an aircraft at long range and flying at low altitudes above water with a transmitting radar while resolving multipath signals. The signals from the radar are received both directly and reflected from the surface of the water using horizontally polarized and vertically polarized antenna arrays, are digitized and are stored in separate covariant matrices. Eigenvalues for the eigenvectors of the matrices processed on signal samples recorded on horizontally polarized X arrays are compared to the eigenvalues for the eigenvectors of the covariance matrices processed on signal samples recorded on vertically polarized X arrays. Incident field polarization is associated with the antenna array measurements that yield the strongest eigenvalue. The eigenvector and eigenvalues for the strongest signal are selected and used for subsequent signal processing. An initial global search assuming mirror sea-state reflection conditions using the signal eigenvector having the strongest eigenvalue is performed to yield an approximate elevation .alpha. and azimuth .beta. to the aircraft. The approximate values are then used as the starting point for a subsequent conjugate gradient search to determine accurate elevation .alpha. and azimuth .beta. to the aircraft. [A927]

"System and method for detecting emitters signals having multi-valued illumination times"

A system and method is provided for detecting emitter signals and for determining a scan strategy for a receiver system that receives such emitter signals. When detecting emitter signals of a particular emitter, the receiver may periodically revisit the portion of the frequency spectrum in which that emitter operates. The revisit time that the receiver uses for a particular emitter may dependent on certain characteristics of the emitter. One of these characteristics is the illumination time of the emitter. Some emitters may present more than one illumination time to a detecting receiver. This may occur, for example, if the emitter sweeps azimuth and changes its elevation angle. Thus, a system and method are provided for computing revisit times for emitters with multi-valued illumination times. [A928]

"Methods and systems utilizing Doppler prediction to enable fusing"

A method for controlling a detonation altitude of a radar equipped munition is described. The method includes calculating a velocity of the munition while the munition is at an altitude greater than the desired detonation altitude, determining when the munition is at a reference altitude, and calculating a time representing when the vehicle will reach the desired detonation altitude based on the calculated velocity and determined reference altitude. The method also includes generating a fusing signal to detonate the munition after the calculated time has passed. [A929]

"Method and system for real time pulse processing in ATCRBS/Mode-S transponders"

An apparatus for processing pulses in ATCRBS/Mode S interrogations includes an antenna for receiving a radio frequency interrogation signal. The radio frequency interrogation signal is downconverted by a downconverter to an intermediate frequency signal. The intermediate frequency signal is converted to a digitized interrogation signal by an analog-to-digital converter. A processing unit, coupled to the analog-to-digital converter, detects a pulse peak in the digitized interrogation signal using a moving threshold to locate the peak pulse between a first fixed threshold and a second fixed threshold. [A930]

"Data compression system and method for a weather radar system"

A method of compressing data in a weather radar system utilizes a compression system. Weather radar data associated with graphical images provided on a weather radar display is compressed for downloads or downlinks from the airplane or storage on the airplane. The weather radar data can be compressed from any part of the process. In one embodiment, spatial resolution of the data is decreased while data resolution is increased. [A931]

"Aircraft traffic warning system using an ad-hoc radio network"

Methods and apparatus are provided for a traffic warning system (TWS) for light aircraft. The TWS comprises a processor coupled to a transceiver, adapted to measure signal strength and send/receive messages containing station ID and preferably altitude and position data. Memory, display and various flight data instruments, such as GPS, altimeter, etc., are also coupled to the processor. The transceiver-processor automatically identifies TWS equipped aircraft within range using an ad-hoc network and exchanges ID and position information. The processor determines range from signal strength and/or received position information and, given enough data, determines direction, altitude, speed, etc., of the other aircraft, which it presents to the pilot. These values and their rate of change are compared to stored alarm thresholds, and the pilot is warned when another aircraft triggers the threshold. Evasive action is recommended where possible. [A932]

"Mobile ballistic missile detection and defense system"

The present invention is directed towards a ballistic missile detection and defense system. The system of the present invention comprises a ship based interceptor or antiballistic missile, a missile launch detection and tracking system, and a signal processing system capable of receiving said tracking signal calculating an intercept trajectory for an antiballistic missile to intercept a ballistic missile, and further capable of outputting an intercept trajectory program to an antiballistic missile. [A933]

"Synthetic multi-aperture radar technology"

Systems and methods of improving synthetic aperture radar (SAR) system are disclosed. In particular, an example system includes a radar signal radiator configured to transmit radar signal pulses that have a partial bandwidth at a regular interval. The partial bandwidth is a portion of a full bandwidth that said radar signal radiator is designed to generate. The example system also includes a receiver configured to receive radar signals returned in response to said transmitted radar signal pulses, and a processor configured to extrapolate said received signals to said full bandwidth, to thereby create high resolution SAR images. [A934]

"Method and apparatus for interferometric radar measurement"

In a method for interferometric radar measurement, at least two side looking RADAR systems on satellite and/or missile-supported platforms illuminate a common surface area by means of microwave signals. A first side looking RADAR system sends a first radar signal on a first transmit frequency, and at least a second side looking RADAR system sends at least a second radar signal on at least a second transmit frequency. At least one of the at least two side looking RADAR systems receives the at least two interfering radar signals reflected on the common surface area, determines difference phases of the received radar signals from the interferograms, determines therefrom a drift of a system clock of the at least two side looking RADAR systems, and compensates the determined drift. [A935]

"Waveform ambiguity optimization for bistatic radar operation"

A radar transmitter is at a first location on a moving platform and illuminates a target with a sequence of frequency modulated radar pulses. The frequency modulated pulses are linear frequency modulated, i.e. chirped. The target reflects the frequency modulated radar pulses. A receiving antenna has a difference pattern null and receives the reflections from the target as a main scatterer and an ambiguity of the main scatterer. The sequence of pulses change the start of their frequency modulation (chirp) over a SAR array. The change in start frequency from pulse to pulse allows to shift the range ambiguity so as to align with the delay/Doppler difference pattern null of the antenna. Thus, both the main scatterer as well as the shifted range ambiguity are on the difference pattern null, facilitating their cancellation. [A936]

"Process for the evaluation of signals in an SAR/MTI pulsed radar system"

The invention relates to a process for the evaluating a received signal of an SAR/MTI pulsed radar system that transmits SAR and MTI pulses with respective definable pulse repetition frequency PRF_SAR and PRF_MTI, such that the received signal is a superimposition consisting of echo pulse sequences of SAR and MTI echo pulse signals. According to the invention, in the received echo pulse sequence of the received signal, each SAR echo from an area of interest is evaluated SAR process. The remaining pulses of the received echo pulse sequence of the received signal are evaluated in using an MTI process. [A937]

"Ball measuring apparatus"

The present invention provides a ball measuring apparatus capable of measuring a trajectory of a ball from a hitting position to a landing position, the landing position and a stop position. A ball measuring apparatus 100 according to a first embodiment includes a first millimeter wave radar device 1 capable of carrying out a measurement from the hitting position to a predetermined position of the trajectory and having at least one transmitting antenna and a plurality of receiving antennas, and a second millimeter wave radar device 2 capable of measuring the stop position and having at least one transmitting antenna and a plurality of receiving antennas. A ball measuring apparatus 101 according to a second embodiment has a millimeter wave radar device 31 and a CCD camera 32. [A938]

"Frequency diverse array with independent modulation of frequency, amplitude, and phase"

Method and apparatus for a frequency diverse array. Radio frequency signals are generated and applied to a power divider network. A progressive frequency shift is applied to all radio frequency signals across all spatial channels. Amplitude weighting signals are applied for sidelobe control. Phase control is included for channel compensation and to provide nominal beam steering. The progressive frequency offsets generate a new term which cause the antenna beam to focus in different directions as a function of range. Alternative embodiments generate different waveforms to be applied to each radiating element, permitting the transmission of multiple signals at the same time. [A939]

"System for administering a restricted flight zone using radar and lasers"

A system is disclosed for administering a restricted flight zone using radar and lasers for detecting, tracking, warning and destroying airborne craft that enter restricted flight zones without authorization or that approach dangerously close to protected areas on the ground. The system comprises a support for positioning adjacent the surface of the Earth at a bottom of the zone, detecting and defending apparatus mounted on the support for detecting airborne objects in the zone and defending against the airborne objects in the zone, and controlling apparatus for controlling the detecting and defending means. [A940]

"Measurement and signature intelligence analysis and reduction technique"

Methods and apparatus compress data, comprising an In-phase (I) component and a Quadrature (Q) component. Statistical characteristics of the data are utilized to convert the data into a form that requires fewer bits in accordance with the statistical characteristics. The data may be further compressed by transforming the data and by modifying the transformed data in accordance with a quantization conversion table that is associated with the processed data. Additionally, redundancy may be removed from the processed data with an encoder. Subsequent processing of the compressed data may decompress the compressed data in order to approximate the original data by reversing the process for compressing the data with corresponding inverse operations. Interleaved I and Q components can be processed rather than separating the components before processing the data. The processed data type may be determined by providing metadata to retrieve the appropriate quantization table from a knowledge database. [A941]

"Antenna adjustment system and method for an aircraft weather radar system"

A weather radar system or method can be utilized to adjust a position of a weather radar system. The weather radar system can utilize processing electronics coupled to an antenna control system. The processing electronics can determine an error associated with the position of the weather radar antenna and adjust the position of the weather radar antenna in response to data related to returns received by the weather radar antenna and data related to expected returns. [A942]

"Non-statistical method for compressing and decompressing complex SAR data"

Provided is a non-statistical method for compressing and decompressing complex SAR data derived from reflected energy. The method includes selecting a first FFT to provide a target ratio of pixel spacing to resolution. A second FFT is then selected which is smaller than the first FFT. The data is zero-padded to fill the second FFT and transformed to provide at least one transfer frequency. This transfer frequency is then transferred to the at least one remote site. At the remote site the second FFT is inverted to restore the data from the received transfer frequency. The restored data is then zero-padded again to fill the first FFT. The first FFT is then used to transform the zero-padded restored data to provide a data set of points with the target ratio of pixel spacing to resolution. [A943]

"Collision alerting and avoidance system"

A collision alerting and avoidance system for use in an aerial vehicle is presented herein. The system comprises a one low profile antenna array disposed on the aerial vehicle. The array includes a plurality of horns, a polar horn, 45-degree horns, and equatorial horns. A transmitter/receiver probe is coupled to each horn. The transmitter/receiver probes are configured to transmit electromagnetic waves and to receive an echo signal reflected from a threat obstacle. A plurality of transmitter/receiver modules are coupled to each of the transmitter/receiver probes. The transmitter/receiver modules are configured to produce electromagnetic waves for transmission and to receive the echo signal. A processor coupled to the plurality of transmitter/receiver modules controls the transmission of electromagnetic waves from the horns and processes the echo signal to provide an output signal containing information regarding the obstacle. [A944]

"Declutter of graphical TCAS targets to improve situational awareness"

Traffic collision and avoidance systems and methods for a host aircraft. The system receives traffic information from one or more target aircraft, determines threat levels of target aircraft associated with the received traffic information, generates one or more objects based on the determined threat levels and a pre-defined threat level, and displays the generated one or more objects that are associated with threat levels within the pre-defined threat level. A first indicator that indicates lateral position relative to the host aircraft and a second indicator that indicates vertical direction of travel of the associated target aircraft are also displayed. [A945]

"Storm top detection"

A method of characterizing a maximum height of a storm cell for an aircraft is provided. First reflectivity data formed from a first scan of a storm cell by a radar is received and a first centroid of the storm cell is identified. Second reflectivity data formed from a second scan of the storm cell by the radar is received and a second centroid of the storm cell is identified. A scan axis for a third scan of the storm cell based on the first centroid and the second centroid is determined. Third reflectivity data formed from the third scan of the storm cell by the radar at a first time is received. The third reflectivity data is sampled to form pixel data that includes a reflectivity indicator determined for each pixel formed from the third reflectivity data. A maximum height of the storm cell is determined by processing the pixel data. [A946]

"Hazardous and non-hazardous weather identification system and method"

A weather radar system or method can be utilized to determine non-hazardous weather region for an aircraft. The weather radar system can utilize processing electronics coupled to an antenna. The processing electronics can determine presence of the non-hazardous weather region in response to data related to returns received by the weather radar antenna. The data can include a spatial frequency parameter or reflectivity gradient. [A947]

"Stereo display for position sensing systems"

A method for display of radar data includes performing a first radar scan to obtain, for at least one object (24) , a first range reading, a first azimuth reading, and a first altitude reading. A second radar scan is then performed to obtain, for the at least one object (24) , a second range reading, a second azimuth reading, and a second altitude reading. Position and travel direction of the at least one object (24) are computed within a predetermined cylindrical volume (20) , according to readings from the first and second radar scans. An icon (34) is assigned to the at least one object (24) . A reference point (R) is determined for the predetermined cylindrical volume. The icon (34) is then displayed within the predetermined cylindrical volume (20) in stereoscopic form. [A948]

"Interrupt SAR implementation for range migration (RMA) processing"

A moving radar (405) generates a synthetic aperture image from an incomplete sequence of periodic pulse returns. The incomplete sequence of periodic pulse returns has one or more missing pulses. The radar converts the incomplete sequence of pulse returns into a digital stream. A computer (403) processes the digital stream by computing an along track Fourier transform (402) , a range compression (408) , an azimuth deskew (410) and an image restoration and auto focus (412) . The image restoration and autofocus (412) utilizes a low order autofocus (501) , a gap interpolation using a Burg algorithm (503) , and a high order autofocus (505) for generating an interpolated sequence. The interpolated sequence contains a complete sequence of periodic pulse returns with uniform spacing for generating the synthetic aperture image. The image restoration and autofocus (412) computes a linear prediction coefficients estimate using the Burg Algorithm (606) . The linear prediction coefficients estimate (606) is used to compute a weighted forward-backward interpolation to generate the complete sequence of periodic pulse returns (608) . [A949]

"System and method for determining aircraft tapeline altitude"

A method, apparatus, and computer program product for accurately determining aircraft altitude, impact pressure, and calibrated air speed are provided. The determined results may be used for analysis in certification processes, used for building flight testing or simulation models that also may used in certification processes, or used for other purposes such as data to be used in a flight simulator. Altitude information of an aircraft is determined based on recorded altitude information generated by an inertial navigation system (INS) of the aircraft and altitude information generated by a global positioning system (GPS) of the aircraft. A static pressure value is generated based on the determined altitude information. [A950]

"Sensory systems employing non-uniformly spaced waveguide sensors for determining orientation and rotational speed of objects"

A sensory system for determining the orientation of an object, wherein the sensory system includes a plurality of non-uniformly spaced waveguide sensors or array (s) of waveguide sensors. The non-uniformly spaced waveguide sensors are responsive to received radio frequency signals wherein the received power of the signals is dependent upon the orientation of the waveguide (s) . [A951]

"Damage detection system"

A damage detection system includes a processor and a transmitter communicatively connected to the processor. The transmitter sends a signal to the processor and the processor is programmed to assign a spatial coordinate to the transmitter. The processor is further programmed to identify a transmitter location as damaged when the transmitter fails to send the signal. The damage detection system may analyze the damaged area and report potentially affected sub-systems to users of a machine or vehicle equipped with the damage detection system. [A952]

"Systems and methods for self-test of a radar altimeter"

Systems and methods for testing a signal generated by a Direct Digital Synthesizer (DDS) in a radar altimeter. In an embodiment of the method, a voltage signal derived by comparing a fixed reference frequency to a ramped frequency signal generated by the DDS based on a clock-based reference signal is generated. The generated voltage signal is integrated over a predefined range of clock signals. The integration is sampled at a previously defined clock tick. The sample is compared to a desired value and an indication that the radar altimeter is malfunctioning is provided if the comparison exceeds a predefined threshold value. The radar altimeter system is deactivated if an indication that the radar altimeter is malfunctioning has been provided. [A953]

"Methods and systems for identifying high-quality phase angle measurements in an interferometric radar system"

A method for determining a mechanical angle to a radar target utilizing a multiple antenna radar altimeter is described. The method comprises receiving radar return signals at the multiple antennas, populating an ambiguity resolution matrix with the electrical phase angle computations, selecting a mechanical angle from the ambiguity resolution matrix that results in a least amount of variance from the electrical phase angle computations, and using at least one other variance calculation to determine a quality associated with the selected mechanical angle. [A954]

"Method for determining missile information from radar returns"

A target missile identifier compares radar cross-section (RCS) information about the missile with a set including at least one template of RCS to make determination (s) of at least one of (a) the missile type (solid/liquid propellant) , (b) missile main engine cutoff, andor (c) staging state of a multistage missile. [A955]

"Aircraft hazard detection and alerting in terminal areas"

A weather radar system or method can be utilized to determine potential weather hazard for an aircraft in a terminal area. The weather radar system can utilize processing electronics coupled to an antenna. The processing electronics can determine presence of the potential in response to data related to returns received by the weather radar antenna. The data can include a mean velocity parameter or a spectral width parameter or reflectivity. [A956]

"Reduced state estimation with biased measurements"

This invention relates to sate estimation after processing measurements with unknown biases that may vary arbitrarily in time within known physical bounds. These biased measurements are obtained from systems characterized by state variables and by multidimensional parameters, for which the latter are also known and may vary arbitrarily in time within known physical bounds. The measurements are processed by a filter using a mean square optimization criterion that accounts for random and biased measurement errors, as well as parameters excursions, to produce estimates of the true states of the system. The estimates are applied to one of (a) making a decision, (b) operating a control system, and (c) controlling a process. [A957]

"Tactical aircraft check algorithm, system and method"

A method of generating aircraft tactical alerts includes receiving track positions for two aircraft, receiving trajectories and static conformance bounds for the two aircraft, receiving current position for the two aircraft, generating tactical check segments and variable conformance bounds for the two aircraft based on the current position, the static conformance bounds, trajectory, adapted data, and the track positions, and generating a tactical alert if the variable conformance bounds overlap within a specified lookahead time. The variable conformance bounds can be either symmetric or asymmetric about projected tracks. The variable conformance bounds can use step functions, or continuously widening bounds up to the static conformance bounds. The variable conformance bounds can be based on modifying the static conformance bounds in two or three spatial dimensions. [A958]

"Compensation of flight path deviation for spotlight SAR"

A radar acquires a formed SAR image of radar scatterers in an area around a central reference point (CRP) . Target (s) are within the area illuminated by the radar. The area covers terrain having a plurality of elevations. The radar is on a moving platform, where the moving platform is moving along an actual path. The actual path is displaced from an ideal SAR image acquisition path. The radar has a computer that divides the digital returns descriptive of the formed SAR image into multiple blocks, such as a first strip and an adjacent strip. The first strip is conveniently chosen, likely to generally align with a part of the area, at a first elevation. An adjacent strip covers a second part of the area at a second elevation. The first strip is overlapping the adjacent strip over an overlap portion. The first and second elevation are extracted from a terrain elevation database (DTED) . Horizontal displacement of returns (range deviation) is computed for each strip using the elevation information from the terrain elevation database. Taylor series coefficients are computed for the horizontal displacement due to terrain elevation using the ideal path, the actual path and central reference point. Actual flight path deviation is available at each pulse position while azimuth frequency is given in azimuth angle off mid angle point. Remapping between indices in two arrays is also computed. Phase error compensation and compensation in azimuth (spacial frequency) is computed using the Taylor series coefficients, a Fast Fourier Transform and an inverse Fast Fourier Transform for each strip. Phase error compensation is applied to the digital returns from each strip to obtain the SAR image. The SAR image is further improved by having the first strip corrected data and the second strip corrected data merged over the overlap portion to generate a relatively seamless SAR image. [A959]

"Apparatus and method of tracking objects in flight"

A path in three-dimensions for an object in flight is determined according to a radar signal reflected by the object. The radar signal is transmitted at an offset angle from horizontal sufficient to capture the object within the transmitted radar signal. The transmitted radar signal is reflected by the object to form a reflected radar signal containing an indication of a position of the object. The reflected radar signal is received and used to determine two-dimensional position information for the object by detection of the indication of the position of the object in the received radar signal. Position information is derived in three-dimensions from the position information in two-dimensions. The path information representative of the path for the object is obtained from the position information in three-dimensions based on an optimization of a curvature of said path information. [A960]

"System and method for locating targets using measurements from a space based radar"

A system and method for determining a position of a target within an acceptable tolerance using an iterative approach. A airborne or space-based measuring device is used to measure an estimated position of the target. The information from the measuring device is used in conjunction with either live captured or stored topography, or the like, information relating to the surface of the planet proximate the target to iteratively determine the actual position of the target. [A961]

"Time-to-go missile guidance method and system"

A method and apparatus for guiding a vehicle to intercept a target is described. The method iteratively estimates a time-to-go until target intercept and modifies an acceleration command based upon the revised time-to-go estimate. The time-to-go estimate depends upon the position, the velocity, and the actual or real time acceleration of both the vehicle and the target. By more accurately estimating the time-to-go, the method is especially useful for applications employing a warhead designed to detonate in close proximity to the target. The method may also be used in vehicle accident avoidance and vehicle guidance applications. [A962]

"Method and a station for assisting the control of an aircraft"

A station for assisting the control of an aircraft includes warning means (5) adapted to deliver an alert for avoiding a later collision when there is a risk that the predicted flight trajectory of the aircraft crosses any predicted flight path of another aircraft. An arrangement (4) is adapted to determine whether the aircraft carrying said station is within an airspace volume with defined geometrical dimensions and time of appearance and disappearance or not and make the function of the warning means dependent upon this comparison by, when located in said airspace volume, deactivating said warning means with respect to other aircraft of a predefined identity, and when not located in said airspace volume, activate or keep the function of said warning means activated with respect to aircraft of said predefined identity. (FIG. 1) . [A963]

"Method for developing and using an image reconstruction algorithm for multipath scattering"

Described herein is an implementation of the IRAMS processing based upon a multi-delay-resolution framework applied to SAR image data measured at different aspect angles. The power of this new embodiment of IRAMS is that it produces a good separation of immediate response scatterer and delayed response scatterer data for the case of anisotropic scattering events, i.e., those in which the scattering intensity depends upon the aspect angle. Two sources of delayed response scattering include multiple reflection scattering events and delayed responses arising from the physical material composition of the scatterer. That is, this multi-delay-resolution IRAMS processing separates immediate response and delayed response scattering for cases in which there exist delayed response scattering data in the original SAR image data at some aspect angles, but the intensity of these delayed response scattering data is weak or non-existent at different aspect angles. Thus, this IRAMS embodiment provides the additional information of the particular aspect angles at which delayed response scattering effects are most important, thereby improving both the estimates of the delayed response scattering data and the immediate response scattering data. [A964]

"Ranging systems"

A continuous wave ranging system, comprising a modulator 2 for modulating an r.f. carrier wave in accordance with a pseudo random code, a transmitting antenna 5 for radiating the modulated signal towards a target, a receiving antenna 6 and receiver 7 for detecting the signal reflected back from the target, a correlator 8 for correlating the reflected signal with the transmitted code with a selected phase shift corresponding to the current range gate to be tested, whereby the range of the target from the system may be determined, a store 12 containing a plurality of different pseudo random codes, and selector means 13 arranged to supply to the modulator 2 and to the correlator 8 a code from the store 12 which code does not produce a breakthrough sidelobe in at least the next range gate or gates to be tested. [A965]

"Aircraft avoidance system for prohibiting an aircraft from entering an exclusion zone"

The present invention relates to an avoidance system and method for directing an aircraft away from an exclusion zone. The exclusion zone may be any three dimensional space for example about a building or city. The avoidance system uses a constant signal from a ground based transmitter and an aircraft's receiver which receives and processes the signal and activates the avoidance system by engaging the flight director system or autopilot to steer away from the exclusion zone. [A966]

"Synthetic aperture radar system and method for local positioning"

A positioning system includes a passive, isotropic reflecting landmark at a fixed position and a device. The device transmits an electromagnetic pulse having a circular polarization and receives a return signal over a period of time. The return signal includes a reflected pulse from the reflecting landmark. The processes the return signal to isolate the reflected pulse from the return signal and to determine a range from the device to the reflecting landmark. The reflecting landmark includes a first passive reflector, a second passive reflector, and a static structure configured to statically position the second passive reflector at an angle relative to the first passive reflector. The device optionally moves in a particular direction while receiving the return signal, detects a Doppler shift in the reflected pulse portion of the return signal, and determines an angle between the particular direction and a straight line between the device and the landmark. [A967]

"System and method for in-flight trajectory path synthesis using the time sampled output of onboard sensors"

Disclosed are a system, method, and program storage device implementing the method, of data fusion, wherein the method comprises determining pre-launch data affecting a flight of a self-sensing air-bursting ballistic projectile, the projectile comprising a plurality of independent data sensors, predicting a trajectory path of the projectile based on a target location of the projectile, calculating trajectory path errors based on the predicted trajectory path, generating in-flight data from each of the data sensors, combining the in-flight data into a single time-series output using a fusion filter, tracking a trajectory position of the projectile based on the single time-series output, pre-launch data, and the trajectory path errors, comparing the tracked trajectory path with the predicted trajectory path, analyzing the in-flight data to gauge successful navigation of the projectile to the target location, and self-guiding the projectile to the target location based on the trajectory position. [A968]

"Mixed integer linear programming trajectory generation for autonomous nap-of-the-earth flight in a threat environment"

A method of planning a path of a vehicle by defining a first plurality of constraints representing dynamics of the vehicle, defining a second plurality of constraints representing collisions with obstacles, defining a third plurality of constraints representing visibility to threats, and using the first, second and third plurality of constraints with mixed integer linear programming to generate a trajectory for a vehicle from a starting point to a destination point in an environment containing the obstacles and the threats. [A969]

"Man-portable counter mortar radar system"

The present invention is a man-portable counter-mortar radar (MCMR) radar system that detects and tracks enemy mortar projectiles in flight and calculates their point of origin (launch point) to enable and direct countermeasures against the mortar and its personnel. In addition, MCMR may also perform air defense surveillance by detecting and tracking aircraft, helicopters, and ground vehicles. MCMR is a man-portable radar system that can be disassembled for transport, then quickly assembled in the field, and provides 360-degree coverage against an enemy mortar attack. MCMR comprises an antenna for radiating the radar pulses and for receiving the reflected target echoes, a transmitter that produces the radar pulses to be radiated from the antenna, a receiver-processor for performing measurements (range, azimuth and elevation) on the target echoes, associating multiple echoes to create target tracks, classifying the tracks as mortar projectiles, and calculating the probable location of the mortar weapon, and a control and display computer that permits the operation of the radar and the display and interpretation of the processed radar data. [A970]

"Methods and systems for maintaining a position during hovering operations"

A method for maintaining a position of a hovering vehicle that incorporates a radar altimeter is described. The method includes receiving signals at the radar altimeter based on a change of horizontal direction, operating the radar altimeter to generate a Doppler frequency spectrum based on the received signals, and determining a change in vehicle direction and velocity which will reduce a width of the Doppler frequency spectrum of the received signals. A radar altimeter which generates the Doppler frequency spectrum is also described. [A971]

"Security system with metal detection and mm-wave imaging"

A concealed weapons and contraband detection system combining metal detection equipment with millimeter wave imaging equipment. The preferred millimeter wave imaging equipment includes at least one millimeter wave frequency scanning antenna for collecting frequency dependent beams of millimeter wave radiation from a narrow one-dimensional field of view. The collected radiation is amplified at the collected frequencies and the amplified signals are separated into frequency dependent bins with a tapped-delay beam-former. These bins are then sampled to produce a one-dimensional image of the antenna field of view. A two dimensional image of a target may be obtained by moving the target across the field of view of the scanning antenna or by moving the antenna in order to scan its line of focus over the target. In preferred embodiments the millimeter wave imager is combined with an active eddy current type metal detector to provide a hybrid system providing important advantages over prior art security systems. Preferred embodiments include hybrid portal systems and hybrid hand-held systems. [A972]

"Synthetic aperture radar image compression"

A method is disclosed of generating multi-resolution images using synthetic aperture radar (SAR) phase history data. A high resolution SAR image may be formed from the phase history data, or a lower resolution SAR image may be formed from a sub-aperture of the phase history data. The multi-resolution images may also be compressed. Compressed multi-resolution images are progressively transmitted to a client until the client receives an image with adequate image quality and/or resolution. Compressed multi-resolution images may also be used for iterative target detection, where images are analyzed by a target detection processor, starting with a lowest resolution image, going to a highest resolution image, until an adequate image of the target or scene is obtained. If a target is not found in the multi-resolution images, a new sub-aperture is chosen on the phase history data, and the target detection process repeats for the new sub-aperture. [A973]

"Radar altimeter"

The present invention provides a radar altimeter system with a closed loop modulation for generating more accurate radar altimeter values. The system includes an antenna, a circulator, a receiver, and a transmitter. The circulator receives or sends a radar signal from/to the antenna. The receiver receives the received radar signal via the circulator. The transmitter generates a radar signal and includes a phase-locked loop circuit for generating the radar signal based on a pre-defined phase signal. The transmitter includes a direct digital synthesizer that generates the phase signal based on a pre-defined clock signal and a control signal. The system includes a digital signal processor and a tail strike warning processor that determine position of a tail of the aircraft relative to ground and present an alert if a warning condition exists based on the determined position of the tail of the aircraft and a predefined threshold. [A974]

"Self-protecting device for an object"

An object self-protection apparatus (12) having a monitoring device (14) which is fixed with respect to the object and a launch container (18) , in particular for fragmentation projectiles, which has a target-tracking radar device (20) for the approach movement of a missile (22) which is to be defended against. The monitoring device (14) which is fixed with respect to the object and the target-tracking radar device (20) are connected together with an aiming drive for the launch container (18) . Hereby, an expensive search radar is replaced by a passive sensor device (16) forming the monitoring device (14) which is fixed with respect to the object. The passive sensor device (16) generates accurately measured angular information in respect of the approaching missile (22) . The distance and the speed of the missile (22) are then determined by the target-tracking radar device (20) . [A975]

"System and method for selecting a receiver hardware configuration to detect emitter signals"

A system and method is provided for detecting emitter signals and for determining a scan strategy for a receiver system that receives such emitter signals. Multiple receiver hardware configurations may be available for detecting a set of emitters. A system and method are provided that allow an operator to select the most appropriate configuration for an intercepting dwell, thereby facilitating resolution of conflicting hardware configurations for different emitter modes. [A976]

"Systems and methods for tracking targets with aimpoint offset"

A target identification and tracking system includes a carrier vehicle and one or more tracking vehicles. The carrier vehicle may determine an aimpoint of a target from a high resolution image of the target and may generate an offset from a tracking point to the aimpoint. The offset may be conveyed to an assigned tracking vehicle for tracking the tracking point of the target while navigating toward the aimpoint of the target. The tracking point may be the target's centroid. The carrier vehicle may employ a high-resolution LIDAR imaging system to identify the aimpoint from a target's features, while the tracking vehicle may employ a lower resolution optical imaging system for tracking the target's tracking point. The carrier vehicle may correct the offset for parallax and the offset may be revised as the tracking vehicle approaches the target. [A977]

"Self-calibrating interferometric synthetic aperture radar altimeter"

A synthetic aperture radar system uses RF bandwidth and Doppler beam sharpening principles to develop fine altitude and along-track resolutions. To achieve accurate cross-track position measurements the system and method exploit a combination of modes based on a novel antenna pattern combination. The unique arrangement of the antenna patterns allows the radar to process terrain elevation measurements in three independent modes, namely, time-delay response (TDR) , amplitude monopulse (AM) and phase monopulse (PM) . The additional modes address the interfering scatter problem and the calibration issues required for practical and cost effective operation. The approach also maximizes the number of terrain measurements made per look, thereby reducing the impact of errors and noise through averaging and "voting" (i.e., the comparison of measurements and discarding of "outliers") . [A978]

"Doppler-sensitive adaptive coherence estimate detector methods"

A method is provided for detecting a target signal of a specific known form in the presence of clutter. The method includes dividing a set of initial training data, derived from returns from a burst of identical pulses, into a set of censored data and a set of uncensored data. A covariance matrix estimate, based on the uncensored data, is used to compute adaptive coherence estimate values, and an average adaptive coherence estimate threshold level is computed for each Doppler band to obtain a corresponding threshold. The censored data and the covariance matrix estimate are used to compute adaptive coherence estimate values for the uncensored data for each Doppler band, and these values are compared with the respective thresholds to determine the presence or absence of the target signal. [A979]

"System, method and computer program product for detecting and tracking a moving ground target having a single phase center antenna"

A synthetic aperture radar (SAR) system having a single phase center antenna is provided, the SAR system including a measurement unit and a tracker unit. The measurement unit is capable of receiving a phase history of a target point scatterer. From the phase history, then, the measurement unit is capable of estimating a ground position, velocity and acceleration of the target to thereby detect the target. The tracker unit, in turn, is capable of updating the ground position, velocity and acceleration of the target to thereby track the target based upon the ground position, velocity and acceleration. In this regard, the tracker unit is capable of updating the ground position, velocity and acceleration using a Kalman filter. [A980]

"System and method for distance measurement"

A system and method for performing distance measurement using wireless signals. A time of flight calculation is enabled by an interrogating device that transmits an interrogation signal to a responding device, which returns a synchronized signal back to the interrogating device. The wireless signals between the interrogating device and the receiving device have a harmonic relationship. In one embodiment, a time shift of a received signal relative to a transmitted interrogation signal is determined based on a comparison of a first reference point on a signal representative of the transmitted interrogation signal and a second reference point on a signal representative of the received signal. [A981]

"System and method for enhanced situational awareness of terrain in a vertical situation display"

A vertical situation display ("VSD") system according to the invention generates a terrain image that represents a profile view of terrain elevation relative to the position of an aircraft traveling above the terrain. The VSD system generates the VSD image such that the terrain image is biased toward the lower elevation region of the VSD screen, thus making efficient use of the available display area. The VSD image is also generated such that it is continuous across the lateral range of the VSD, thus ensuring that terrain is shown in the VSD at all practical times, depending upon the available range and any priority display rules. [A982]

"Instantaneous 3--D target location resolution utilizing only bistatic range measurement in a multistatic system"

A multistatic radar has a radar transmitter for illuminating a target with a radar signal. The target reflects the radar signal to three separate radar receivers, each performing a bistatic range measurement to the target. The three bistatic range measurements are combined in a quadratic equation having two solutions (roots) . One solution (root) corresponds to a correct three dimensional target position with respect to the radar transmitter while the other is an incorrect three dimensional target position with respect to the radar transmitter. The incorrect three dimensional target position is identified and eliminated by comparing the three dimensional target position to the transmitter location, and the receiver locations. The incorrect three dimensional target position is also identified by the target altitude exceeding a threshold, typically set above 80,000 feet AGL. [A983]

"Automatic weather radar system and method"

Methods and apparatus are provided for operating a radar system to provide a thunderstorm image to a pilot. The method comprises using one or more radar scans depending upon the aircraft altitude, a single upward tilted scan at or below a datum level of about 15,000.+-.3000 feet wherein a clutter free storm image may be obtained and two scans above the datum level, a first upward tilting scan to determine, clutter free, a storm head perimeter and a second lower tilting scan for the storm body with ground clutter. The perimeter is used to discard return echoes from the second scan that lie outside the perimeter or an expansion thereof and retain those lying on or within the perimeter. The result is presented to the pilot. Optionally, the thunderstorm image is graded from center to edge so as to indicate weaker echo intensity near the edge. [A984]

"Imaging apparatus and method"

An imaging apparatus has transmitter illuminating a selected surface with a radar beam footprint, and processor for profiling/processing the radar returns so as to derive attitude information in real time about a number of predefined axes associated with the radar which depends upon the relative dispositions of the radar, the selected surface and upon the radar beam footprint characteristics. A plurality of transmit beams image the surface and the processing arrangement has the capability of determining roll, pitch and/or yaw pointing data associated with the radar, such pointing data being determined by derivation of the attitude information and by selective input of terrain elevation data so as to take account of variations in the radar viewing geometry with terrain elevation. This provides a low cost advantage over known radar designs, and retains utility for many applications, for example spaceborne and airborne applications. [A985]

"Random set-based cluster tracking"

Tracking objects by receiving a dataframe from a detection sensor device, the dataframe containing a timestamp and data corresponding to each detected object, generating new observation nodes for each detected object, propagating group track state parameters to obtain posterior observable positions and projecting them onto the received dataframe, generating gates for the posterior observable positions and projecting them onto the received dataframe, determining feasible track node and feasible observation node assignments based on the proximity of the new observation nodes to the gates, updating track node state parameters and corresponding scores, performing a multi-frame resolution algorithm to resolve group track nodes into subtrack nodes, determining a set of feasible composite assignments for composite sets of track nodes and observation nodes, updating track node state parameters and corresponding scores, and determining a selected set of joint assignments based on the feasible composite assignments and their respective scores. [A986]

"System and method for the measurement of full relative position and orientation of objects"

A system for measuring a position and orientation of an object in flight relative to a reference coordinate system is provided. The system including: three or more illuminating sources, each disposed in a predefined position, the three or more illuminating sources together emitting a plurality of distinct polarized radio frequency signals to provide temporally synchronized, pulsed radio frequency signals that illuminate the object, one or more waveguide cavities disposed on the object for receiving the plurality of distinct polarized radio frequency signals from each of the three or more illuminating sources in flight, and a processor for measuring a time for the plurality of distinct polarized radio frequency signals to propagate from each of the three or more illuminating sources to the one or more waveguide cavities and the level of signal received at the waveguide cavities and to determine a position of the object relative to the three or more illuminating sources based on the measured times and the orientation of the object relative to the reference coordinate system based on the measure levels of received signals. [A987]

"System and method for communicating with airborne weapons platforms"

An airborne network configured to simultaneously transmit video imagery for battle damage indication from multiple airborne missiles to multiple tactical airborne non-launch aircraft. [A988]

"Dual mode target sensing apparatus"

A dual-mode target seeking apparatus having a seeker dome defining an aperture and transmissive to microwave frequency energy of a first frequency and to light wave energy at a second frequency and at a third frequency. An optics system within the seeker dome is transmissive to the microwave frequency energy reflective to the light wave energy received via the aperture. A first detector receives the microwave frequency energy via the aperture, and a second detector images a target by the light wave energy of the second and third frequencies via the optics system. [A989]

"Efficient stripmap SAR processing for the implementation of autofocus and missing pulse restoration"

A moving radar generates a search mode synthetic aperture image of a patch from a sequence of periodic pulse returns having one or more missing pulses. An azimuth and range interpolation generates an interpolated sequence having samples oriented in range and azimuth frequency with uniform spacing. Range compression is performed using an IFFT. Azimuth deskew, an autofocus and pulse restore generates a focused and restored sequence. Azimuth reskew, and gain phase equalization generates an equalized sequence. A first linear phase is summed to the equalized sequence for applying a fractional sample shift in range frequency. A range FFT and Along Track IFFT is further applied to obtain a domain changed sequence. A second linear phase is summed to the domain changed sequence. A CT FFT of the result generates an image of the patch. The azimuth interpolation and range interpolation also include a Stolt interpolation after a matched filter function. [A990]

"Process for mapping multiple-bounce ghosting artifacts from radar imaging data"

Described herein are frequency-domain back-projection processes for forming spotlight synthetic aperture radar ("SAR") images that are not corrupted by the effects of multiple-bounce ghosting artifacts. These processes give an approximately exact reconstruction of the multiple bounce reflectivity function (MBRF) f (x,y,.gamma.) . Specifically, the evaluation of f (x,y,.gamma.) in they .gamma.=0 plane gives an approximately exact reconstruction of the true object scattering centers which is uncorrupted by multiple-bounce contributions to the phase history data G (.xi., .theta.) . In addition, the non-zero dependence of f (x,y,.gamma.) upon the MB coordinate .gamma. can be used to facilitate the identification of features-interest within the imaged region. [A991]

"Video rate passive millimeter wave imaging system"

A passive millimeter wave imaging system that includes at least one millimeter wave frequency scanning antenna and multiple beam formers collecting narrow beams of millimeter wave radiation from a two-dimensional field of view. The collected radiation is amplified and separated into bins corresponding to various vertical and horizontal beam orientations. In a preferred embodiment the beam formers include one phase processor and 192 frequency processors. Two dimensional images of a target are obtained by the simultaneous detection of signal power within each beam and converting it into pixel intensity level at a rate of 30 frames per second. [A992]

"Target localization using TDOA distributed antenna"

This invention is a system and method of locating a target using distributed antenna. The antenna consists of several receiving elements in known locations. At least one of the receiving elements is also a transmitter and transmits an interrogation signal to a target. The return signal from the target is received by a plurality of receiving elements and the target's position is calculated using the time of arrivals of the reply signal and the round trip delay between the transmission of the interrogation signal and the reception of the subsequent reply signal. [A993]

"Object detection method and apparatus"

Method and apparatus for detecting objects. In one embodiment, a person entering a secured zone is illuminated with low-power polarized radio waves. Differently polarized waves which are reflected back from the person are collected. Concealed weapons are detected by measuring various parameters of the reflected signals and then calculating various selected differences between them. These differences create patterns when plotted as a function of time. Preferably a trained neural network pattern recognition program is then used to evaluate these patterns and autonomously render a decision on the presence of a weapon. [A994]

"Device and method for the suppression of pulsed wireless signals"

The invention relates to a method of suppressing pulsed signals in particular of DME or TACAN type present in the radio signals received (Ue) by a radio-frequency receiver, characterized in that the reception frequency band of the receiver is divided into frequency sub-bands corresponding to the transmission channels of the pulsed signals, in that the presence of the pulsed signals and the transmission channel of said pulsed signals in the frequency sub-bands are detected, and in that the frequency sub-band comprising the detected pulsed signals is filtered over the duration of the pulsed signal so as to eliminate said pulsed signals pulse type. [A995]

"Navigation system"

A radar altimeter system with a closed-loop modulation for generating more accurate radar altimeter values. The present invention combines flight safety critical sensors into a common platform to permit autonomous or semiautonomous landing, enroute navigation and complex precision approaches in all weather conditions. An Inertial Navigation System (INS) circuit board, a radar altimeter circuit board and a Global Navigation Satellite System (GNSS) circuit board are housed in a single chassis. VHF (Very High Frequency) Omni-directional Radio (VOR) , Marker Beacon (MB) , and VDB (VHF Data Broadcast) receiver circuit boards may also be implemented on circuit boards in the chassis. [A996]

"Systems and methods for managing transmission power into a shared medium"

A system for transmitting into a shared medium includes a processor, a transmitter, and a receiver. The processor is coupled to the transmitter for transmitting in a manner, at a time, and at a power level as directed by the processor. The processor determines from cooperation with the receiver the number of transmitters expected to be sharing the medium at a future time when transmitting is desired, prescribes a total power for a plurality of transmissions, and prescribes a maximum power for individual transmissions of various types. As implemented for air traffic collision avoidance, a suitable total power for MODE S interrogations transmitted by a TCAS unit on the host aircraft and a suitable power level for individual interrogation transmissions are set according to the detected number of operational TCAS in the airspace, the detected or reported number of members in a flight formation that includes the host aircraft, the altitude of the host aircraft, and the distances from the host aircraft to other members of the flight formation. Other implementations adjust receiver sensitivity, for example, increasing the minimum trigger level (MTL) for detecting interrogations and squitters. With decreased receiver sensitivity, continued use of limited transmission power levels improves system reliability and decreases interference of TCAS with other systems such as ATCRBS. Further implementations revise conventional TCAS interference limiting techniques. Transmission of broadcast messages may be conducted at reduced power or omitted. [A997]

"Ethernet connection of airborne radar over fiber optic cable"

A weather radar signal path for an aircraft. The signal path has an antenna, a digital down-converter, a first transceiver, fiber optic cabling, a second transceiver and a processing unit. The antenna is adapted to, in a first mode, receive reflected radar signals from atmosphere ahead. The digital down-converter is adapted to convert the reflected radar signals received by the antenna into digital radar signals at a lower frequency. The first transceiver is adapted to, in the first mode, at least transmit the digital radar signals through said fiber optic cabling. The fiber optic cabling is adapted to, in the first mode, transfer the digital radar signals between the first and second transceivers. The second transceiver is adapted to, in the first mode, receive said digital radar signals from the fiber optic cabling. The processing unit is adapted to, in the first mode, process the digital radar signals to generate weather information based on predetermined algorithm. [A998]

"Anti-personnel airborne radar application"

An anti-personnel airborne radar application for ultra slow target tracking is provided. The anti-personnel airborne radar application includes a rotorcraft and a signal processing system. The signal processing system includes a radar antenna supported by said rotorcraft, a plurality of phase centers, a conditioning circuit for each phase center, an adaptive signal processor, and an ultra slow target indicator. Each phase center is for receiving reflected radar signals received by the radar antenna. The adaptive signal processor processes the received condition signal from each of the phase centers, allowing the ultra slow target indicator to render tracking reports. A method of detecting human motion over a ground swath is also provided. [A999]

"Device for protecting military vehicles from infrared guided munitions"

A heat seeking missile decoy device mounted on a military vehicle to change the infrared signature of the military vehicle. The device is at ambient temperature when stored on the military vehicle. When a heat seeking missile is fired at the military vehicle, the decoy device deploys and increases in temperature, changing the infrared signature of the vehicle and causing a hot spot away from vulnerable components of the vehicle. The hot spot radiates in the infrared in an area that is away from vulnerable parts of a military vehicle, drawing the heat seeking missile toward it. The termination trajectory of the heat seeking missile is at the end of the decoy device and not the vulnerable parts of the military vehicle. The energy required to heat the device is passive waste energy from the vehicle engine exhaust. [A1000]

"Methods and systems for measuring terrain height"

An altitude measuring system is described that includes a radar altimeter configured to measure altitude and a digital terrain map database. The database includes data relating to terrain elevation and at least one data parameter relating to an accuracy of the terrain elevation data and the altitude measured by the radar altimeter. The system is configured to weigh an altitude derived from the terrain elevation data and the radar altimeter measurements according to the at least one data parameter. [A1001]

"Efficient autofocus method for swath SAR"

A moving radar generates a search mode synthetic aperture image of a patch from periodic pulse returns reflected from the patch. The patch is imaged from radar returns derived from two or more overlapping arrays. A strong scatterer is located within each array, then the data from each array is motion compensated with respect to the motion of the radar and the strong scatterer. The motion compensated results for each array are autofocused to derive a phase error for each array. Using the phase error for each array, a connected phase error estimate is computed, added to the phase error of each array to minimize the differences between phases in the overlap between arrays insuring that there is no or minimal phase discontinuity in the overlap region between arrays. Avoiding phase discontinuity yields a clear SAR image of the combination of arrays rendering the patch. [A1002]

"Robust detection technique of fixed and moving ground targets using a common waveform"

Detection of moving targets in SAR images is improved by a radar on a moving platform for generating a focused synthetic aperture image of a scene The scene contains a target described by pixels within the SAR image. The radar has a monopulse antenna having a sum channel output and a difference channel output feeding analog to digital converters for converting the sum channel output and difference channel output into respective digital streams concurrently. The digital streams generate a difference channel SAR image and a sum channel SAR image. Target ratios are computed for those pixels descriptive of a target within the scene. Background ratios are computed for pixels around the target. Target ratios and background ratios define respective least square fit of angle discriminants. Comparing the target least square fit of angle discriminant with the background least square fit angle discriminant identifies an angle offset and a Doppler offset of the target with respect to the background. The background least square fit of angle discriminant using background ratios is computed for a region around the target. A 20 by 20 sum synthetic aperture pixels is evaluated as a background around the target. [A1003]

"Autofocus method based on successive parameter adjustments for contrast optimization"

A radar on a moving platform generates an initial synthetic aperture (SAR) image of a scene from a sequence of periodic pulse returns approximately motion compensated. The SAR image is formed from pixel intensities z.sub.n (x,y) within a x,y extent of the initial synthetic aperture image. Targets are selected from the initial synthetic aperture image using a sliding window, computing a first entropy for the selected targets, and sorting the targets using the first entropy to obtain a target list having target elements, then concatenating the target elements to form a data matrix compatible in the azimuth dimension with a Fast Fourier Transform. A phase correction for autofocus is iteratively computed and applied to the initial synthetic aperture image using an inner loop, a mid loop and an outer loop. The phase correction is expressed using an orthogonal polynomial having a plurality n consecutive terms a.sub.n, a.sub.2 denoting a quadratic term, and a.sub.N denoting a last order term. The outer loop, using an L index, calculates an outer loop E.sub.L (a.sub.2) entropy for the quadratic term and an outer loop E.sub.L (a.sub.N) entropy for the last order term. Iterations within the outer loop continue until E.sub.L (a.sub.2) -E.sub.L (a.sub.N) is less than an outer loop tolerance. Similarly, the mid loop, and inner loop continue until the computation of their respective entropies meet a pre-set tolerance. The inner loop entropy uses a Golden Section search for computing the inner loop entropy. [A1004]

"Device and method for calibrating and improving the accuracy of barometric altimeters with GPS-derived altitudes"

A portable, handheld electronic navigation device includes an altimeter and a GPS unit. An internal memory stores cartographic data, for displaying the cartographic data on a display of the navigation device. Accordingly, the device is capable of displaying cartographic data surrounding a location of the unit as determined by GPS and altitude information as determined by the barometric altimeter and GPS. The device provides an enhancement of the calibration and hence the accuracy of barometric altimeter measurements with the aid of derived altitudes from a GPS. The device is able to determine the need for calibration and perform the subsequent computations necessary to facilitate the calibration. Furthermore, the device is able to determine a correction quantity that should be applied to barometric altitude readings, thereby allowing the device to be calibrated while in motion. Both of these features ultimately result in a more accurate determination of altitude. In accordance with an aspect of the invention, the altimeter of the navigation device may be calibrated with altitude information entered by a user, with altitude information obtained from the cartographic, with altitude information derived from GPS or with any combinations thereof. [A1005]

"System for avoidance of collision between an aircraft and an obstacle"

A field unit for warning of a danger of collision between an aircraft and an obstacle, in particular a topographical ground obstacle or an obstacle formed by a mast, building or aerial cable structure, comprises a multi-part tubular mast having devices for fixing a solar panel and a radar antenna, an elongate radar antenna in an environment-protective casing, which, with an electronics unit, forms a radar system for synthesized radar detection of an aircraft in a radar coverage area, a central processing unit for identifying on the basis of information from the radar system an aircraft which is in a zone of the radar coverage area and which on the basis of radar information such as direction, distance and/or speed computes a collision danger area, and a high-intensity light system and radio transmitter system that can be activated by the central processing unit upon detection of an aircraft in a collision danger area. The radio transmitter system may be a VHF or UHF radio transmitter system for providing a radio signal modulated by an audible warning signal, preferably a voice warning signal, whilst the light system preferably comprises a stroboscope light system. The field unit is arranged for communication with other similar field units for remote activation of light or audio warnings in a neighbouring field unit. [A1006]

"Measurement and signature intelligence analysis and reduction technique"

Methods and apparatus compress data, comprising an In-phase (I) component and a Quadrature (Q) component. Statistical characteristics of the data are utilized to convert the data into a form that requires fewer bits in accordance with the statistical characteristics. The data may be further compressed by transforming the data and by modifying the transformed data in accordance with a quantization conversion table that is associated with the processed data. Additionally, redundancy may be removed from the processed data with an encoder. Subsequent processing of the compressed data may decompress the compressed data in order to approximate the original data by reversing the process for compressing the data with corresponding inverse operations. Interleaved I and Q components can be processed rather than separating the components before processing the data. The processed data type may be determined by providing metadata to retrieve the appropriate quantization table from a knowledge database. [A1007]

"Methods and systems for estimating three dimensional distribution of turbulence intensity using radar measurements"

Methods, systems, and computer program products for storing turbulence radar return data into a three-dimensional buffer. The method involves modeling the radar signal scattering properties of space surrounding the radar/aircraft. Presented turbulent wind variance measurements are compared to predictions of the measurement using the modeled scattering properties, thereby producing more accurate turbulence information for storage into the three-dimensional buffer. [A1008]

"Augmented reality traffic control center"

In an exemplary embodiment, an augmented reality system for traffic control combines data from a plurality of sensors to display, in real time, information about traffic control objects, such as airplanes. The sensors collect data, such as infrared, ultraviolet, and acoustic data. The collected data is weather-independent due to the combination of different sensors. The traffic control objects and their associated data are then displayed visually to the controller regardless of external viewing conditions. The system also responds to the controller's physical gestures or voice commands to select a particular traffic control object for close-up observation or to open a communication channel with the particular traffic control object. [A1009]

"System and methods for preventing the unauthorized use of aircraft"

An aircraft having a memory loaded with geolocation data corresponding to restricted airspace boundaries and an autonomous system for rerouting the aircraft outside of the restricted airspace boundaries as the aircraft approaches to within a predetermined distance of the restricted airspace. [A1010]

"Minimum safe altitude warning"

A ground-based CFIT warning system provides pilots with CFIT alerts. The system is based upon a ground-based tracking system, which provides surveillance of aircraft, such as the AirScene.TM. multilateration system manufactured by Rannoch Corporation of Alexandria, Va. The system monitors both horizontal and vertical positions of aircraft. When an aircraft has been determined to be operating below safe altitudes, or too close to obstructions, the pilot is provided with a warning. The warning may be delivered via the pilot's voice communications and/or a data link or the like. [A1011]

"Motion compensation for convolutional SAR algorithms"

A synthetic aperture image of a scene is acquired using a radar system. The scene has one or more radar scatterers located on a horizontal flat {circumflex over (x) },y plane. The radar system is mounted on a moving platform moving at an angle .theta..sub.tilt with respect to the {circumflex over (x) },y plane, with a component of motion in a perpendicular {circumflex over (z) } direction. The synthetic aperture image acquisition requires digitizing radar returns having a phase returned from scatterers in the scene, adjusting the phase of the radar returns in response to .theta..sub.tilt to generate phase adjusted returns, then computing the synthetic aperture image from said phase adjusted returns. The phase adjustment takes into account .theta..sub.tilt platform motion with respect to the scene. [A1012]

"Traffic alert and collision avoidance system enhanced surveillance system and method"

A traffic alert and collision and avoidance system (TCAS) is disclosed. The TCAS comprises a first transponder and a first interrogator associated with a first aircraft. The first transponder sends an interrogation request. The TCAS also comprises a second transponder associated with a second aircraft. The second transponder responds to the interrogation request. The response comprises enhanced surveillance data that was asked for in the request. [A1013]

"Switching method and device on an aircraft radiofrequency landing system"

A method and device for carrying out switchover on a radio frequency landing system of an aircraft between a first input of a radio frequency receiver, which input is connected to a first antenna disposed on a lower part of the aircraft and receives a first signal, and a second input of the radio frequency receiver, which input is connected to a second antenna disposed on an upper part of the aircraft and receives a second signal. On initialization, switchover occurs to the input whose signal exhibits the highest level. After the initialization phase, a first value of a parameter, in relation to the aircraft, and a second value of this same parameter, in relation to the runway, are determined. The difference between these first and second values is computed, and switchover occurs to one of the first and second inputs as a function of this difference. [A1014]

"Airborne weather radar system and radar display"

An airborne weather radar system that detects potentially hazardous weather conditions associated with storms and includes a radar display featuring visual indications of these conditions. The radar display includes a vertical situation display having iconal representations and symbolic icons indicative hazardous weather conditions and aviation hazards along the aircraft's flight path not otherwise immediately apparent or shown on standard weather radar displays. The system includes processes for detecting and predicting hazardous weather conditions such as overshooting thunderstorm tops and vaulted thunderstorm energy and serious hazards such as turbulence and hail. [A1015]

"Weather radar hazard detection system and method"

An aircraft weather radar system is disclosed. The system comprises a radar antenna, aircraft sensors, and a database. The system also comprises a processing device receiving information from the radar antenna and from the aircraft sensors and able to retrieve information from the database. Further, the system comprises a cockpit display coupled to the processing device. The processing device is programmed to determine storm system hazards and to display the storm system hazards on the display using an iconal representation or textual representation. [A1016]

"Dual synthetic aperture radar system"

The dual synthetic aperture array system processes returns from the receiving arrays. The two identical receiving arrays employing displaced phase center antenna techniques subtract the corresponding spectrally processed data to cancel clutter. It is further processed that a moving target is detected and its velocity, angular position and range is measured, in or out of the presence of clutter. There are many techniques presented in the disclosure. These techniques are basically independent but are related based on common set of fundamental set of mathematical equations, understanding of radar principles and the implementations involved. These many techniques may be employed singly and/or in combination depending on the application and accuracy required. They are supported by a system that includes, optimization of the number of apertures, pulse repetition frequencies, DPCA techniques to cancel clutter, adaptive techniques to cancel clutter, motion compensation, weighting function for clutter and target, and controlling the system in most optimum fashion to attain the objective of the disclosure. [A1017]

"Robust predictive deconvolution system and method"

A method for processing a received, modulated pulse (i.e. waveform) that requires predictive deconvolution to resolve a scatterer from noise and other scatterers includes receiving a return signal, obtaining L+ (2M-1) (N-1) samples y of the return signal, where y (l) ={tilde over (x) }.sup.T (l) s+v (l) , applying RMMSE estimation to each successive N samples to obtain initial impulse response estimates [{circumflex over (x) }.sub.1{- (M-1) (N-1) }, . . ., {circumflex over (x) }.sub.1{-1}, {circumflex over (x) }.sub.1 {0}, . . ., {circumflex over (x) }.sub.1{L-1}, . . ., {circumflex over (x) }.sub.1{L}, {circumflex over (x) }.sub.1{-1 + (M-1) (N-1) }], computing power estimates {circumflex over (.rho.) }.sub.1 (l) ={circumflex over (x) }.sub.1 (l) ,.sup..alpha. for l=- (M-1) (N-1) . . . L-1+ (M-1) (N-1) and 0< .alpha..ltoreq.2 computing MMSE filters according to w (l) =.rho. (l) (C (l) +R) .sup.-1s where .rho. (l) =E[,x (l) ,.sup..alpha.] is the power of x (l) for 0< .alpha..ltoreq.2 and R=E[v (l) v.sup.H (l)] is the noise covariance matrix applying the MMSE filters to y to obtain [{circumflex over (x) }.sub.2{- (M-2) (N-1) } . . . {circumflex over (x) }.sub.2{-1} {circumflex over (x) }.sub.2{0} . . . {circumflex over (x) }.sub.2{L-1} {circumflex over (x) }.sub.2{L} . . . {circumflex over (x) }.sub.2{L-1+ (M-2) (N-1) }] and repeating (d) (f) for subsequent reiterative stages until a desired length-L range window is reached thereby resolving the scatterer from noise and other scatterers. The RMMSE predictive deconvolution approach provides high-fidelity impulse response estimation. The RMMSE estimator can reiteratively estimate the MMSE filter for each specific impulse response coefficient by mitigating the interference from neighboring coefficients that is a result of the temporal (i.e. spatial) extent of the transmitted waveform. The result is a robust estimator that adaptively eliminates the spatial ambiguities that occur when a fixed receiver filter is used., [A1018]

"Through air radar level transmitter"

A process control instrument comprises a control for generating or receiving a high frequency signal. A waveguide comprises a cylindrical housing closed at one end by a rear wall. A loop launcher is operatively connected to the control and comprises a wire having a first straight leg electrically connected at one end to the control and extending into the waveguide a first select length. A second straight leg is connected at one end to the rear wall and extends into the waveguide a second select length, greater than the first select length. A curved middle section connects the other ends of the first and second straight legs. An antenna is operatively coupled to the waveguide. [A1019]

"Technique for enhanced quality high resolution 2D imaging of ground moving targets"

A radar receiver on a moving platform images a moving target and non-moving clutter using a single SAR array. The radar receiver converts the radar returns into digital radar returns and motion compensates the digital radar returns with respect to a reference, then applies further phase compensation to obtain an autofocused synthetic aperture image. A plurality of moving target pixels descriptive of the moving target are detected within the autofocused synthetic aperture image. The plurality of moving target pixels are transformed from the autofocused image to the time domain. The time domain moving target data is focused by iteratively applying a phase compensation to the time domain moving target data. [A1020]

"Methods and systems for controlling a height of munition detonation"

A unit is described that is configured to control detonation of a munition such that the munition is detonated at a desired altitude. The unit includes a radar transmitter, a radar receiver that includes a radar range gate, and a sequencer. The sequencer is configured to receive a detonation altitude and set the range gate based on the received detonation altitude. The unit is also configured to output a detonation signal when radar return pulses received by the receiver aligned with gate delay pulses from the range gate. [A1021]

"Network system for onboard equipment"

An onboard equipment network system comprises a radar core device, a GPS core device, an echo sounder core device and a sonar core device and display devices which are connected to a network through a hub. Each core device includes a detecting section or a positioning section, as well as a control section, a power supply section and a data transmitter for transmitting detecting signals or positioning signals, while each display device includes a command section for transmitting command data to the individual core devices for setting their operating conditions and a display section for displaying image data received from the individual core devices. The command data is transmitted using Transmission Control Protocol (TCP) while the image data is transmitted using User Datagram Protocol (UDP) . [A1022]

"Altitude measurement system and associated methods"

An altitude measuring system and method for aircraft is provided. The altitude measuring system includes altitude sensors for providing data to an altitude processing unit. The altitude processing unit spatially averages each output to determine a mean altitude. Pitch and roll are accounted for by correction. A method of determining aircraft altitude from a plurality of altitude sensors includes receiving altitude sensor data from each sensor and spatially averaging the altitude sensor outputs to determine aircraft altitude. A method of estimating the maximum height of an ocean surface includes receiving a plurality of altitude sensor data and determining a mathematical description of the ocean surface from the sensor data. The maximum probable wave height of the ocean surface is estimated from the mathematical description. From the maximum wave height, a cruise altitude may be determined. [A1023]

"Secondary surveillance radar system, ground equipment for use therein, and response signal checking method applied thereto"

A secondary surveillance radar system for use in surveillance of an airspace, which reliably achieves surveillance of the airspace even when an aircraft including a mode S transponder and an aircraft including an ATCRBS transponder are both located in the airspace, wherein both of a time interval between time when transmission of an all-call interrogation signal specific for mode S is completed and time when the transmission of an all-call interrogation signal specific for mode A is started and a time interval between time when transmission of the all-call interrogation signal specific for mode S is completed and time when transmission of an all-call interrogation signal specific for mode C is started is varied in units of one all-call time period. [A1024]

"Method of observing sea ice"

An ice thickness/drifting velocity observation of sea ice by using an ice thickness measurement sonar and a current meter moored into the sea and a sea ice observation by a high-resolution airborne SAR are synchronously performed, a correlation between a draft profile of sea ice passing over the sonar and an SAR backscattering coefficient profile is calculated, and an ice draft of desired sea ice is calculated from the relational expression and an SAR backscattering coefficient. As the SAR backscattering coefficient, a backscattering coefficient of L-band HV polarization may be used. A backscattering coefficient of X-band VV polarization is preferably used as the SAR backscattering coefficient to detect thin ice having a thickness of not more than approximately 10 cm. [A1025]

"Doppler radar sensing system for monitoring turbine generator components"

The invention provides a sensing system and a method for monitoring the damage to turbine components in a turbine generator. The sensing system comprises an electromagnetic wave generator that generates an electromagnetic wave, a transmitter that transmits the generated electromagnetic wave from a first turbine component, a second turbine component that receives the transmitted electromagnetic wave and reflects the electromagnetic wave, a receiver that receives the reflected electromagnetic wave, and a processor that interprets the received electromagnetic wave. [A1026]

"Measurement and signature intelligence analysis and reduction technique"

Methods and apparatus compress data, comprising an In-phase (I) component and a Quadrature (Q) component. The compressed data may be saved into a memory or may be transmitted to a remote location for subsequent processing or storage. Statistical characteristics of the data are utilized to convert the data into a form that requires a reduced number of bits in accordance with the statistical characteristics. The data may be further compressed by transforming the data, as with a discrete cosine transform, and by modifying the transformed data in accordance with a quantization conversion table that is selected using a data type associated with the data. Additionally, a degree of redundancy may be removed from the processed data with an encoder. Subsequent processing of the compressed data may decompress the compressed data in order to approximate the original data by reversing the process for compressing the data with corresponding inverse operations. [A1027]

"Ground operations and imminent landing runway selection"

A method and system for locating aircraft with respect to airport runways selecting as a function of aircraft state parameters one of a plurality of candidate runways that the aircraft on which it is installed is most likely to encounter, whether taxiing, preparing for take-off, or approaching to land. [A1028]

"Radar altimeter having an automatically calibrated sensitivity range control function"

A radar altimeter for an air vehicle is described. The radar altimeter includes a transmit antenna configured to transmit radar signals toward the ground, a receive antenna configured to receive radar signals reflected from the ground, the receive antenna also receiving signals propagated along a leakage path from the transmit antenna, and a receiver configured to receive signals from the receive antenna. The radar altimeter also includes at least one altitude processing channel configured to receive signals from the receiver to determine an altitude, and an automatic sensitivity-range-control (SRC) channel configured to receive signals from the receiver. The SRC channel is configured to determine an amplitude of the received leakage path signals when an altitude of the radar altimeter is sufficient to separate received signals reflected from the ground from signals received from the leakage path. [A1029]

"Low-cost position-adaptive UAV radar design with state-of-the-art cots technology"

A position-adaptive radar method and device for small UAV platforms capable of detecting "leakage signals" that, for example, propagate between two buildings or "leak through" penetrable surfaces such as walls or layers of the ground. The position-adaptive radar comprises a monostatic radar receiver that measures and processes leakage signals and then "self adapts" in position to establish line-of-sight between a mini-UAV platform and an obscuration channel that propagates the leakage signal. This allows a mini-UAV platform to process signals in real-time while gathering intelligence information and locating objects-of-interest that may be embedded within an obscuration channel. [A1030]

"Methods and apparatus for randomly modulating radar altimeters"

A method for randomly phase modulating a radar altimeter is described. The method includes momentarily applying a signal from a random noise source to an amplifier, applying an output of the amplifier to a voltage controlled oscillator (VCO) , applying an output of the VCO to a transmitter and mixer of the radar altimeter to modulate transmissions of the radar altimeter and to demodulate reflected radar transmissions received by the radar altimeter and holding the output of the amplifier constant from before a radar altimeter transmission until after reception of the reflected radar signals from that transmission by the radar altimeter. The method further includes repeating the applying steps and the holding step. [A1031]

"System, method and computer program product for reducing quadratic phase errors in synthetic aperture radar signals"

A method is provided for reducing quadratic phase errors in synthetic aperture radar signals from a plurality of range lines where each range line includes a plurality of azimuth positions. The method includes receiving a plurality of slow-time samples representing radar signals for a plurality of azimuth positions for a plurality of range lines. A plurality of corrected samples and an initial quadratic phase error coefficient are identified based upon the slow-time samples. The corrected samples are processed according to a superresolution signal processing technique to thereby obtain a plurality of estimated Doppler frequencies for a plurality of point scatterers at each range line, after which a true signal for each range line is reconstructed based upon the plurality of estimated Doppler frequencies. A correction to the initial quadratic phase error coefficient is then obtained based upon the corrected samples, the true signals and the initial quadratic phase error coefficient. [A1032]

"Method and apparatus for predictive altitude display"

Embodiments of the invention provide a method and apparatus for indicating aircraft height relative to an obstruction in a terrain awareness warning system. The method includes receiving data indicative of geographic features of an obstruction, lateral distance of the geographic feature from an aircraft, height and flight path of the aircraft, calculating a projected height of the aircraft at the location of the obstruction using the data, generating a result signal, and displaying a colored indication on a display screen based on the result signal. The apparatus includes inputs for signals from instruments measuring height, flight path, and location of an aircraft, as well as an input for an instrument providing information about geographic features of terrain surrounding the aircraft. The apparatus includes a means for employing the signals to calculate an effective height of the aircraft relative to the terrain, and a screen display for graphically displaying the results of the calculation. [A1033]

"Radar tracking system"

A radar tracking system for an anti-aircraft, missile, including angle tracking, doppler tracking and range tracking feedback loops operating on sum and difference channels. Fast fourier transform digital filters are used to provide a frequency spectrum of the sum and difference I.F. channels and detection and confirmation algorithms are employed for selecting the F.F.T. target `bin`. Adjacent F.F.T. bins are used to simulate a bin centered on the target frequency, shifts of the latter with target/missile acceleration causing frequency errors which are detected by a discriminator and used to control the target I.F. Confirmation of target acquisition is achieved by successive summations of the target bin power the totals being accumulated and compared with upper and lower thresholds. Confirmation and rejection results from total levels outside the thresholds while further accumulation and comparison follow the intermediate condition. Multiple target discrimination is provided by comparison of two S/N ratios, one obtained from target bin power and average power, and the other obtained from coherent power in the target bin and overall power in the target bin. [A1034]

"Radar process for classifying or identifying helicopters"

A radar method of classifying generating or identifying helicopters, by generating a one-dimensional distance profile of the helicopter to be classified or to be identified by measuring the radar each of the helicopter fuselage, the radar echo of the rotor head of the main rotor and/or the radar echo of the main axis, and the radar echo of the rear rotor axis, determines the aspect angles in the azimuth and elevation directions relative to the axis of the radar antenna and the method also determines helicopter parameters from the measured radar echoes. The determined helicopter parameters are compared with stored helicopter parameters for different helicopter types. [A1035]

"System and method for tracking beam-aspect targets with combined Kalman and particle filters"

Systems and methods of tracking a beam-aspect target are provided. In embodiments, a target is tracked with a Kalman filter while detections are received. After a detection is missed, the Kalman filter may be concurrently propagated with a blind-zone particle filter until a probability that the target is in a blind zone exceeds a threshold. When the probability exceeds the threshold, the Kalman filter may refrain from further propagating. After a gated detection is received, the blind-zone particle filter and an unrestricted-zone particle filter may be concurrently propagated while a probability that the target is in an unrestricted zone exceeds a threshold. The system may return to tracking with the Kalman filter when a covariance of the unrestricted-zone particle filter falls below a predetermined covariance. [A1036]

"Warped plane phased array monopulse radar antenna"

A phased array, phase-amplitude monopulse antenna arrangement for ground, shipboard or airborne radar systems. The phased array antenna is systematically warped and projects partially overlapping, separate beams from upper and lower regions of the array. A single set of phase-shifters is employed with a simplified feed structure to permit development of both azimuthal and elevation angle error signals in signal processing circuitry for target analysis. [A1037]

"Method and device for determining at least one cue of vertical position of an aircraft"

A method and device for determining a vertical position cue of an aircraft while landing in the presence of a lateral alignment beam, which is emitted from the ground and provides an indication of the aircraft's lateral alignment with respect to a landing strip, may include detecting the lateral alignment beam with aircraft equipment. On the basis of cues relating to the detected lateral alignment beam and of predetermined cues, an axis of approach of the aircraft is determined. Additionally, the actual position and a preset position of the aircraft, which corresponds to the position the aircraft would have if it were on the approach axis, are determined. On the basis of the actual and preset positions of the aircraft, the vertical deviation of the aircraft, representing the vertical position cue, is computed. [A1038]

"Method for SAR processing without INS data"

A Synthetic Aperture Radar (SAR) avoids the need for an INS/GPS by focusing a SAR image having discernible features and a center. The image is formed from digitized returns, each of the digitized returns having a phase and an amplitude. The focusing steps of an algorithm processing the digitized returns include: computing a coarse range and coarse range rate of the center of the image, motion compensating the digitized returns, converting the digitized returns in polar format into an orthogonal Cartesian coordinate system, autofocusing the image data to obtain a focused image, performing a Fourier transform to obtain a focused image described by the returns, computing an estimated fine range and fine range rate from features contained within the focused image, and converging the fine range and fine range rate within the orthogonal Cartesian coordinate system for use within the azimuth and range coordinate system and motion compensating the digitized returns. [A1039]

"Methods and system suppressing clutter in a gain-block, radar-responsive tag system"

Methods and systems reduce clutter interference in a radar-responsive tag system. A radar transmits a series of linear-frequency-modulated pulses and receives echo pulses from nearby terrain and from radar-responsive tags that may be in the imaged scene. Tags in the vicinity of the radar are activated by the radar's pulses. The tags receive and remodulate the radar pulses. Tag processing reverses the direction, in time, of the received waveform's linear frequency modulation. The tag retransmits the remodulated pulses. The radar uses a reversed-chirp de-ramp pulse to process the tag's echo. The invention applies to radar systems compatible with coherent gain-block tags. The invention provides a marked reduction in the strength of residual clutter echoes on each and every echo pulse received by the radar. SAR receiver processing effectively whitens passive-clutter signatures across the range dimension. Clutter suppression of approximately 14 dB is achievable for a typical radar system. [A1040]

"Weather information network including graphical display"

An apparatus for providing weather information onboard an aircraft includes a processor unit and a graphical user interface. The processor unit processes weather information after it is received onboard the aircraft from a ground-based source, and the graphical user interface provides a graphical presentation of the weather information to a user onboard the aircraft. Preferably, the graphical user interface includes one or more user-selectable options for graphically displaying at least one of convection information, turbulence information, icing information, weather satellite information, SIGMET information, significant weather prognosis information, and winds aloft information. [A1041]

"Missile identification and tracking system and method"

Sensors determine the kinematic measurements of a boosting missile, and the information is applied to a plurality of pairs or sets of filters, one of which is matched to the characteristics of a particular target type, and the other of which is general, and not matched to a particular target, for producing from each filter of the set missile position, velocity, acceleration, and specific mass flow rate states, and covariances of those states. From the filtered information, the estimates are made of at least missile mass flow rate, thrust, velocity at stage burnout, and remaining burn time. The likelihood is computed that the states and covariances from the filter sets represent the same target. The largest likelihood is selected as representing the target. In one mode, the estimated parameters are weighted and summed for a composite likelihood. [A1042]

"Autonomous station keeping system for formation flight"

A system for autonomously keeping an aircraft's station in a formation flight of a plurality of aircraft includes a navigation system configured to determine a position of an aircraft. A data link is configured to allow the aircraft to communicate data with at least one other aircraft in the formation flight of the plurality of aircraft. A sensor is configured to detect a presence of another aircraft within a predetermined distance of the aircraft. A processor is configured to provide control signals to the aircraft's autoflight system to keep the aircraft at a predetermined station relative to the other of the plurality of aircraft in the formation flight. [A1043]

"Self-calibrating wideband phase continuous synthesizer and associated methods"

The synthesizer and method provide a relatively wideband swept frequency signal and include generating a first swept frequency signal with a first generator, and successively switching between different frequency signals with a second generator. Such switching creates undesired phase discontinuities in the output swept frequency signal. The first swept frequency signal is combined with the successively switched different frequency signals to produce the relatively wideband swept frequency signal, and the second generator is calibrated to reduce the undesired phase discontinuities during switching based upon the output swept frequency signal. [A1044]

"Radar system for obstacle warning and imaging of the surface of the earth"

A radar system for active obstacle warning and imaging of the surface of the earth, working in the pulse frequency or FH-CW range, which can be used in on-line operation in real time, includes a plurality of antenna elements for sending and receiving radar signals, which are arranged on the fuselage of an aircraft, and which may be turned on and scanned sequentially, whereby a synthetic aperture can be generated by means of periodic sending and receiving of the antenna elements. Antenna elements are arranged along the curved surface of the aircraft contour, whereby a SAR processor is present, which analyzes the data obtained from the antenna elements and displays them as processed radar images on board the aircraft, in a virtual cockpit. [A1045]

"System and method for monitoring individuals and objects associated with wireless identification tags"

A monitoring system includes a wireless identification tag and interrogator. The tag includes memory that stores information associated with a person or object associated with the wireless identification tag. The interrogator wirelessly transmits an interrogation signal, which includes a sequence of interrogation codes, to the wireless identification tag. If one of the interrogation codes is associated with the wireless identification tag, the tag wirelessly transmits an acknowledgment signal associated with the tag. The interrogator receives the acknowledgment signal, which indicates that the wireless identification tag has been monitored within an area. A method of monitoring a person or object within a defined area includes the steps of storing information in a wireless identification tag, transmitting an interrogation signal, receiving the interrogation signal by the tag, determining whether an interrogation code in the received interrogation signal is associated with the tag and, if so, transmitting an acknowledgment signal. [A1046]

"System and method for verifying the radar signature of an aircraft"

The invention is a system and method for verifying the radar signature of a pair of aircraft. The system includes a radar transmitter and receivers located in the leading and trailing edge of the wing at the wing tip of the aircraft such that when flying the aircraft in formation with one aircraft behind the other aircraft, each aircraft can illuminate the other and verify the radar signature of the other. [A1047]

"Device and method for SPR detection in a Mode-S transponder"

A Mode-S transponder is provided for detecting synchronization phase reversal (SPR) signals. The transponder includes a receiver for receiving a Mode-S signal that contains a P6 pulse having a Mode-S data segment and an SPR signal therein. The transponder also includes a phase detector that detects a phase change between first and second states in the received Mode-S signal. The phase detector includes an SPR qualifier that determine whether, following a state change, the Mode-S signal remains at one of the first and second states for at least a predetermined minimum time sufficient to qualify as a detector enable signal. [A1048]

"Reduced state estimation with multisensor fusion and out-of-sequence measurements"

This invention relates to state estimation after processing measurements with time delays from multiple sensors of systems characterized by state variables and by multidimensional parameters, for which the latter are unknown and may vary arbitrarily in time within known physical bounds. If a measurement is time-late, apply the measurement to an out-of-sequence filter that uses a mean square optimization criterion that accounts for measurement errors and said bounding values, as well as the delay time, to optimally produce estimates of the true states of the system. If the measurement is not time-late, apply the measurements to an in-sequence filter that uses a mean square optimization criterion that accounts for measurement errors and said bounding values, to produce estimates of the true states of the system. The estimates are applied to one of (a) making a decision relating to the system, (b) operating a control system, and (c) controlling a process. [A1049]

"Device and method for alert and density altitude features in a transponder"

A transponder having a subsystem for providing an altitude alert function signifying a deviation from a set altitude is described. The subsystem includes an input for receiving an altitude deviation limit associated with the set altitude, a CPU receiving updated altitude and determining a difference between the updated altitude and the set altitude associated with the altitude deviation limit, and a transponder subsystem output device for providing the difference between the updated altitude and the set altitude to a user. [A1050]

"Fast and slow time scale clutter cancellation"

Target detection in the presence of non stationary clutter is improved by a radar receiver on a moving platform for detecting a target using a plurality of short coherent arrays and a plurality of long coherent arrays synthesized from the short coherent arrays overlapping the target. The target is obscured by slow scale clutter and fast scale clutter in the vicinity of the target. The radar receiver has a plurality of subapertures overlapping to acquire radar returns reflected from the target during the arrays, an analog to digital converter for each of the subapertures to convert the radar returns into digital radar returns for a plurality of range bins covering the target, the slow scale clutter and the fast scale clutter, and a digital computer for performing steps of SAR image creation, further enhanced by thresholding short array magnitude data, computing a time domain component of threshold filters using the thresholded short array magnitude data then coherently subtracting the time domain component of threshold filters from the short arrays, and using the result to synthesize long coherent arrays. A Space Time Adaptive Algorithm

(STAP) is applied to the long coherent arrays thus obtained to suppress slow and stationary clutter. The short coherent arrays are between 10 and 400 milliseconds long. The long coherent arrays are between 400 and 4000 milliseconds long. [A1051]

"Integrated traffic surveillance apparatus"

An apparatus and method for combining the functionality of multiple airborne traffic surveillance systems that operate in the L-band frequency range. The apparatus and method combine the functionality of both a Traffic Alert Collision Avoidance System (TCAS) and a Mode-Select (Mode-S) transponder in an integrated L-band traffic surveillance apparatus having a single processor that is embodied in a single Line Replaceable Unit. [A1052]

"Interrupt SAR image restoration using linear prediction and Range Migration Algorithm (RMA) processing"

SAR images are improved by a method for acquiring a synthetic aperture image from a sequence of periodic pulse returns where the sequence of periodic pulse returns is interspersed with interrupts, i.e. missing pulses. The interrupts mark the start and end of one or more segments, where the segments contain the periodic pulse returns form the SAR image. The method comprises the steps of: converting said pulse returns into a digital stream, performing an azimuth deskew on said digital stream to obtain a deskewed digital stream, forming a forward-backward data matrix from the deskewed digital stream for one or more segments, forming an average segment covariance from the forward-backward data matrix, computing a model order for the average segment covariance, computing one or more linear prediction coefficients using data contained in the forward backward data matrix, and model order, using the linear prediction coefficients to compute missing pulse returns belonging within the interrupts. The computation for extrapolating the missing pulse returns is introduced after the Stolt interpolator in RMA processing. In computing the model order, eigenvalues are found and compared to a threshold. Roots of a linear prediction polynomial are computed, then stabilized to obtain stabilized roots. Linear prediction coefficients are reconstituted using the stabilized roots. Sub-bands are used to decrease computing time for the missing pulse returns. [A1053]

"Method and apparatus for air-to-air aircraft ranging"

A method and apparatus is disclosed for determining the range between two planes, ownship (10) and target (12) . Model data (66) estimating the velocity and position of target (12) is compared to actual flight path data of the target (12) passively received by ownship (10) . The model data (66) and actual data is compared, and an error measurement is calculated. The model data is also subject to position and velocity constraints (78 and 82) which penalize unrealistic estimates. The error measurement and penalties are used to create a perturbation model (90) which is added to the model data to generate new model data. When the model data (66) conforms closely to the actual data, a range is computed from the model data (66) . [A1054]

"Method for interferometric radar measurement"

It is proposed in connection with a method for the interferometric radar measurement in conjunction with a helicopter operating in accordance with the ROSAR principle (Heli-Radar) that two coherent receiving antennas with receiving channels are associated with a transmitter of the ROSAR-system mounted on the revolving rotary cross, and that the difference (.DELTA.R) between the two distances (R+.DELTA.R, R) from the measured impact point P are calculated, in the manner known per se, based on the wavelength .lamda. of the emitted radar signal and the measured phase difference of the receiving echo of the two coherent receive channels. [A1055]

"Surveillance system"

A surveillance system for an aircraft includes a first antenna comprising a four radiating element antenna. The first antenna is configured for electrical coupling to a first air traffic control transponder and a first traffic alert and collision avoidance system, and a second antenna comprises a single element antenna configured for electrical coupling to a second air traffic control transponder. The surveillance system also comprises a second antenna comprising a single radiating element antenna configured for electrical coupling to a second air traffic control transponder. The surveillance system also comprises a first mounting interface configured for coupling the first antenna to the aircraft. The surveillance system also comprises a second mounting interface configured for coupling a second antenna to the aircraft. The mounting interface of the first antenna has a size and a shape corresponding to a size and shape of the mounting interface of the second antenna. [A1056]

"Radar altimeter"

A radar altimeter is provided that includes a transmitter operable to generate a radio signal at a modulation frequency, and transmit the radio signal toward a ground surface for reflection therefrom to thereby propagate a reflected radio signal. The radar altimeter also includes a receiver operable to receive the reflected radio signal, and determine the altitude of the aircraft based on the modulation frequency of the radio signal and a difference frequency derived from the radio signal and the reflected radio signal. The receiver is also operable to control the transmitter so as to vary the modulation frequency of the radio signal based on the altitude of the aircraft.

Preferably, the modulation frequency of the radio signal is greater at lower altitudes than at higher altitudes. [A1057]

"Multiple target ranging system"

A continuous wave ranging system, comprising a modulator 2 for modulating an r.f. carrier wave in accordance with a pseudo-random code 3, a transmitting antenna 5 for radiating the modulated signal towards a target, a receiving antenna 6 and receiver 7 for detecting the signal reflected back from the target, a correlator 8 for correlating the reflected signal with a transmitted code with a selected phase shift 9 corresponding to the current range gate to be tested, and means 10, 11, 12 for processing the range/amplitude data from the correlator 8 to discriminate between reflections due to the target and those due to other objects adjacent to the target. [A1058]

"Voice communications control system and method"

An audio communications control system operates between multiple voice communications systems and a single headset worn by an operator accessing the multiple communications systems via voice transmission. The single headset includes a left speaker, a right speaker, and a microphone. The audio interface provides an electrical connection and operation with each of the voice communications systems, even though each may operate with differing equipment and signal processing. The audio interface switches discrete voice communications signals and routes them to one of the left speaker, the right speaker, and conversely from the microphone of the headset to any of selected systems. [A1059]

"Conformal range migration algorithm (CRMA) "KARMA""

Motion compensation for coherent combination of pulses facilitates a SAR image of a scene on earth's surface. A great circle (406) is centered with respect to the earth's center, The great circle (406) has an axis (412) perpendicular to a first plane. Axis (412) passes through the earth's center. The first plane contains great circle (406) and includes the earth's center. Great circle (406) has a first center defined by an intersection of the first plane and axis (412) . The scene has one or more radar scatterers and is located on a surface (402) . The radar system is mounted on a moving platform (400) moving with a component of motion in a direction along great circle (406) . The radar comprises a radar receiver for digitizing the radar returns having a phase from scatterers on surface (402) , and a computer for focusing the phase of said radar returns from the scatterers on surface (402) . The surface (402) is located on a local scene centerline circle (408) , the local scene centerline circle (408) defining a second plane. This second plane is parallel to the first plane. The local scene centerline circle (408) is centered on the axis at a second center, where the second center is displaced with respect to the first center along the axis by a distance (414) . The phase of the radar returns received from the scene is compensated for the motion of the moving platform (400) using a cylindrical coordinate system referenced with respect to the second center to yield a SAR image. [A1060]

"Passive airborne collision warning device and method"

A passive airborne mounted collision warning system suitable for light aircraft that enables an observer aircraft to determine the position of a nearby transponder-equipped target aircraft. The transponder-equipped target aircraft transmits replies responsive to interrogation signals from rotating secondary surveillance radars (SSR) . In an embodiment of the invention, position of the target aircraft is determined based on the known position of the observer aircraft obtained e.g. via satellite navigation means such as GPS, the position of the SSR, and the bearing of the target aircraft measured by a direction finding antenna. The direction-finding antenna elements and the GPS receiver components are included in a device that is externally mounted on the observer aircraft. The data from the device is connected to a portable computer for processing and presentation to the pilot to alert him of the position of the target aircraft for avoiding collisions. [A1061]

"Three-dimensional synthetic aperture radar for mine detection and other uses"

A radar system for generating a three-dimensional image includes a radar transmitter which is operable to produce a radar signal of a frequency of at least three gigahertz. A plurality of radar receiving antennas from an antenna array. The antenna array is aerially translatable. for example, in one embodiment, the antenna array is disposed along the wings of an aircraft which, in operation, flies over the intended target area. A three-dimensional image is generated from a reflected radar signal returned from the surface of an object in response to the transmitted radar signal. The radar system may be incorporated into an aircraft and adapted to detect subsurface objects such as mines buried beneath the surface of the ground as the aircraft traverses over a target area. [A1062]

"Systems and methods for correlation in an air traffic control system of interrogation-based target positional data and GPS-based intruder positional data"

An improved system and methods for correlating an interrogation-based air traffic surveillance intruder, such as an Traffic alert and Collision Avoidance System (TCAS) intruder, and a GPS-based air traffic surveillance target, such as an Automatic Dependent Surveillance Broadcast (ADS-B) target to minimize or eliminate the display of two symbols for the same intruder/target on the CDTI of an aircraft. The method comprises the steps of receiving ADS-

B data at a processing unit and calculating select component deltas for the ADS-B data versus an entry in a TCAS intruder file. Progressive weights are assigned to the deltas and the progressive weights are summed, resulting in a total confidence score. Total confidence scores of ADS-B target and TCAS intruder pairs are compared to determine correlation between the ADS-B target and the TCAS intruders. [A1063]

"Phase center measurement of electronic warfare antennas using GPS signals"

An electronic warfare apparatus for determining the location of for example a ground based source of electromagnetic radiation from a platform such as an aircraft. Location is determined using angle of arrival based vector determinations provided by signal differences detected in the ground based signals arriving at platform antennas. Elimination of angle of arrival errors arising from imprecise knowledge of platform electronic warfare antenna characteristics is a focal point of the invention and is accomplished through precision use of global position system information received via the same electronic warfare antennas. Accurate determination of electronic warfare antenna characteristics prior to consideration of the large distance multiplication factors imposed by aircraft to distant signal source geometry enables accurate distant signal source location using the invention. [A1064]

"Method for recognizing and identifying objects"

A method for recognizing and identifying objects by means of several sensors, particularly using imaging sensors (L, W, V) in the infrared and/or visible wavelength range and radar devices (R) which are based on the generation of a synthetic aperture. According to the invention, generation of the synthetic aperture occurs in accordance with the ROSAR principle, wherein a plurality of antenna elements (A) , which the radar device (R) comprises, is placed on the aircraft (F) along its arched contour (K) , controlled sequentially and scanned, and wherein the information acquired by the radar devices (R) and the imaging sensors (L, W, V) is subsequently processed, in such a way that optimal imaging of the surroundings of the aircraft (F) is made possible in every viewing direction. [A1065]

"High resolution SAR processing using stepped-frequency chirp waveform"

A stepped-frequency chirped waveform improves SAR groundmapping for the following reasons. Range resolution in SAR image is inversely proportional to the transmitted signal bandwidth in nominal SAR systems. Since there is a limit in the transmitted bandwidth that can be supported by the radar hardware, there is a limit in range resolution that can be achieved by processing SAR data in conventional manner. However, if the frequency band of the transmitted signal is skipped within a group of sub-pulses and received signal is properly combined, the composite signal has effectively increased bandwidth and hence improvement in range resolution can be achieved. The proposed new and practical approach can effectively extend the limit in range resolution beyond the level that is set by the radar hardware units when conventional method is used. [A1066]

"Method of detecting moving objects and estimating their velocity and position in SAR images"

A method of detecting moving objects and of estimating their velocity and position in SAR images includes the steps of generating a sequence of single-look SAR images which have the same polarization, are successive in time, and have a look center frequency which varies from one image to the next, detecting candidates for moving objects in the single-look SAR images of the sequence by searching for regions with a course of intensity that deviates from the environment, estimating the velocity of the detected candidates, and verifying the detected candidates as moving objects. The estimation of one or more velocity components of a detected candidate takes place jointly with the estimation of one or more position components of the candidate. A cost function is established as a function of the components to be estimated, taking into account the positions of the candidate in the individual single-look SAR images of the sequence, which cost function is minimized by means of an optimization method for the parameter or parameters to be estimated. [A1067]

"Methods and apparatus for determination of a filter center frequency"

A method for calculating a center frequency and a bandwidth for a radar doppler filter is herein described. The center frequency and bandwidth are calculated to provide radar performance over varying terrain and aircraft altitude, pitch, and roll. The method includes receiving an antenna mounting angle, a slant range, and velocity vectors in body coordinates, calculating a range swath doppler velocity, a track and phase swath bandwidth, and a phase swath doppler velocity. The method continues by calculating a range swath center frequency based on the range swath doppler velocity, calculating a phase swath center frequency based on the phase swath doppler velocity, and calculating a level and verify swath bandwidth based upon the track and phase swath bandwidth. [A1068]

"Smart airport automation system"

A smart airport automation system includes a subsystem that inputs weather and airport configuration data to determine an active runway in use and an airport state. Another subsystem inputs aircraft position and velocity data from available surveillance sources, known flight-intent information, and past aircraft trajectories to project future aircraft unconstrained trajectories. A third subsystem uses the projected trajectories and aircraft intent to determine desired landing and takeoff sequences, and desired adjacent aircraft spacing. A fourth subsystem uses such information to predict potential aircraft conflicts, such as a loss of acceptable separation between adjacent aircraft. A fifth subsystem packages the weather, airport configuration, aircraft state, desired landing/takeoff sequence, and potential conflict detection into a verbal advisory message that is broadcast on a local common radio frequency. A sixth subsystem uses the projected trajectory information to control the runway and taxiway lighting system. [A1069]

"Identification and tracking of moving objects in detected synthetic aperture imagery"

A method of tracking a moving object in an image created by use of a synthetic aperture includes identifying a plurality of receive phase centers for an image collector, obtaining a synthetic aperture image using the plurality of receive phase centers, and reading a signature of the moving object based on the synthetic aperture image, where the reading of the signature includes identifying, in the synthetic aperture image, as a function of image collection time, a presence of the moving object. The reading of the signature may also include identifying a changing position of the moving object, and may include associating a plurality of range difference values with respective ones of the plurality of phase centers. A signature of a scatterer may be formed using only its associated .DELTA.R-versus-time profile. The presence of a mover in the image may be determined by filtering the image to detect all or part of a signature, or by using one or more signatures to train a neural network to observe the mover directly. [A1070]

"Robust predictive deconvolution system and method"

A method for processing a received, modulated pulse (i.e. waveform) that requires predictive deconvolution to resolve a scatterer from noise and other scatterers includes receiving a return signal, obtaining L+ (2M-1) (N-1) samples y of the return signal, where y (l) =x.sup.T (l) s+v (l) , applying RMMSE estimation to each successive N samples to obtain initial impulse response estimates [x.sub.1 {- (M-1) (N-1) }, . . ., x.sub.1 {-1}, x.sub.1 {0}, . . ., x.sub.1 {L-1}, x.sub.1 {L}, . . ., x.sub.1 {L-1+ (M-1) (N-1) }], computing power estimates .rho..sub.1 (l) =.vertline.x.sub.1 (l) .vertline..sup.2 for l=- (M-1) (N-1) , . . ., L-1+ (M-1) (N-1) , computing MMSE filters according to w (l) =.rho. (l) (C (l) +R) .sup.-1 s, where .rho. (l) =.vertline.x (l) .vertline..sup.2 is the power of x (l) , and R=E[v (l) v.sup.H (l)] is the noise covariance matrix, applying the MMSE filters to y to obtain [x.sub.2 {- (M-2) (N-1) }, . . ., x.sub.2 {-1}, x.sub.2 {0}, . . ., x.sub.2 {L-1}, x.sub.2 {L}, . . ., x.sub.2 {L-1+ (M-2) (N-1) }], and repeating (d) - (f) for subsequent reiterative stages until a desired length-L range window is reached, thereby resolving the scatterer from noise and other scatterers. The RMMSE predictive deconvolution approach provides high-fidelity impulse response estimation. The RMMSE estimator can reiteratively estimate the MMSE filter for each specific impulse response coefficient by mitigating the interference from neighboring coefficients that is a result of the temporal (i.e. spatial) extent of the transmitted waveform. The result is a robust estimator that adaptively eliminates the spatial ambiguities that occur when a fixed receiver filter is used. [A1071]

"Method and system for localizing a target in an interrogation-response system"

In a method and system to determine the position of a target by means of an IFF type antenna, the antenna having a given direction of aim, the method comprises a step for combining the distance D from the target to the carrier, the altitude A of the target, the altitude A.sub.pf of the carrier equipped with the IFF antenna and the angular error value of the target and the direction of aim of the antenna beam to localize the target with precision. Application to IFF interrogations in mode C. [A1072]

"Synthetic aperture radar (SAR) compensating for ionospheric distortion based upon measurement of the group delay, and associated methods"

A synthetic aperture radar (SAR) compensates for ionospheric distortions based upon measurement of the group delay, particularly when operating in the VHF/UHF band. The SAR is based upon a multi-input multi-output (MIMO) technique for estimating the effective ionospheric conditions, which is referred to as the group delay approach. The group delay approach is divided into a 1-dimensional (range) approach and a 2-dimensional (range and cross-range) approach. The group delay measures the effective or observed TEC, which is used to reduce the ionospheric distortion. [A1073]

"Intelligent passive navigation system for back-up and verification of GPS"

A passive navigation system for an airborne platform includes an on-board computer having a database that contains preprogrammed information regarding pre-existing ground-based signal emitters (e.g. cell-phone, television and radio broadcast transmitters) . for each emitter, the database includes the geolocation of the emitter and identifying signal characteristic (s) of each emitter's signal such as frequency, bandwidth and strength. An antenna array and digital receiver cooperate with the computer on the platform to passively receive signals from the emitters and determine a direction of arrival (DOA) for selected signals. The computer also extracts identifying signal characteristic (s) from selected received signals and matches them against the database information to ascertain the geolocation of the emitter that corresponds to the received signal. The platform location is then calculated from the DOA (s) and emitter geolocations using a triangulation-type algorithm. Also, preprogrammed site-specific terrain scattering information can be compared to observed scattered signals to enhance system accuracy. [A1074]

"Synthetic aperture radar (SAR) compensating for ionospheric distortion based upon measurement of the Faraday rotation, and associated methods"

A synthetic aperture radar (SAR) for a moveable platform includes an antenna, a radar transmitter and radar receiver cooperating with the antenna. A radar processor is connected to the radar transmitter and radar receiver to account for the Faraday rotation introduced by propagation through the ionosphere by estimating an individual ionospheric distortion for each received echo pulse based upon a measured Faraday rotation, and reducing the ionospheric distortion for each received echo pulse based upon the estimated individual ionospheric distortion associated therewith for providing a compensated echo pulse. [A1075]

"Field interchangeable level measurement system"

A microwave-based level measurement system having a planar microwave antenna configuration. According to another aspect, the microwave-based level measurement devices are field interchangeable with ultrasonic based level measurement devices. [A1076]

"Dynamic logic algorithm used for detecting slow-moving or concealed targets in synthetic aperture radar (SAR) images"

The present invention includes an application of a dynamic logic algorithm to detect slow moving targets. Show moving targets are going to be moving in the range from 0-5 mph. This could encompass troop movements and vehicles or convoys under rough terrain. The method can be defined as a seven step process of detecting slow moving targets using a synthetic aperture radar (SAR) , said slow moving targets being objects of interest that are moving in the range from 0-5 mph, wherein this method is composed of the steps of receiving SAR signal history data having an SAR image, assuming a presence of slow moving target in a SAR image based-on range, cross-range position, and velocity, assuming a presence of clutter, assigning target and clutter models that are probability distribution functions (pdf) that are defined to account for every pixel in the SAR image, wherein the target is modeled using a sum of Gaussians fitted along the target shape model, while the clutter is modeled with a uniform distribution, computing a "target present" predetermined threshold value, converging the target model to a minimum variance value, and comparing the target model minimum variance value to the predetermined threshold to determine if a target is present or absent. [A1077]

"Two antenna, two pass interferometric synthetic aperture radar"

A multi-antenna, multi-pass IFSAR mode utilizing data driven alignment of multiple independent passes can combine the scaling accuracy of a two-antenna, one-pass IFSAR mode with the height-noise performance of a one-antenna, two-pass IFSAR mode. A two-antenna, two-pass IFSAR mode can accurately estimate the larger antenna baseline from the data itself and reduce height-noise, allowing for more accurate information about target ground position locations and heights. The two-antenna, two-pass IFSAR mode can use coarser IFSAR data to estimate the larger antenna baseline. Multi-pass IFSAR can be extended to more than two (2) passes, thereby allowing true three-dimensional radar imaging from stand-off aircraft and satellite platforms. [A1078]

"Using dynamic interferometric synthetic aperature radar (InSAR) to image fast-moving surface waves"

A new differential technique and system for imaging dynamic (fast moving) surface waves using Dynamic Interferometric Synthetic Aperture Radar (InSAR) is introduced. This differential technique and system can sample the fast-moving surface displacement waves from a plurality of moving platform positions in either a repeat-pass single-antenna or a single-pass mode having a single-antenna dual-phase receiver or having dual physically separate antennas, and reconstruct a plurality of phase differentials from a plurality of platform positions to produce a series of desired interferometric images of the fast moving waves. [A1079]

"System and method for locating a target and guiding a vehicle toward the target"

A vehicle guidance system. The system includes a first mechanism for tracking a vehicle based on time-of-arrival information associated with energy emanating from the vehicle and providing vehicle position information in response thereto. A second mechanism steers the vehicle based on the vehicle position information. In a specific embodiment, the system of further includes a third mechanism for locating the target based on time-of-arrival information associated with energy radiating from the target and providing target location information in response thereto. The second the second mechanism steers the vehicle based on the target location information and the vehicle position information. [A1080]

"System for administering a restricted flight zone using radar and lasers"

A system is disclosed for administering a restricted flight zone using radar and lasers for detecting, tracking, warning and destroying airborne craft that enter restricted flight zones without authorization or that approach dangerously close to protected areas on the ground. The system comprises a support for positioning adjacent the surface of the Earth at a bottom of the zone, detecting and defending apparatus mounted on the support for detecting airborne objects in the zone and defending against the airborne objects in the zone, and controlling apparatus for controlling the detecting and defending means. [A1081]

"System and method for information assimilation and functionality control based on positioning information obtained by impulse radio techniques"

A system and method for information assimilation and functionality control based on positioning information obtained by impulse radio techniques, which utilizes the position information and communication abilities inherent in impulse radio technology to correlate position information of an entrant into a predetermined area with information about the entrant to accomplish a multitude of functionalities and assimilate information. [A1082]

"Phase-continuous frequency synthesizer"

A digitally controlled frequency synthesizer has a first direct digital synthesizer that generates a first phase-coherent, time-varying frequency, and a second direct digital synthesizer that generates an offset frequency waveform. A plurality of cascaded frequency converters successively combine the offset frequency waveform with a reference frequency waveform to produce a plurality of waveforms having respectively different frequencies. A switch switches between the plurality of waveforms produced by the cascaded frequency converters to realize a second waveform. The operation of the second direct digital synthesizer is controlled so as to maintain phase continuity between respective ones of the plurality of waveforms contained in the second waveform as output by the switch. A mixer multiplies the first waveform by the second waveform to produce a time-varying output frequency. [A1083]

"Methods and apparatus for determination of a filter center frequency"

A method for calculating a center frequency and a bandwidth for a radar doppler filter is herein described. The center frequency and bandwidth are calculated to provide radar performance over varying terrain and aircraft altitude, pitch, and roll. The method includes receiving an antenna mounting angle, a slant range, and velocity vectors in body coordinates, calculating a range swath doppler velocity, a track and phase swath bandwidth, and a phase swath doppler velocity. The method continues by calculating a range swath center frequency based on the range swath doppler velocity, calculating a phase swath center frequency based on the phase swath doppler velocity, and calculating a level and verify swath bandwidth based upon the track and phase swath bandwidth. [A1084]

"Radar altimeter with forward ranging capabilities"

A method for incorporating a forward ranging feature into a radar altimeter is described. The method comprises positioning an antenna of the altimeter such that a side lobe of a radar signal radiates from the antenna in a forward direction and processing a radar return from the side lobe to determine a range to a forward object. [A1085]

"Fusion of shape and multiscale features for unknown target rejection"

A plurality of image chips (202) (over 100) , each of the chips containing the same, known target of interest, such as, for example an M109 tank are presented to the system for training. Each image chip of the known target is slightly different than the next, showing the known target at different aspect angles and rotation with respect to the moving platform acquiring the image chip. The system extract multiple features of the known target from the plurality of image chips (202) presented for storage and analysis, or training. These features distinguish a known target of interest from the nearest similar target to the M109 tank, for example a Caterpillar D7 bulldozer. These features are stored for use during unknown target identification. When an unknown target chip is presented, the recognition algorithm relies on the features stored during training to attempt to identify the target. The tools used for extracting features of the known target of interest as well as the unknown target presented for identification are the same and include the Haar Transform (404) , and entropy measurements (410) generating coefficient locations. Using the Karhunen-Loeve (KL) transform 406, eigenvectors are computed. A Gaussian mixture model (GMM) (507) is used to compare the extracted coefficients and eigenfeatures from the known target chips with that of the unknown target chips. Thus the system is trained initially by presenting to it known target chips for classification. Subsequently, the system uses the training in the form of stored eigenfeatures and entropy coefficients fused with multiscale features to identify unknown targets. [A1086]

"Telematics process for helicopters"

The invention relates to a telematics method for helicopters. According to the inventive method, the use spectrum of helicopters which are provided with all-weather flight guidance and obstacle warning systems is enlarged and flight security is further improved by transmitting data and/or speech by means of terrestrial and/or satellite-supported mobile radio telecommunications networks and by connecting to a locating system. Logistics processes of the helicopter operation and of the institutions benefiting from a helicopter use are optimized. [A1087]

"Airborne or spaceborne tomographic synthetic aperture radar (SAR) method"

By means of tomograhic radar technique consisting of a coherent combination of large numbers of synthetic aperture radar images acquired by several air or space SAR systems having different look angles, a real three-dimensional imaging of volume scatterers is achieved. This allows the separation of the backscattered signal of volume scatterers in the height direction which can be further evaluated independently. The invention can be put to use in the three-dimensional analysis of vegetation layers and ground strata, but also for imaging and mapping of buildings, urban areas and mountainous terrain. [A1088]

"Method of measuring point-blank passing time or the like of airplane"

A terrain clearance measuring radio wave being emitted from an airplane is received, and changes in electric field intensity of the radio wave is input and recorded to a computer, whereby the time of occurrence of a sharply appearing peak value of the changes permits accurate measurement of the point-blank passing time, independent of flight frequency. [A1089]

"Method and apparatus for reducing false taws warnings and navigating landing approaches"

A system for reducing nuisance alerts and warnings in a terrain awareness and warning system for an aircraft, including determining if the aircraft is within a predetermined geometric volume surrounding an airport. If the aircraft is within the geometric volume, then determining the aircraft's current projected flight path for a selected distance or time and comparing it with at least one approach volume extending from a runway at the airport towards an outer boundary of the geometric volume. If the aircraft's current projected flight path is such that the aircraft is expected to be within the approach volume and stay within the approach volume to the runway, then inhibiting selected alerts and warnings associated with non-threatening terrain. [A1090]

"Spatial multibeam ambiguity resolving technique (SMART)"

A synthetic aperture radar (SAR) image of a wide coverage area is acquired during a frame containing a first plurality of ambiguities induced in the SAR image from radar scatterers within the area. The area is illuminated with radar pulses and a segmented receive antenna oriented towards the area. The segmented receive antenna has a second plurality of sub-apertures, where the second plurality of sub-apertures is larger than the first plurality of ambiguities. Each sub-aperture has its own receiver. The digital stream from each receiver is stored in a computer for the duration of the frame to obtain frame data. A SAR image is extracted from the frame data. The first plurality of ambiguities are identified from analysis of the frame data, and a correction is computed to account for the first plurality of ambiguities contained within the synthetic aperture image. The correction is applied to reduce distortions caused by the ambiguities in the SAR image. [A1091]

"Correlation of flight track data with other data sources"

The surveillance system provides a means to augment Automatic Dependent Surveillance-Broadcast (ADS-B) with "look alike ADS-B" or "pseudo ADS-B" surveillance transmissions for aircraft which may not be ADS-B equipped. The system uses ground based surveillance to determine the position of aircraft not equipped with ADS-B, then broadcasts the identification/positional information over the ADS-B data link. ADS-B equipped aircraft broadcast their own position over the ADS-B data link. The system enables aircraft equipped with ADS-B and Cockpit Display of Traffic Information (CDTI) to obtain surveillance information on all aircraft whether or not the proximate aircraft are equipped with ADS-B. [A1092]

"Methods and systems for detecting forward obstacles"

Methods and apparatus for detecting obstacles in the flight path of an air vehicle are described. The air vehicle utilizes a radar altimeter incorporating a forward looking antenna and an electronic digital elevation map to provide precision terrain aided navigation. The method comprises determining a position of the air vehicle on the digital elevation map, selecting an area of the digital elevation map in the flight path of the air vehicle, based at least in part on the determined air vehicle position, and scanning the terrain representing the selected map area with the forward looking antenna. The method also comprises combining the digital elevation map data for the selected map area with radar return data for the scanned, selected area and displaying the combined data to provide a representation of the terrain and obstacles in the forward flight path of the air vehicle. [A1093]

"Vertical weather profile display system and method"

An aircraft weather radar system is disclosed. The system comprises a radar antenna, aircraft sensors, and a database. The system also comprises a processing device receiving information from the radar antenna and from the aircraft sensors and able to retrieve information from the database. Further, the system comprises a cockpit display coupled to the processing device. The processing device is programmed to estimate storm system characteristics based on the received information from the aircraft sensors and the database and to display the storm system characteristics on a vertical weather profile display using a graphical representation. [A1094]

"Method and system for providing along-track alignment and formatting of synthetic aperture radar (SAR) data, and SAR image formation algorithms using such method and system"

An along-track alignment and formatting system (ATAFS) formats synthetic aperture radar (SAR) data to align and format signals from scatterers in a scene to achieve an ideal data format in the along-track dimension in which such ideal data format leads to improved image quality of an image based on the SAR data and/or reduced computational burden for generating an image based on the SAR data. Two aspects of the ATAFS include: 1) the division of data stabilization into two distinct steps, and 2) the along-track (or slow-time) migration of signal support of scatterers as a function of their along-track location. A suite of SAR image formation algorithms use the ATAFS in conjunction with conventional signal processing stages to transform input coherent signal data into a complex image with image quality and geometric accuracy commensurate with the inherent information content of the input data. [A1095]

"Side looking SAR system"

A synthetic aperture radar (SAR) processes radar has a transmit aperture and a receive aperture that is of a different size from the transmit aperture. The receive aperture is separated from the transmit aperture and is divided into a number of receive sub-apertures arranged in the elevation and azimuth directions. Circuitry is used to process the received radar signal coherently by phase shifting each receive sub-aperture signal by a time and/or frequency variant phase value and by summing the resulting signals from receive sub-apertures arrayed along the elevation direction, whereby the time and/or frequency variant phase value is generated in such a way that the radar echo signal is maximized in the summed signal as the radar transmit signal runs over the earth's surface. [A1096]

"High resolution autonomous precision positioning system"

A vehicle navigation method and system employing echo or doppler analysis to provide autonomous or enhanced navigational capabilities by correlating stored scene information with echo analysis information derived from an Active Traveling-Wave Device (ATWD) output representing information concerning the vehicle's state and velocity vectors with respect to a mapped scene. [A1097]

"Device and method for alert and density altitude features in a transponder"

A transponder having a subsystem for providing an altitude alert function signifying a deviation from a set altitude is described. The subsystem includes an input for receiving an altitude deviation limit associated with the set altitude, a CPU receiving updated altitude and determining a difference between the updated altitude and the set altitude associated with the altitude deviation limit, and a transponder subsystem output device for providing the difference between the updated altitude and the set altitude to a user. [A1098]

"Method and apparatus for collection and processing of interferometric synthetic aperture radar data"

A system and method provide for the collection of interferometric synthetic aperture radar (IFSAR) data. In the system, a first space vehicle configured for emitting electro-magnetic energy and collecting the reflection from a region of interest (ROI) , may be directed along a first orbital track. The collected image data may be stored and later provided to a ground station for image and interferometric processing. A second space vehicle may also be configured for emission and collection of electro-magnetic energy reflected from the plurality of ROI's. The second space vehicle is positioned in an aligned orbit with respect to the first space vehicle where the separation between the vehicles is known. In order to minimize decorrelation of the ROI during image processing, the lead and trail satellite are configured to substantially simultaneously emit electromagnetic pulses image data collection. In order to avoid interference in the collection of this image data, each system is configured to control the emission of pulses such that the receipt of direct and bistatic pulses by the other vehicles does not interfere with data collection. [A1099]

"Digital intermediate frequency receiver module for use in airborne SAR applications"

A digital IF receiver (DRX) module directly compatible with advanced radar systems such as synthetic aperture radar (SAR) systems. The DRX can combine a 1 G-Sample/sec 8-bit ADC with high-speed digital signal processor, such as high gate-count FPGA technology or ASICs to realize a wideband IF receiver. DSP operations implemented in the DRX can include quadrature demodulation and multi-rate, variable-bandwidth IF filtering. Pulse-to-pulse (Doppler domain) filtering can also be implemented in the form of a presummer (accumulator) and an azimuth prefilter. An out of band noise source can be employed to provide a dither signal to the ADC, and later be removed by digital signal processing. Both the range and Doppler domain filtering operations can be implemented using a unique pane architecture which allows on-the-fly selection of the filter decimation factor, and hence, the filter bandwidth. The DRX module can include a standard VME-64 interface for control, status, and programming. An interface can provide phase history data to the real-time image formation processors. A third front-panel data port (FPDP) interface can send wide bandwidth, raw phase histories to a real-time phase history recorder for ground processing. [A1100]

"Method and system for mutual coherent synthetic aperture radiometry"

Method and system for synthetic aperture radiometry not limited by the Van Cittert-Zernike theorem and the quasi-monochromatic assumption. A radiometer system (300) for imaging the emissions from a distribution of incoherent emission sources located within a target area comprising a first antenna (322) configured to receive a first signal (326) emitted primarily from a target area, and a second antenna (324) configured to receive a second signal (327) emitted primarily from the target area. The first and second antennas may be located at approximately the same distance from the target area (310) or at substantially different distances from the target area (310) . The radiometer system (300) is configured to allow the second antenna (324) to move faster than the first antenna (322) with respect to the target area (310) , with the second antenna (324) moving along a pre-determined trajectory corresponding to a synthetic aperture (430) . A cross correlation receiver (330) computes a plurality of cross correlation functions as based on all relevant relative time delays between the first signal (326) and the second signal (327) . The image processor (340) converts computed correlation data (332) into a plurality of complex valued radial down range profiles of the target area and further computes an image of the target area based on synthetic aperture image processing principle. [A1101]

"Transponder having high phase stability, particularly for synthetic aperture radar, or sar, systems"

A transceiver or transponder particularly for synthetic aperture radar, or SAR, systems, operating in a frequency band having a central frequency, the transponder comprising a receiver (1) and a transmitter (2) both thermally stable and made by microstrip technology, the receiver (1) and the transmitter (2) being adapted to receive and to transmit, respectively, an electromagnetic wave provided with at least one linear polarisation, the receiver (1) being connected to the transmitter (2) by amplifier means comprising an amplifier unit (5) for each linear polarisation of the wave received by the receiver (1) , each amplifier unit (5) including at least two amplifier stages (7, 9, 11) cascade arranged along a single microstrip and interconnected to one another and to an input and to an output of the corresponding amplifier unit (5) by means of coupling or matching stages (6, 8, 10, 12) , the output signal of each amplifier unit (5) having substantially the same frequency as the input signal thereto, the amplifier units (5) having substantially the same gain, the gain being no lower than 25 dB, the transponder being phase stable so that each linear polarisation of the transmitted electromagnetic wave has phase variations in time no higher than 20.degree., the transponder further comprising electromagnetic decoupling means (4, 14) between the transmitter (2) and the receiver (1) . [A1102]

"Passive clear air turbulence detection avionics system and method"

A passive clear turbulence (CAT) detection system for use on-board an aircraft comprises: an antenna for receiving electromagnetic radiation and for generating electrical signals representative thereof, and a processor for processing the electrical signals with at least one CAT waveform signature to detect CAT activity in relation to the aircraft. Also disclosed is a method of detecting clear air turbulence (CAT) from an aircraft, the method comprising the steps of: receiving electromagnetic radiation and generating electrical signals representative thereof, and processing the electrical signals with at least one CAT waveform signature to detect CAT activity in relation to the aircraft. [A1103]

"Methods and apparatus for determining an interferometric angle to a target in body coordinates"

A method for processing radar return data to determine a physical angle, in aircraft body coordinates to a target, is disclosed. The radar return data includes a phase difference between radar return data received at an ambiguous radar channel and a left radar channel, a phase difference between radar return data received at a right radar channel and an ambiguous radar channel, and a phase difference between radar return data received at a right radar channel and a left radar channel. The method includes adjusting a phase bias for the three phase differences, resolving phase ambiguities between the three phase differences to provide a signal, and filtering the signal to provide a physical angle to the target in aircraft body coordinates. [A1104]

"Device and method for SPR detection in a Mode-S transponder"

A method is provided for controlling when a transponder replies to Mode-S interrogation signals. The method includes receiving Mode-S signals containing P5 and P6 pulses. The received P5 and P6 pulses have certain amplitudes. Each P6 pulse contains a sync phase reversal (SPR) signal followed by a data segment containing Mode-S data The P5 pulse is asynchronous with respect to the P6 pulse and the P5 pulse is timed to overlay the SPR signal. The method further includes, analyzing each P5 and corresponding P6 pulse, and identifying the SPR signal correctly in at least 99% of the received Mode-S signals in which the amplitude of the P6 pulse is at least 12 dB greater than the amplitude of the P5 pulse and in no more than 2% of the received Mode-S signals in which the amplitude of the P6 pulse is at least 3 dB less than the amplitude of the P5 pulse, and replying to the Mode-S signals for which the SPR signal is correctly identified. [A1105]

"Miniature radio-acoustic sounding system for low altitude wind and precipitation measurements"

The present invention is directed to a radio-acoustic sounding system for providing wind measurements at altitudes of 100 meters or less. Wind measurements are obtained by transmitting a pulse of audio frequency energy through one or more volumes corresponding to the coverage area of one or more radio frequency transceivers. The frequency of the audio pulse is selected to have a wavelength that is one-half the wavelength of the electromagnetic energy transmitted by the antenna or antennas. By monitoring a return radio frequency signal at selected times following the transmission of the audio pulse, wind data is obtained at selected altitudes. Wind speed and direction can be obtained by observing the Doppler frequency shift of return radio frequency signals, or by observing the amplitude of the return radio frequency signals. In accordance with an embodiment of the present invention, precipitation measurements may be made by transmitting a radio frequency signal at the same radio frequency as is used in connection with wind measurements, and observing return radio frequency signals. [A1106]

"Inverse precision velocity update for monopulse calibration"

A radar system derives a correction for an actual boresight (311) of a radar monopulse antenna mounted on a moving platform from .SIGMA. data and .DELTA. data generated with respect to an a priori known, calibrated boresight (309) . The monopulse antenna (602) is coupled to a ground position measuring system (616) while acquiring data. The radar receiver acquires a .SIGMA. and .DELTA. synthetic aperture map of the same radar scattering location with respect to the calibrated boresight. .SIGMA. SAR data and the .DELTA. SAR data are motion compensated using the position and velocity supplied by the ground positioning system. A computer forms a ratio of the aligned .DELTA. pixels to the aligned .SIGMA. pixels for each of a plurality of aligned .SIGMA. pixels located near the calibrated boresight. The correction for the location of the actual boresight of the monopulse antenna is computed by an analysis of the ratio of aligned .SIGMA. pixels and corresponding aligned .DELTA. pixels over the radar scattering location. Typically, a least square fit analysis is used to plot the .DELTA./.SIGMA. ratio, and ascertain where the zero crossing of the monopulse angle=0 line is found thereby identifying the position of the actual boresight, and the correction from the a priori, calibrated boresight. [A1107]

"Airborne biota monitoring and control system"

A method and system for identifying harmful airborne biota, particularly insects, and including plant material, such as mold spores and pollen, and flying insects and birds and either killing ordisabling the harmful airborne biota is disclosed. Lasers, radar, and other types of radiation may be used to illuminate at least a perimeter around assets to be protected, with radiation returns detected and applied to a pattern classifier to determine whether the detected insects of interests are harmful, benign or beneficial. In the event the insects are determined to be harmful, a variety of measures responsive to the radiation returns may be taken to eliminate the harmful insects, these measures including firing pulses of beamed energy or radiation of a sufficient intensity to at least incapacitate them, or mechanical measures such as controlled drone aircraft to track and kill the pests. [A1108]

"Runway obstacle detection system and method"

An airborne radar system is disclosed. The airborne radar system comprises a radar antenna, radar circuitry coupled to the radar antenna, and a runway database comprising runway location information. The airborne radar system also comprises a processing device retrieving from the runway database, runway location information for a runway being approached by an aircraft, based on the location of the aircraft, and directing a radar beam defined by a polygon which represents the runway and which is derived from the runway information, the processing device determining whether there are any obstacles on the runway. [A1109]

"RF identification system for determining whether object has reached destination"

An RFID system for verifying whether an object that has been transported to a first destination has reached its intended destination. An RFID transceiver tag is mounted on the object. The intended destination is stored in a memory within the tag. An interrogator at the first destination sends an RF interrogation signal, to which the tag responds by transmitting an RF signal containing its intended destination. The interrogator compares whether the intended destination transmitted by the tag is the same as the first destination and, if not, the interrogator signals that the object should not be delivered to the destination. [A1110]

"Vertical profile display with arbitrary plane"

A system for allowing pilots to quickly determine weather hazard-free flight paths and weather hazards that exist along the aircraft flight plan. The system includes a memory, a processor, and a display device. The memory stores weather radar return information in a three-dimensional display distance value signal, retrieves weather radar return information stored in a plane of voxels in the three-dimensional buffer based on the selected display distance value and aircraft position information, and generates an image based on the retrieved weather radar return information. The display device is coupled to the processor for displaying the generated image. [A1111]

"Waveform synthesis for imaging and ranging applications"

Frequency dependent corrections are provided for Local Oscillator (LO) feed-through. An operational procedure filters LO feed-through effects without prior calibration or equalization. Waveform generation can be adjusted/corrected in a synthetic aperture radar system (SAR) , where a rolling phase shift is applied to the SAR's QDWS signal where it is demodulated in a receiver, unwanted energies, such as LO feed-through energy, are separated from a desired signal in Doppler, the separated energy is filtered from the receiver leaving the desired signal, and the separated energy in the receiver is measured to determine the degree of imbalance that is represented by it. Calibration methods can also be implemented into synthesis. The degree of LO feed-through can be used to determine calibration values that can then be provided as compensation for frequency dependent errors in components, such as the QDWS and SSB mixer, affecting quadrature signal quality. [A1112]

"Near-vertical incidence HF radar"

An HF radar system comprises a transmitting system, a receiving system, a signal processing system and a frequency management/ionospheric sounding system. The transmitting system comprises a transmitting antenna array configured to transmit a beam in a near vertical direction and a transmitting device arranged to drive the transmitting antenna array at frequencies suitable for downward refraction by the ionosphere. The receiving system comprises a receiving antenna array configured to receive returning signals from a target area returning to the receiving antenna array via refraction at the ionosphere. The signal processing system comprises a digital data processing system. The frequency management/sounding system comprises cooperating transmitting and receiving systems sending HF signals to the ionosphere and analysing the returning signals. Alternatively, the system may have a duplexed antenna array. The receiving system includes means to discriminate the returning signal produced by a helicopter, other aircraft or surface vessels. [A1113]

"Waveform synthesis for imaging and ranging applications"

Frequency dependent corrections are provided for quadrature imbalance and Local Oscillator (LO) feed-through. An operational procedure filters imbalance and LO feed-through effects without prior calibration or equalization. Waveform generation can be adjusted/corrected in a synthetic aperture radar system (SAR) , where a rolling phase shift is applied to the SAR's QDWS signal where it is demodulated in a receiver, unwanted energies, such as LO feed-through and/or imbalance energy, are separated from a desired signal in Doppler, the separated energy is filtered from the receiver leaving the desired signal, and the separated energy in the receiver is measured to determine the degree of imbalance that is represented by it. Calibration methods can also be implemented into synthesis. The degree of LO feed-through and imbalance can be used to determine calibration values that can then be provided as compensation for frequency dependent errors in components, such as the QDWS and SSB mixer, affecting quadrature signal quality. [A1114]

"Synthetic airborne hazard display"

A system and method for downlinking weather data, generated by existing weather and data sensors, to a ground station. The ground station utilizes data from multiple aircraft to form refined weather information, and uplinks the refined weather information to the aircraft. The refined weather information is stored at the aircraft and picture generating equipment, such as an existing onboard ground proximity terrain or weather radar picture and symbol generator, generates pictorial information depicting weather. The pictorial information is displayed, for example by an existing EFIS or weather radar display, in the form of polygons. [A1115]

"Waveform synthesis for imaging and ranging applications"

Frequency dependent corrections are provided for quadrature imbalance. An operational procedure filters imbalance effects without prior calibration or equalization. Waveform generation can be adjusted/corrected in a synthetic aperture radar system (SAR) , where a rolling phase shift is applied to the SAR's QDWS signal where it is demodulated in a receiver, unwanted energies, such as imbalance energy, are separated from a desired signal in Doppler, the separated energy is filtered from the receiver leaving the desired signal, and the separated energy in the receiver is measured to determine the degree of imbalance that is represented by it. Calibration methods can also be implemented into synthesis. The degree of quadrature imbalance can be used to determine calibration values that can then be provided as compensation for frequency dependent errors in components, such as the QDWS and SSB mixer, affecting quadrature signal quality. [A1116]

"Transponder lock"

A transponder lock provides allows an aircraft transponder to continue transmitting an alerting code for the duration of an emergency. The transponder lock thereby enables the aircraft transponder to continue to provide crucial information to ground tracking stations. Installation of the transponder lock results in very little aircraft downtime because the transponder lock connects in-line with existing aircraft wiring. [A1117]

"Missile detection and neutralization system"

The present invention is intended to provide a system for determining the precise launch point of ballistic missiles, and may additionally provide the capability of neutralizing said threats. The invention provides a mobile object information means configured to classify electromagnetic frequency activity within satellite and land based commercial and private broadcast and telecommunications spectra in a given geographical area, said means also configured to classify associated area weather normality and anomalies. The system includes a software algorithm configured to extract from said database, a missile launch in a given geographical zone by "tagging" an electromagnetic wave disturbance caused by the high intensity initial fuel burn of said missile launch. Additionally, the system is intended to affect the electrical functioning of a missile guidance system or warhead detonator by transmitting a precisely tuned frequency wave combination from a defensive missile borne frequency generator, or from a network of satellite or land based transmitters. [A1118]

"Voice recognition landing fee billing system"

An apparatus and method are described for generating landing fee and other airport service bills automatically. The system automatically detects aircraft N-number from air traffic control voice data using a voice recognition system and determines aircraft landing and departure events from one or more remote sensor units which determine aircraft vicinity or actual aircraft track. From the landing and departure data and the voice-recognized registration number, the system automatically bills aircraft owners for landing fees based upon this voice recognition as well as upon aircraft position detection. [A1119]

"Process for mapping multiple-bounce ghosting artifacts from radar imaging data"

Described herein are frequency-domain back-projection processes for forming spotlight synthetic aperture radar ("SAR") images that are not corrupted by the effects of multiple-bounce ghosting artifacts. These processes give an approximately exact reconstruction of the multiple bounce reflectivity function (MBRF) .function. (x,y,.gamma.) . Specifically, the evaluation of .function. (x,y,.gamma.) in the .gamma.=0 plane gives an approximately exact reconstruction of the true object scattering centers which is uncorrupted by multiple-bounce contributions to the phase history data G (.xi., .theta.) . In addition, the non-zero dependence of .function. (x,y,.gamma.) upon the MB coordinate .gamma. can be used to facilitate the identification of features-interest within the imaged region. [A1120]

"Radio altimeter test method and apparatus"

A method, apparatus and circuit for testing a radio altimeter is disclosed. During the test-mode operation of the altimeter, a signal processor controls a transmitter to generate a radio frequency signal at a first period of time, which is transmitted through an attenuator, transmitted then through a receiver and received by the signal processor at a second period of time for processing of altimeter operational information. [A1121]

"Multisource target correlation"

An improved method for correlating between targets in an air traffic control system. A methods or systems according to the invention compare selected components of a first target report to the components of a second target report, produce a confidence level on each component comparison, and determine whether to declare the targets similar based on the confidence level on each component compared. The first and second target reports may include ADS-B target reports and TIS target reports. The individual components of the reports may be range, bearing, track angle, and relative altitude. The methods or systems may use a fuzzy logic probability model to produce a continuous confidence level on each component comparison. [A1122]

"Method and apparatus for improving the utility of a automatic dependent surveillance"

The surveillance system provides a means to augment Automatic Dependent Surveillance--Broadcast (ADS-B) with "look alike ADS-B" or "pseudo ADS-B" surveillance transmissions for aircraft which may not be ADS-B equipped. The system uses ground based surveillance to determine the position of aircraft not equipped with ADS-B, then broadcasts the identification/positional information over the ADS-B data link. ADS-B equipped aircraft broadcast their own position over the ADS-B data link. The system enables aircraft equipped with ADS-B and Cockpit Display of Traffic Information (CDTI) to obtain surveillance information on all aircraft whether or not the proximate aircraft are equipped with ADS-B. [A1123]

"Methods and apparatus for terrain correlation"

A method for testing radar system performance is disclosed which utilizes radar data test points in a radar data file. The method includes interpolating GPS data from a flight test to provide a GPS data point for every radar data test point, generating body coordinate values for every point in a corresponding digital elevation map (DEM) file using the interpolated GPS data, and applying a bounding function around at least a portion of the body coordinate values generated from the DEM file at a given time. The method also includes determining which body coordinate value generated from the DEM file is closest a current GPS data point for the given time and comparing the determined body coordinate value to the radar data test points at the given time. [A1124]

"Systems and methods for correlation in an air traffic control system of interrogation-based target positional data and GPS-based intruder positional data"

An improved system and methods for correlating an interrogation-based air traffic surveillance intruder, such as an Traffic alert and Collision Avoidance System (TCAS) intruder, and a GPS-based air traffic surveillance target, such as an Automatic Dependent Surveillance Broadcast (ADS-B) target to minimize or eliminate the display of two symbols for the same intruder/target on the CDTI of an aircraft. The method comprises the steps of receiving ADS-B data at a processing unit and calculating select component deltas for the ADS-B data versus an entry in a TCAS intruder file. Progressive weights are assigned to the deltas and the progressive weights are summed, resulting in a total confidence score. Total confidence scores of ADS-B target and TCAS intruder pairs are compared to determine correlation between the ADS-B target and the TCAS intruders. [A1125]

"Method and arrangement for obtaining and conveying information about occupancy of a vehicle"

Method and arrangement for obtaining and conveying information about occupancy of a passenger compartment of a vehicle including a health state determining mechanism for determining the occupant's health state, and a communications mechanism coupled to the health state determining mechanism for establishing a communications channel between the vehicle and a remote facility to enable the occupant's health state to be transmitted to the remote facility. The determining mechanism may include a heartbeat sensor, a sensor for detecting motion of the occupants such as a micropower impulse radar sensor and/or an arrangement for detecting changes in the weight distribution of the occupants, a motion sensor for determining whether the occupants are breathing, a chemical sensor for analyzing the amount of carbon dioxide in the passenger compartment or around the occupants and/or a chemical sensor for detecting the presence of blood in the passenger compartment. The determining mechanism may determine whether a driver's breathing is erratic or indicative of a state in which the driver is dozing. It may also include a breath-analyzer for analyzing the alcohol content in air expelled by the driver. An alarm or warning light is activatable by the remote facility over the communications channel based on analysis of the occupant's health state. [A1126]

"Digital receiving system for dense environment of aircraft"

The capacity of a Mode-S ADS-B surveillance radar system is increased by sectorizing the radar system by the use of a directional array of Mode-S, quarter wavelength, single element, stub antennas. The ensemble of signals from the array of Mode-S antenna elements is processed electronically. The signal processing/receiver architecture increases the capacity of the Mode-S ADS-B system to be capable of effectively functioning within a highly congested airspace. [A1127]

"Radio tag for LFM radar"

An RFID system using encoded digital information utilizing pulsed linear frequency modulation (LFM) . The LFM waveform is sent from an aircraft or satellite and is received by a transponder. The LFM waveform is demodulated using both, an AM and an FM receiver. The demodulated data is compared to preprogrammed criteria tables, and after validation is decoded and utilized. Algorithms in the transponder are used to determine the frequency deviation and for calculating the direction of the slope of the LFM input signal. The valid RF signal is stored in a delay element, encoded with the transponder data using phase modulation (PM) , and frequency modulation (FM) . The tag transmission is synchronized to the input LFM waveform. The transmit/receive chopping signal prevents unwanted oscillations and is capable of randomization. [A1128]

"Imaging methods and systems for concealed weapon detection"

Imaging methods and systems for concealed weapon detection are disclosed. In an active mode, a target can be illuminated by a wide-band RF source. A mechanically scanned antenna, together with a highly sensitive wide-band receiver can then collect and process the signals reflected from the target. In a passive mode, the wide-band receiver detects back-body radiation emanating from the target and possesses sufficient resolution to separate different objects. The received signals can then be processed via a computer and displayed on a display unit thereof for further analysis by security personnel. [A1129]

"Integrated airborne transponder and collision avoidance system"

An airborne collision avoidance system includes a receiver stage constructed and arranged to detect (a) at a first radio frequency, first interrogation signals, and first collision resolution advisory (RA) signals transmitted from other nearby aircraft, and (b) at a second radio frequency, first acquisition signals including position information with respect to the nearby aircraft, and first reply signals from the nearby aircraft. A transmitter stage is constructed to produce (a) at the first radio frequency, second interrogation signals and second collision RA signals, and (b) at the second radio frequency, second acquisition signals including position information with respect to the given aircraft, and second reply signals from the given aircraft in response to the first interrogation signals. Tracking and collision avoidance information derived by a system processor from the detected first acquisition and first RA signals is shown on a cockpit display. The receiver and the transmitter stages are coupled to a single pair of upper and lower fuselage antennas through a T/R switch module. [A1130]

"Device and method for SPR detection in a mode-S transponder"

A method is provided for controlling transponder replies to Mode-S interrogation signals. The method includes receiving Mode-S signals containing P5 and P6 pulses each having certain amplitudes. Each P6 pulse contains a sync phase reversal (SPR) signal followed by a data segment containing Mode-S data. The P5 pulse is asynchronous with respect to the P6 pulse and is timed to overlay the SPR signal. The method includes, analyzing each P5 and corresponding P6 pulse, identifying the SPR signal correctly in the received Mode-S signals in which the amplitude of the P6 pulse is at least 12 dB greater than the amplitude of the P5 pulse and in no more than 2% of the received Mode-S signals in which the amplitude of the P6 pulse is at least 3 dB less than the amplitude of the P5 pulse, and replying to the Mode-S signals where the SPR signal is correctly identified. [A1131]

"Estimation and correction of phase for focusing search mode SAR images formed by range migration algorithm"

A method for acquiring synthetic aperture images of stationary targets converts a plurality of radar signals stored as digital values and motion compensated to a first order into a well focused image. The digital values are Fourier transformed, match filtered and interpolated using a Stolt interpolator, then skewed to reorient distortions arising from imperfect motion compensation, generating an image data, descriptive of the stationary targets in the range and azimuth direction. The image data is divided into a plurality of overlapping sub-patches in, preferably, the cross track (azimuth) direction. Each sub-patch containing a portion of the image data and overlapping data. The overlapping data is part of the image data and common between two or more of the overlapping sub-patches. Each of the overlapping sub-patches is individually focused using autofocus means to obtain focused sub-patches having a phase. The phase is adjusted for each of the focused sub patches to obtain a continuous phase with respect to one or more of the focused sub-patches, thereby obtaining smooth phase transition sub-patches. The synthetic aperture images of stationary targets are computed after concatenating the smooth phase transition sub-patches. [A1132]

"Radar system having multi-platform, multi-frequency and multi-polarization features and related methods"

A radar system may include an antenna, a waveform generator for generating a plurality of waveforms for different polarizations and/or having different frequency components, and a transmitter connected to the waveform generator for transmitting the plurality of waveforms via the antenna. Moreover, the radar system may also include a receiver connected to the antenna for receiving reflected signals from targets, and a processor for iteratively deconvolving the reflected signals to generate target data. More particularly, the radar system and targets may be relatively movable with respect to one another, and the processor may therefore store reflected signals over a length of relative movement and generate the target data based upon the stored signals to thus provide a synthetic aperture radar (SAR) system or an inverse SAR (ISAR) system. [A1133]

"Error correction of messages by a passive radar system"

Receiving a message including bits corresponding to an identifier, the identifier including a unique address for a aircraft transponder, extracting the unique address from the identifier, comparing the unique address to a set of predetermined addresses, changing selected ones of the identifier bits when the unique address is not one of the set of predetermined addresses, wherein the changing of the identifier bits changes a value of the unique address in the identifier, read-comparing the updated unique address to the set of predetermined addresses and processing the message when the unique address matches one of the set of predetermined addresses. [A1134]

"Systems and methods for millimeter and sub-millimeter wave imaging"

In one aspect, the present invention provides an apparatus 10 for imaging. At least one source 12 (or 12/14) of composite radiation illuminates a field of view 16. The radiation includes a set of multiple phase-independent partials that are independently controllable and exhibit distinct physical features. A quasi-optical element 21 is disposed between the field of view 16 and a multi-element receiver 18. The multi-element receiver 18 is disposed to receive image radiation 28 from the quasi-optical element 21. Particular ones of the receiver elements transform the image radiation 28 into a set of electrical signals that include information relating to features of the partials. [A1135]

"Synthetic-aperture communications receivers"

The relative movement of a receiver and transmitter in a communications system is used to advantage by electronically synthesizing a larger apparent antenna aperture, thereby increasing signal-to-noise ratio. The approach may be used regardless of whether the transmitter is fixed and the user or vehicle is moving, or the user or vehicle is fixed and the transmitter is moving. According to the method, the apparent angle between the receiver and transmitter is determined relative to the direction of movement and used to produce time-delayed replicas of the received signaling stream which are coherently added to synthesize the increased apparent receiver antenna aperture. Since only the receiver is modified according to the invention, existing transmitters and infrastructures can be used without modification. Although some data buffering is required, only a few number of beams need to be synthesized, in contrast to more complex military SAR configurations. [A1136]

"Shipboard point defense system and elements therefor"

A combined defense and navigational system on a naval vessel is disclosed. The disclosed system includes a track-while-scan pulse radar which is controlled to provide either navigational information or tracking information on selected targets. Additionally, the disclosed system includes a plurality of guided missiles, each of which may be vertically launched and directed toward intercept of a selected target either by commands from the track-while-scan radar or from an active guidance system in each such missile. [A1137]

"Device and method for SPR detection in a mode-s transponder"

A Mode-S transponder is provided for detecting synchronization phase reversal (SPR) signal. The transponder includes a receiver for receiving a Mode-S signal that contains a P6 pulse having a Mode-S data segment and an SPR signal therein. The transponder also includes a phrase detector that detects a phase change between first and second states in the received Mode-S signal. The phase detector includes an SPR qualifier that determine whether, following a state change, the Mode-S signal remains at one of the first and second states for at least a predetermined minimum time sufficient to qualify as a detector enable signal. [A1138]

"System and method for inhibiting transponder replies"

A traffic collision avoidance system has a transponder with an interrogation monitoring engine for receiving interrogations and an interrogation response engine for inhibiting responses to the interrogations if the interrogations are air traffic control interrogations and the transponder is in a quiet mode. Typically the transponder enters quiet mode during military formation flight if the aircraft in which the transponder is installed is not a tail or lead member of the formation. [A1139]

"Centerline identification in a docking guidance system"

The present invention achieves an accurate and quick centerline identification in a docking guidance system and further a verification of a centerline configuration. Heretofore, it is proposed to scan (S1) an apron in front of a docking stand (16) with a range finder (22) and to register a reflection intensity and position for each scanned point. Then, a centerline (14) is identified (S2) in front of the docking stand (16) by using differences in reflection intensity between the centerline (14) and the apron surface surrounding the centerline (14) . Further, at least two centerline definition points (38, 40) are defined (S3) in compliance with the centerline layout. [A1140]

"Microwave planar motion sensor"

A planar microstrip microwave transceiver employing a chip on board design where all components can be surface mounted. The transceiver employs a surface mounted FET chip in a low Q oscillator and a pair of surface mounted Schottky chips in balanced mixer, all of which are wire bonded to microstrip circuitry. This configuration, along with the circuit layout, provides a transceiver module for high frequencies such as 24 GHz that is small, low cost, lightweight and suitable for mass production [A1141]

"Target shadow detector for synthetic aperture radar"

Targets imaged by radar systems typically have shadows associated with them. Target detection and identification is enhanced by analyzing the shadow characteristics of a suspected target. Features of the shadow cast by the suspected target enhance the identification process. Authenticating the suspected target shadow as being indeed cast by the target comprises a) Generating a radar image using radar returns, the radar image containing both the target and its suspected target shadow, b) Forming a pentagonal perimeter adjacent to the target (within the radar image) , the pentagonal perimeter chosen to contain the suspected target shadow, the pentagonal perimeter separating the target from its suspected target shadow, c) Testing the suspected target shadow within said pentagonal perimeter to authenticate that the suspected target shadow is cast by the target. One aspect of the testing performed on the suspect target shadow uses a 2 by 2 dilation and majority filter. Other tests performed are an adjacent overlap test, an edge pixel count test, a maximum area and minimum distance test as well as an area threshold test. The original radar image is converted to a magnitude only form from its I and Q components and a magnitude thresholding is applied to the radar image to obtain a binary image. [A1142]

"Null filter"

An electronic circuit for use in an anti-radiation missile system of the type which uses the electromagnetic transmissions of a target radar for guidance information, detects when the missile has flown into a target null and is no longer receiving energy from one of the main lobes or side lobes of the target radar transmitter. When this condition is detected, the circuit causes an attenuation in the epsilon error guidance signal to momentarily prevent guidance commands based upon the now suspect epsilon error signals from being implemented. [A1143]

"High resolution SAR processing using stepped frequency chirp waveform"

A radar system has improved range resolution from linear frequency modulated (LFM) first sub-pulse and second sub-pulse, both having linear frequency modulation about different center frequencies. The first transmitted sub-pulse and the second transmitted sub-pulse have chirp slope .gamma.. Sample shifting and phase adjusting is performed for the first radar returns with respect to second radar returns to form a line of frequency modulated chirp slope .gamma. with respect to time, the line connecting the center frequencies of the center frequencies. The first sub-pulse and second-sub pulse can have equal time duration, where the first and second center frequency are equidistant from a reference frequency. The returns are reflected by a target located at a location near a reference point s. The radar computes the reference frequency f.sub.ref centered with respect to the first center frequency f.sub.1 and the second center frequency f.sub.2, ##EQU1## a reference time ##EQU2## a time delay .tau..sub.s,m to said reference point s with respect to time t.sub.m for m=1,2 a time delay .tau..sub.s,ref to said reference point s with respect to said reference time t.sub.M, where ##EQU3## The first sub-pulse returns received from the first sub-pulse are shifted by an amount ##EQU4## Typically, the radar de-chirps returns prior to sample shifting and phase adjusting. In an example, the radar de-skews returns prior to sample shifting and phase adjusting. In another example, de-chirped returns are de-skewed after sample shifting and phase adjusting. [A1144]

"Radar altimeter with forward obstacle avoidance capabilities"

A radar altimeter is described which includes a transmitter for transmitting a radar signal, a receiver for receiving the reflected radar signal, and at least one antenna coupled to one or both of the transmitter and receiver. The altimeter also includes a forward facing millimeter wave (MMW) antenna configured to move in a scanning motion and a frequency up/down converter coupled to the MMW antenna, the transmitter, and the receiver, and a radar signal processor. The converter up converts a frequency received from the transmitter to a MMW frequency for transmission through the MMW antenna, and down converts frequencies received to a radar frequency which are output to the receiver. The radar signal processor controls scanning motion of the MMW antenna, processes signals received at the antenna for a portion of the scanning motion, and processes signals received at the MMW antenna for other portions of the scanning motion. [A1145]

"Method of tracking a target and target tracking system"

A method of tracking a target (2) moving in an airspace and a target tracking system (10) for performing the method are described. A search sensor (12) searches a search space at a first clock rate (2.pi./.DELTA.T1) and establishes target information in regard to a track (4) flown through by the target (2) . Calculation means (16) extrapolate an expected flight path (6) from the target information established and provide flight path data, which describes the expected flight path (8) , to a tracking sensor (14) , which covers a tracking space (15) , and provides this data at a second clock rate (2.pi./.DELTA.T2) , which is higher than the first clock rate (2.pi./.DELTA.T1) . When the target (2) reaches the tracking space (15) , the tracking sensor (14) is aimed at the expected flight path (6) on the basis of the flight path data provided, the target (2) is detected as soon as it is detectable by the tracking sensor (14) , and the tracking sensor (14) is tracked on the target autonomously. [A1146]

"Full polarization synthetic aperture radar automatic target detection algorithm"

A method, apparatus and computer-readable medium having stored thereon instructions for automatic detection of desired targets from radar data are disclosed. for each working point in a set of radar data, from a scattering matrix derived from collected radar data, a working total radar cross section and a working asymmetry angle are calculated. The working total radar cross section and the working asymmetry angle are then evaluated to determine whether the working point should be classified as a target point or a clutter point. The method and apparatus suitably may employ a two-dimensional table of total radar cross sections and asymmetry angles previously classified as signifying target points or clutter points. Reading from the look-up table, the working point is classified as a target point or a clutter point. [A1147]

"Generalized clutter tuning for bistatic radar systems"

A system and method for controlling clutter Doppler spread in a bistatic radar system is developed resulting in enhanced detection of low-Doppler targets or improved SAR mode performance. In an illustrative embodiment, a bistatic radar system (10) includes a transmitter (12) for transmitting electromagnetic energy (106) towards a target (16) , a receiver (14) adapted to receive the electromagnetic energy (116) reflected from the target (16) , and a processor (122) for optimizing a parameter or parameters of the system such that the directional derivative of the bistatic Doppler field along the isorange contour is near a desired value. The parameters to be optimized may include the transmitter velocity vector, the receiver velocity vector, or the receiver azimuth flight direction. The desired value is the minimal absolute value of the directional derivative in order to minimize the clutter Doppler spread, or the maximum absolute value of the directional derivative in order to maximize the clutter Doppler spread. [A1148]

"Methods and apparatus for radar data processing"

A method for testing a radar system utilizing flight test radar data is described. The method includes time synchronizing measured radar data with a GPS based time marker, storing at least a portion of the time synchronized radar data, storing the GPS data, processing the stored GPS data to correspond with a physical position of an antenna which received the radar data, providing a radar model, and comparing the processed radar model data to the stored radar data. [A1149]

"Adaptive radar thresholds system and method"

A system and method for adapting weather radar gain is disclosed. The system and method includes estimating a freezing altitude. The system and method also includes determining, based on the freezing-altitude estimate, the altitude of more than one atmospheric layer. The system and method further includes determining the proportion of a radar beam sample in each atmospheric layer and adjusting the radar gain, based on the proportion. [A1150]

"Techniques for 3-dimensional synthetic aperture radar"

The height of a radar target above a horizontal plane at a location within the horizontal plane is measured using a synthetic aperture radar (SAR) . The synthetic aperture radar is mounted on a moving platform. The moving platform moves along a continuous climbing path with respect to the horizontal plane acquiring a plurality of SAR arrays of radar return information. Monopulse, Interferometric SAR (IF-SAR) , and shadow length height measurements are fused to refine the target height measurement. Monopulse and IFSAR are combined to resolve target height ambiguities. The SAR arrays are separated vertically, at separate heights with respect to the target, and acquired sequentially in time, as a single pass. [A1151]

"Method and system for determining air turbulence using bi-static measurements"

A method and system for determining atmospheric disturbances or turbulence is disclosed. The system includes a plurality of sensor arrays, including at least one sensor element, distributed in a predetermined manner. Each of the sensor elements is in communication with a corresponding receiving system that is operable to receive and process energy received from the aircraft. A determination is then made regarding air turbulence by determining a rate of change of signal phase among selected sets of signals received at the receiving systems. A turbulence map is then determined from the determined rate of change of the phase and the angle of the received signal. When the rate of phase change exceeds known levels an indication of turbulence is made. [A1152]

"System and method for synthetic aperture radar mapping a ground strip having extended range swath"

A system and method for mapping a ground strip having an extended range swath includes a synthetic aperture radar (SAR) mounted on a moving platform. The ground strip is divided into columns that extend from the near-range edge of the ground strip. Each column contains two or more portions and has an azimuthal length equal to the radar's near-range beamwidth, W. Each column is sequentially illuminated while the platform moves through a distance, L.sub.illum, (equal to the near range beamwidth) . During column illumination, portions within the column are sequentially mapped by altering the depression angle, .phi., of the radar beam. Each portion is SAR mapped using a respective SAR aperture length with the sum of aperture lengths for the column being less than or equal to the distance the platform moves during illumination. The resultant maps are mosaicked together to produce one contiguous SAR map of the ground strip. [A1153]

"HD fourier transforms for irregularly sampled data"

A collected data is divided into M single valued subsets, where M is greater than zero. A two-dimensional subset image is formed from each single valued subset. Then, a fast Fourier transform is performed on each image to obtain a two-dimensional subset frequency space. Next, a one-dimensional discrete Fourier transform in z, where z is an integer equal to or greater than zero, is performed. Lastly, a two-dimensional discrete Fourier transform in (x,y) for each value of z is performed, thereby forming the three-dimensional volume from the collected data set. [A1154]

"Methods and apparatus for optimizing interferometric radar altimeter cross track accuracy"

An apparatus for calibrating a radar altimeter is described. The altimeter provides an angle to a target based on radar energy received at right, left, and ambiguous antennas. The apparatus comprises a turntable on which the radar is mounted, a turntable controller which controls positioning of the radar altimeter, a radar energy source receiving transmit signals from the radar altimeter, a reflector, and a calibration unit. The reflector reflects and collimates radar energy from the radar source towards the radar altimeter. The calibration unit receives an angle from the controller indicative of a position of the radar altimeter with respect to the collimated radar energy and a measured angle from the radar altimeter. The calibration unit calculates a correction based on differences between the angle received from the turntable and the measured angle received from the altimeter and provides the calibration correction to the altimeter. [A1155]

"Radar anti-fade systems and methods"

A method for suppressing ground return radar fading in a radar altimeter is described. The method includes providing a radar gate width which corresponds to an area that is smaller than an antenna illumination area being impinged by transmissions of the radar altimeter, dithering the radar gate viewing area within the antenna illumination area being impinged by transmissions of the radar altimeter, and taking radar return samples with the radar altimeter. [A1156]

"Digital IF processor"

Apparatus for processing a signal of a predetermined intermediate frequency (IF) to generate in-phase (I) and quadrature (Q) components thereof comprises: an analog-to digital converter circuit for sampling and digitizing the IF signal to generate digitized data samples thereof at a sampling rate that produces consecutive digitized data samples that are separated in phase by a substantially fixed phase angle 2.pi./n, where n is an integer greater than zero, first digital circuitry coupled to the analog-to digital converter circuit for demodulating the digitized data samples by multiplying every n consecutive digitized data samples with n respectively corresponding digital reference samples, and second digital circuitry coupled to the first digital circuitry for combining selected ones of the demodulated samples based on the substantially fixed phase angle to generate digital data samples of the I and Q components of the IF signal. The apparatus may include third digital circuitry coupled to the second circuitry for generating digital data samples of a log video component of the IF signal from the digital data samples of the I and Q components. The first, second and third digital circuitry may be programmed into a gate array integrated circuit. [A1157]

"Position-adaptive UAV radar for urban environments"

Bistatic/multistatic radar system concept for purposes of interrogating difficult and obscured targets in urban environments via the application of low-altitude "smart" or "robotic-type" unmanned air vehicle platforms. A significant aspect of the invention is the formulation of a unmanned air vehicle system concept that implements self-adaptive positional adjustments based on sensed properties such as phase discontinuities of the propagation channel. [A1158]

"System and a method for navigating a vehicle"

In a system for navigating a vehicle according to the appearance of the surface region over which it moves there are at least three devices adapted to carry out a position determination of the vehicle according to a predetermined algorithm as well as members adapted to compare the positions determined by the devices and at a substantial deviation of any position from the other positions assume that this is erroneous and form an average of the other positions as the correct position of the vehicle. [A1159]

"Constant altitude weather and all weather display"

A system, method, and computer program product for allowing a pilot to view weather hazards at a selected altitude or within a range of altitudes. The weather display system includes a memory, a processor, and a display device. The memory stores radar return data in a three-dimensional buffer. The processor is coupled to the memory and retrieves radar return data stored in the three-dimensional buffer that corresponds to an altitude. The processor generates an image of the retrieved radar return data. The display device displays the generated image. [A1160]

"Measurement and signature intelligence analysis and reduction technique"

Methods and apparatus compress data, comprising an In-phase (I) component and a Quadrature (Q) component. The compressed data may be saved into a memory or may be transmitted to a remote location for subsequent processing or storage. Statistical characteristics of the data are utilized to convert the data into a form that requires a reduced number of bits in accordance with the statistical characteristics. The data may be further compressed by transforming the data, as with a discrete cosine transform, and by modifying the transformed data in accordance with a quantization conversion table that is selected using a data type associated with the data. Additionally, a degree of redundancy may be removed from the processed data with an encoder. Subsequent processing of the compressed data may decompress the compressed data in order to approximate the original data by reversing the process for compressing the data with corresponding inverse operations. [A1161]

"System and method for central association and tracking in passive coherent location applications"

A system and method for central association and tracking for PCL applications is disclosed. Detection reports are received at a target tracking processing system. The detection reports include measurements correlating to line tracks associated with target echoes in earlier processing operations. In addition, other information, such as parameters and observables, are received by the target track processing system. The target track processing system performs a line track association function and a track filtering function on the line tracks according to the measurements within the detection reports. These operations also predict and estimate target parameters for tracking. Target parameters are extrapolated from the propagated and updated target tracks, and fed to a display for a user, or back into the PCL system for further processing. [A1162]

"Method and arrangement for the contactless measuring of distance and position in respect of aircraft docking procedures"

A method and apparatus for the contactless measuring of distances to aircraft when positioning the aircraft, such as when docking or parking. A scanning laser is arranged in front of the aircraft to be positioned and is directed toward a centerline along which an aircraft is to be moved in the course of positioning the aircraft. The laser emits measuring pulses stepwise or incrementally at different angles to detect a predetermined measurement volume. The laser is calibrated with the distance from the laser to the ground for at least some of the angles, and the distances at those angles is measured during positioning of an aircraft. The measured distances are compared with the calibrated distances, and the laser is considered to have measured the correct distance when there is a predetermined agreement between the measured distance and a calibrated distance corresponding with the same angle. [A1163]

"Method and device for measuring the speed of a moving object"

To measure the absolute speed of a body 100 moving relative to the ground 33 using an onboard speed sensor 1, a radar wave is transmitted towards the ground by an antenna with a wide aperture angle. The wave reflected by a reflecting obstacle on the ground and the transmitted wave are mixed and the frequency content of the low frequency signal obtained is determined. The speed of the moving object and the height of the transmitter and receiver antennas above the ground can then be measured by adjusting a theoretical curve to the time-varying evolution of the Doppler frequency corresponding to the reflecting obstacle. [A1164]

"System and method for predicting and displaying wake vortex turbulence"

A circuit and method for predicting an intersection of a host aircraft flight path with the wake vortex of another aircraft. [A1165]

"Coherent two-dimensional image formation by passive synthetic aperture collection and processing of multi-frequency radio signals scattered by cultural features of terrestrial region"

An imaging system uses wideband `RF daylight` created by plural narrowband RF illumination sources, to passively generate spectrally different sets of RF scattering coefficients for multiple points within a prescribed three-dimensional volume being illuminated by the narrowband RF transmitters. To correct for the lack of mutual coherence among different RF illumination sources, the respective sets of scattering coefficient data are applied to a cultural feature extraction operator, to locate one or more strong cultural features spatially common to multiple images. for spatial points along the extracted cultural feature theoretical scattering coefficients are calculated. Differences between phase values of these calculated scattering coefficients and those of the collected and processed scattering energy are used to modify the measured scattering coefficient values for all spatial points in the illuminated region. This allows the scattering coefficients of that narrowband frequency set to be coherently combined with those of another spectrally different narrowband set of scattering coefficients whose phase components have been similarly corrected, based upon the same extracted cultural feature. [A1166]

"Altitude estimation system and method"

A system and method for detecting and tracking a target object, including the calculation of the target object's altitude, is disclosed. During the processing of signals received by a receiver, the system selectively calculates the altitude of the target object from signals modified by an interference effect pattern formed by the signals broadcast by a transmitter, or from the calculation of geometric shapes associated with three or more transmitters and determining the intersection point of those shapes. [A1167]

"Multifunction millimeter-wave system for radar, communications, IFF and surveillance"

A multifunction millimeter-wave system (10) that provides simultaneous and prioritized active radar protection and surveillance, high digital data rate communications, interceptor missile guidance, passive surveillance and IFF interrogation for a military vehicle. The system (10) includes a multi-function control computer (14) that provides high level control functions. The system (10) also includes a plurality of azimuth sector sub-systems (12) , each including a steerable antenna (26) that directs a millimeter-wave beam to a particular location within the area covered by the sector sub-system (12) . Each sector sub-system (12) also includes an FPGA-based modem (20) that performs digital signal processing for the various system operations, such as signal modulation and demodulation. Each sector sub-system (12) also includes an IF/RF transceiver (22) , including a direct digital synthesizer (24) , for providing signal tuning and frequency up-conversion and down-conversion. [A1168]

"Repetitive image targeting system"

The present invention includes a system and method for accurately locating moving targets. The system includes a targeting aircraft that has a radar system with a simultaneous SAR radar/moving target mode that generates an image and identifies moving targets in the generated image. The targeting aircraft also includes a mapping component that matches the generated image to a stored digital map, and generates moving target location information based on the matched image and map and the identified moving targets. [A1169]

"Cellular radar"

A cellular radar system is disclosed for detecting and tracking objects in a surveillance area that is divided into cells. Each cell is scanned by at least two radars to produce two (or more) respective datastreams for the cell. Orbiting unmanned air vehicles can be used as radar platforms. The resulting datastreams for each cell are then multilaterated by a processor to produce a multilaterated datastream for each cell. The multilaterated datastreams for all cells are then combined by the processor and the resulting data used to detect or track one or more objects in the surveillance area. The fused multilaterated datastreams allow objects to be tracked as they move from cell to cell. [A1170]

"Airborne alerting system"

Systems, methods and protocol for assuring separation of aircraft during parallel approaches. The systems, methods and protocol function in cooperation with existing TCAS to facilitate approaches of multiple aircraft on closely-spaced parallel runways. The systems, methods and protocol utilize data transmissions from equipped aircraft to obtain tracking information which is used in separation algorithms to generate alerts to an observer of possible threats. The systems, methods and protocol facilitate parallel approaches to closely-spaced parallel runways under Instrument Approach Procedure. [A1171]

"Process for calibrating radar signals at subapertures of an antenna of two-channel SAR/MTI radar system"

In a process for computing the radar signals present at the output of two subapertures of an antenna of a two-channel radar system, the two subaperture channels are combined by means of a wave guide part to a sum and difference channel, and the signals of the sum and difference channel are used to compute the radar signals at the subaperture channels. The signals of the two subaperture channels are computed from the amplitude- and phase-shifted sum and difference channel signal by being placed in the following equations: ##EQU1## wherein X.sub.1 (r,f) , X.sub.2 (r,f) : Frequency spectrum of the two subaperture channels, X.sub.S (r,f) ,X.sub.D (r,f) : Frequency spectrum of the sum and difference channel, r: distance cell, f: Doppler frequency, .PHI..sub.0 : phase correction factor, and a.sub.0 : amplitude correction factor. [A1172]

"System and method for in-place, automated detection of radome condition"

A system for performing automated in-place measurement of reflectivity of a radome of an airplane. Includes a radar drive circuit that generates radar signals at a predetermined frequency. An antenna receives the generated radar signals from the radar drive circuit, and transmits radar waves at the predetermined frequency. The antenna receives radar return waves from the radome. The antenna is mountable on a scanning apparatus that scans a substantial area of the radome. A signal processor processes the radar return waves from the radome that are received by the antenna. The signal processor determines whether magnitude of the radar return waves from the radome exceeds a predetermined level for a given position on the radome. When the magnitude of the radar return waves exceeds the predetermined level, a degraded condition of the radome is indicated and an alert signal is generated and provided to an operator. [A1173]

"Method and apparatus for predictive altitude display"

Embodiments of the invention provide a method and apparatus for indicating aircraft height relative to an obstruction in a terrain awareness warning system. The method includes receiving data indicative of geographic features of an obstruction, lateral distance of the geographic feature from an aircraft, height and flight path of the aircraft, calculating a projected height of the aircraft at the location of the obstruction using the data, generating a result signal, and displaying a colored indication on a display screen based on the result signal. The apparatus includes inputs for signals from instruments measuring height, flight path, and location of an aircraft, as well as an input for an instrument providing information about geographic features of terrain surrounding the aircraft. The apparatus includes a means for employing the signals to calculate an effective height of the aircraft relative to the terrain, and a screen display for graphically displaying the results of the calculation. [A1174]

"Vertical speed indicator and traffic alert collision avoidance system"

A method and device for deriving and displaying advanced TCAS information. [A1175]

"Distributed elevated radar antenna system"

An airborne radar antenna system for detecting a target in a volume includes a tethered aerostat and an antenna that is supported above ground by the aerostat. The aerostat-based antenna is used for transmitting and receiving a radar beam into the volume to detect the target. Additionally, the system includes a ground-based transmitter that generates a beacon signal which monitors the antenna configuration at the aerostat. A computer then evaluates the beacon signal to create an error signal which is used to maintain a predetermined configuration for the antenna. The system also includes mechanisms for orienting the radar beam along preselected beam paths between the antenna and the volume. [A1176]

"Weather and airborne clutter suppression using a cluster shape classifier"

A method of determining the presence of a weather or other airborne (non-aircraft) clutter in a radar detection system is disclosed. The method includes feature calculations of a cluster of detections, and characterizing the cluster. Confidence factors are determined from the characterization of a cluster and a determination is made from the confidence factors whether the cluster represents a real aircraft or a false target. [A1177]

"Method for mitigating atmospheric propagation error in multiple pass interferometric synthetic aperture radar"

Signal processing methods useful in single-antenna multiple-pass interferometric synthetic aperture radars. The signal processing methods compute an initial elevation estimate from the phase difference between a pair of images (A.sub.0, A.sub.1) with a relatively small elevation angle difference (i.e., a short interferometric baseline) and uses it to initialize the elevation estimation process for pairs of images (A.sub.0, A.sub.2) with longer interferometric baselines. The method may be used to process images that are coherent, or not necessarily mutually coherent. The outputs of the methods comprise a terrain elevation map that mitigates for atmospheric error and a turbulence map. [A1178]

"Satellite configuration for interferometric and/or tomographic remote sensing by means of synthetic aperture radar (SAR)"

For interferometric and/or tomographic remote sensing by means of synthetic aperture radar (SAR) one to N receiver satellites and/or transmitter satellites and/or transceiver satellites with a horizontal across-track shift the same or differing in amplitude form a configuration of satellites orbiting at the same altitude and same velocity. Furthermore, a horizontal along-track separation, constant irrespective of the orbital position, is adjustable between the individual receiver satellites. In this arrangement one or more receiver satellites orbiting at the same altitude and with the same velocity are provided with a horizontal across-track shift varying over the orbit such that the maximum of the horizontal across-track shift occurs over a different orbital position for each satellite, the maxima of the horizontal across-track shifts are positioned so that the baselines are optimized for across-track interferometry. A transmitter or transceiver satellite is positioned either separate from the configuration without across-track shift or as part of the configuration with horizontal across-track shift. [A1179]

"System for supplying power to ROSAR transponders, including transmitting and receiving antennas for ROSAR devices"

In a system for supplying power to ROSAR transmitting and receiving antennas that are integrated into the tip of a helicopter rotor blade, wind energy is converted directly into electrical energy locally at the rotor blade tip. [A1180]

"Method and system for estimation of rainfall intensity in mountainous area"

Here are provided rainfall intensity output means adapted to output rainfall intensity R as a value equivalent to a linear function of altitude H: R (H) =aH+b, and processing means adapted to identify parameters a and b in the above estimate equation by regression analysis using a measurement value obtained by rainfall vertical distribution. This invention provides thereby method and system for estimation of rainfall distribution based on rainfall spatial distribution in mountainous area. [A1181]

"Autonomous mission profile planning"

The present invention, in its various aspects and embodiments, includes a method for planning a mission profile in real time. The method comprises ascertaining a plurality of target information (including a target location, a target velocity, and a target location error) and autonomously determining a pattern from the ascertained target information. In one particular embodiment, the autonomous determination includes projecting along a target axis a distance of the target location error to establish two intersections of the target axis with the target location error, projecting perpendicularly left and right from the intersections to determine a pair of possible start point pairs, selecting the possible start point pair including a closest single start point, selecting the farthest start point of the selected start point pair, identifying an adjusted start point, mirroring the adjusted start point to obtain an adjusted start point pair, and laying out the front-end and back-end traces from the adjusted start point pair. [A1182]

"System and method for single platform, synthetic aperture geo-location of emitters"

The determination of the geographical location of a signal emitter by the coherent, time integrated measurement of received signal wavefront phase differences through a synthetic aperture and the reconstruction of the wavefront of the received signal. The location of an emitter is determined by coherently measuring the phase gradient of an emitted signal at measurement points across a measurement aperture. Each measured phase gradient is integrated to determine a vector having a direction from the measurement point to the signal emitter and an amplitude proportional to the received signal. A figure of merit is determined for each possible location of the signal emitter by integrating each vector with respect to a propagation path between the measurement point of the vector and the possible location of the signal emitter, and the location of the signal emitter is determined as the possible location of the signal emitter having the highest figure of merit. The measurement aperture is generated by motion of a receiving aperture along the path and the receiving aperture is generated as by synthetic aperture methods.

The receiving aperture may be mounted on an airborne platform and a positional towed body. [A1183]

"Efficient phase correction scheme for range migration algorithm"

A system and method for efficient phase error correction in range migration algorithm (RMA) for synthetic aperture radar (SAR) systems implemented by making proper shifts for each position dependent phase history so that phase correction can readily be performed using the aligned phase history data during batch processing. In its simplest form, the invention (44) is comprised of two main parts. First (60) , alignment of the phase error profile is achieved by proper phase adjustment in the spatial (or image) domain using a quadratic phase function. Second (62) , the common phase error can be corrected using autofocus algorithms. Two alternative embodiments of the invention are described. The first embodiment (44a) adds padded zeros to the range compressed data in order to avoid the wrap around effect introduced by the FFT (Fast Fourier Transform) . This embodiment requires a third step (64) : the target dependent signal support needs to be shifted back to the initial position after phase correction. The second embodiment (44b) uses the range compressed data without padded zeros. Instead, an aperture of greater length needs to be generated by the Stolt interpolation. In this embodiment, the third step (64) of shifting the signal support back can be eliminated. [A1184]

"3-D weather buffer display system"

The present invention comprises a system, method, and computer program product for generating various weather radar images. A weather radar display system includes a database, a display, and a display processor coupled to the database and the display. The display processor includes a first component configured to store radar return data in a three-dimensional buffer in the database based on aircraft position information, a second component configured to extract at least a portion of the data stored in the three-dimensional buffer based on aircraft position information, and a third component configured to generate an image of the extracted return data for presentation on the display. [A1185]

"System and method for measuring short distances"

A system and method are provided to measure relatively short distances between one or more moveable objects and with respect to an environment. The transponders may be affixed to other moveable objects and/or may be affixed in position within the environment. The transponders detect the query signal and respond with an acoustic response signal. A synchronized clock system establishes common timing between the transponders and the moveable objects such that the start time at which the acoustic response signal is sent is known. The moveable object detects a receipt time when the acoustic response signal is received. Knowing the start time and the receipt time, a transit time for the acoustic signal can be determined whereby a separation vector may be calculated. The system may be used to determine and transmit a table that contains the relative positions of all moveable objects in the environment. [A1186]

"Synthetic aperture, interferometric, down-looking, imaging, radar system"

A surface imaging radar system for an airborne platform, the system comprises a transmitter for generating a radar signal. The system also comprises an antenna configured to transmit a radar signal generated by the transmitter and receive radar return information from one or more directions directly below the airborne platform to an angular direction of approximately 30 degrees greater than straight down. The system also includes a processor configured to generate surface information based on the received radar return information and an image processor for generating an image based on the surface information. [A1187]

"Identification friend or foe system including short range UV shield"

An identification friend or foe system for use by a weapon to determine whether a target that has been selected is a friendly target comprises a signal source attached to the target and arranged to radiate encrypted signals. A detection system attached to the weapon includes a receiver arranged to receive the encrypted signals when the weapon is within a predetermined range from the target. Signal processing apparatus is connected to the receiver and arranged to determine whether the encrypted signals identify the target as being friendly. The central processing unit is arranged to decrypt the encrypted signal and produce a disarm signal if the target is identified as being friendly. The central processing unit preferably is also arranged to produce a signal that causes the weapon to perform a collision avoidance maneuver to avoid colliding with the target if the target is identified as being friendly. [A1188]

"Focusing SAR images formed by RMA with arbitrary orientation"

A system and method (44) for focusing an image oriented in an arbitrary direction when the collected synthetic aperture radar (SAR) data is processed using range migration algorithm (RMA) . In accordance with the teachings of the present invention, first (60) the data is skewed so that the direction of smearing in the image is aligned with one of the spatial frequency axes of the image. In the illustrative embodiment, the smearing is aligned in the vertical direction. This is done through a phase adjustment that was derived from the requirements for proper shift in the spatial frequency domain. Next (62) , the signal support areas from all targets are aligned by proper phase adjustment in the spatial (or image) domain. Finally (64) , the common phase error can be corrected using autofocus algorithms. [A1189]

"Control of reflected electromagnetic fields at an IFSAR antenna"

A system for reducing multi-path reflections from adjacent metal objects which cause distortion in an IFSAR includes a reflective cone extending between the top of the IFSAR and the skin of its aircraft, and a reflective shroud surrounding the IFSAR. Each of these components may be coated with radar absorbing material. [A1190]

"Method and system of cooperative collision mitigation"

Identifying an object includes the steps of using a sensor onboard a subject vehicle to identify an imminent impact between the subject vehicle and an object, directing and transmitting an elicitation signal to the object from the subject vehicle, receiving onboard the subject vehicle a response signal from the object providing information that positively identifies the object, using the positive identification information to predict a severity level of the imminent collision, and selectively deploying at least one responsive device onboard the subject vehicle according to the predicted severity level. Also, a system for implementing the method is provided. The system includes a sensor, attachable to a subject vehicle, for identifying an imminent collision between the subject vehicle and an object, a first computer for processing dynamics data for the subject vehicle, a second computer for predicting a severity level of the imminent collision, an antenna, a transmitter for transmitting an elicitation signal via the antenna to the object, a reflector or transponder for sending a response signal from the object to the subject vehicle wherein the response signal provides information positively identifying the object, and a receiver for receiving the response signal via the antenna from the object. [A1191]

"Airborne biota monitoring and control system"

A method and system for detecting airborne plant material, such as mold spores and pollen, and flying insects and birds, and classifying them as to whether they are harmful to field crops, production animals or other assets within a protected volume or area. Lasers, radar, and other types of radiation may be used to illuminate at least a perimeter around such assets to be protected, with radiation returns detected and applied to a pattern classifier to determine whether the detected objects of interest are harmful, benign or beneficial. In the event the objects are determined to be harmful (pests) , a variety of measures controllable via the radiation returns may be taken to eliminate the harmful objects, these measures including firing pulses of laser, microwave or other radiation of a sufficient intensity to at least incapacitate them, or mechanical measures such as controlled drone aircraft to macerate the pests with propellers or spray limited amounts of pesticide in the area of the pests. [A1192]

"Method and apparatus for non-coherent navigation using low frame rate telemetry"

A method and apparatus for obtaining measurements, on a spacecraft that employs a transceiver, at intervals that are shorter than the telemetry frame duration for use in correcting ground-based Doppler measurements so as to remove the effects of drift in the spacecraft oscillator frequency reference. Samples of navigation counters on the spacecraft that supply information that may be used to compare the uplink frequency with the downlink frequency at the spacecraft are triggered at intervals that are shorter than the duration of a telemetry frame, the samples are then included in a telemetry frame and are time tagged after they are received on the ground, the time tagged samples are then used to calculate precise two-way Doppler measurements. [A1193]

"Change subtraction of synthetic aperture radar data"

A method (100) for coherent change subtraction of mission and reference synthetic aperture radar (SAR) data (20',20") is provided. The method (100) forms (102) mission and reference images (22',22") from the mission and reference SAR data (20',20") , registers (122) the mission and reference images (22',22") on a common plane to form registered mission and reference images (24',24") , and forms (124) the registered mission and reference images (24',24") into at least one patch (26) containing mission and reference data (28',28") . The method (100) then processes (126) each patch (26) by removing (130) linear phase terms (34) from the mission data (28') , trimming (142) non-overlapping spectra of the mission and reference data (28',28") , and balancing (144) phases and amplitudes of the mission data (28') . The method (100) then concatenates (160) the patches (26) to produce processed mission and reference images (52',52") , and subtracts (162) the processed mission and reference images (52',52") to form a delta image (54) . The method (100) then postprocesses (164,170) the delta image (54) for specific applications. [A1194]

"Process for mapping multiple-bounce ghosting artifacts from radar imaging data"

Described herein are frequency-domain back-projection processes for forming spotlight synthetic aperture radar ("SAR") images that are not corrupted by the effects of multiple-bounce ghosting artifacts. These processes give an approximately exact reconstruction of the multiple bounce reflectivity function (MBRF) .function. (x,y,.gamma.) . Specifically, the evaluation of .function. (x,y,.gamma.) in the .gamma.=0 plane gives an approximately exact reconstruction of the true object scattering centers which is uncorrupted by multiple-bounce contributions to the phase history data G (.xi.,.theta.) . In addition, the non-zero dependence of .function. (x,y,.gamma.) upon the MB coordinate .gamma. can be used to facilitate the identification of features-interest within the imaged region. [A1195]

"Midair collision avoidance system"

A midair collision avoidance system (MCAS) employs an existing design of Traffic Alert and Collision Avoidance System (TCAS) as a module and seamlessly integrates it with a customized tactical module which is capable of providing unique tactical avoidance guidance control and display. The tactical module handles all phases of a tactical mission, including formation flight (e.g., formation fall-in, arming formation flight, engaging formation flight following, and formation brake-away) , and an air-refueling sequence (e.g., rendezvous, linkup, re-fueling, and disengaging air-refueling) . The tactical module divides the air space around the aircraft into advisory, caution, and warning zones and for each provides display, tone and voice alerts to facilitate pop-up avoidance guidance commands. Military aircraft can thus effectively avoid mid air and near mid air collision situations in all three different operation modes: air traffic control (ATC) management mode, tactical mode, and a mixed mode. [A1196]

"System and method for locating and positioning an ultrasonic signal generator for testing purposes"

The invention is directed to an ultrasonic testing system. The system tests a manufactured part for various physical attributes, including specific flaws, defects, or composition of materials. The part can be housed in a gantry system that holds the part stable. An energy generator illuminates the part within energy and the part emanates energy from that illumination. Based on the emanations from the part, the system can determined precisely where the part is in free space. The energy illumination device and the receptor have a predetermined relationship in free space. This means the location of the illumination mechanism and the reception mechanism is known. Additionally, the coordinates of the actual testing device also have a predetermined relationship to the illumination device, the reception device, or both. Thus, when one fixes the points in free space where the part is relative to either of the illumination device or the reception device, one can fix the point and/or orientation of the testing device to that part as well. It should be noted that the results of the point and/or orientation detection may also be used in an actuator and control system. If the position of the testing device needs to be altered with respect to the tested object, the control system and actuator may use the results of this determination to move the testing device relative to the tested object. [A1197]

"Method and apparatus for improving utility of automatic dependent surveillance"

The surveillance system provides a means to augment Automatic, Dependent Surveillance-Broadcast (ADS-B) with "look alike ADS-B" or "pseudo ADS-B" surveillance transmissions for aircraft which may not be ADS-B equipped. The system uses ground based surveillance to determine the position of aircraft not equipped with ADS-B, then broadcasts the identification/positional information over the ADS-B data link. ADS-B equipped aircraft broadcast their own position over the ADS-B data link. The system enables aircraft equipped with ADS-B and Cockpit Display of Traffic Information (CDTI) to obtain surveillance information on all aircraft whether or not the proximate aircraft are equipped with ADS-B. [A1198]

"Dual synthetic aperture radar system"

The dual synthetic aperture array system processes returns from the receiving arrays. The two identical receiving arrays employing displaced phase center antenna techniques subtract the corresponding spectrally processed data to cancel clutter. It is further processed that a moving target is detected and its velocity, angular position and range is measured, in or out of the presence of clutter. There are many techniques presented in the disclosure. These techniques are basically independent but are related based on common set of fundamental set of mathematical equations, understanding of radar principles and the implementations involved. These many techniques may be employed singly and/or in combination depending on the application and accuracy required. They are supported by a system that includes, optimization of the number of apertures, pulse repetition frequencies, DPCA techniques to cancel clutter, adaptive techniques to cancel clutter, motion compensation, weighting function for clutter and target, and controlling the system in most optimum fashion to attain the objective of the disclosure. [A1199]

"High definition imaging apparatus and method"

A high definition radar imaging system receives SAR image data and adaptively processes the image the data to provide a high resolution SAR image. The imaging technique employs an adaptive filter whose tap weights are computed based upon a constrained Maximum Likelihood Method (MLM) . The MLM technique chooses the filter tap weights (i.e., a weighting vector .omega.) to satisfy several criteria including: 1) they preserve unity gain for a point scatter at the desired location, and 2) they minimize the perceived energy in the output image. The weights .omega. are constrained in norm .parallel..omega..parallel..ltoreq..beta., to reduce the loss of sensitivity to bright scatters. Significantly, the present invention applies an additional constraint on the iterative selection of the weighting vector .omega., such that the weighting vector .omega. shall confined to a particular subspace in order to preserve background information in the image. This constraint is accomplished by confining the selection of the weighting vector .omega. to the subspace defined by the linear space of the columns of a covariance matrix generated from the data. [A1200]

"Ranging system beam steering"

An aircraft radar and altimeter system, comprising a radio transmitter and a transmitting antenna for radiating a beam of radio energy, a radio receiver and receiving antenna for receiving radio energy reflected from the ground, processing means for comparing the signal received by the receiver with the signal transmitted by the transmitter and determined from the comparison the instantaneous altitude of the aircraft above the ground, and means for changing the direction of radiation of the beam relative to the aircraft to compensate for changes in the attitude of the aircraft relative to the horizontal about at least one of the fore and aft and side-to-side axes. [A1201]

"System and method for comparing signals"

A method and system that include a first measurement signal and a second measurement signal that can be input to first and second filters. The filters can be subject to a first constraint to minimize the energy difference between the first and second measurement signals on a per frequency basis, and subject to a second constraint that includes a model frequency and phase response. By adapting the filters subject to the two constraints, coherent differences between the two measurement signals can be identified. In one embodiment, the system can be applied to Synthetic Aperture Radar (SAR) data. [A1202]

"Tracking apparatus and method capable of presuming position and velocity of an object with high precision"

In a tracking apparatus for tracking an object by the use of a plurality of detecting data sets supplied from a detecting device, a velocity presuming portion is provided together with a position presuming portion. The position presuming portion finds a presumed position of the object at the latest detecting time of the detecting data sets by the use of the latest detecting time and regression curves found on the basis of the detecting data sets. The velocity presuming portion finds a presumed velocity of the object at the latest detecting time by the use of the regression curves and at least one of former detecting times different from the latest detecting time. [A1203]

"Method of selecting a pulse repetition frequency to detect, track or search for a target"

A method for selecting a pulse repetition frequency to detect, track or search for a target that includes identifying a first feature representative interval of each pulse repetition frequency within a set of pulse repetition frequencies, choosing a selected pulse repetition frequency from the set of pulse repetition frequencies based on cost assigned to each pulse repetition frequency, wherein the cost assigned to a first pulse repetition frequency is at least based on a first cost function of a first position of a first target feature in relation to a first feature assessment interval of the first pulse repetition frequency, and emitting pulsed energy from the emitter using the selected pulse repetition frequency. [A1204]

"Short pulse automatic ranging anti-ship missile fuze"

An active short pulse fuze system for arming on a true target acquisition and firing only on the loss of the acquired target signal. The sea surface is tracked by means of a sea tracking loop A target threshold is established and is coupled to the sea tracking loop so as to expand and contract with the sea tracking. A return signal will pass the target threshold only when there is an abrupt reduction in range, indicating the presence of a target. The presence of this signal will arm the firing circuit. An abrupt increase in range will indicate the loss of the target and cause immediate detonation of the warhead. [A1205]

"Method of determining radio frequency link reliability in an aircraft tracking system"

An aircraft system and method for determining when to attempt acquisition of an intruder for active tracking. A link reliability score associated with the intruder is adjusted based upon the signal strength of transmissions, the frequency of the transmissions, and the number of previous attempts to acquire the intruder for active tracking. [A1206]

"Bistatic radar system using transmitters in mid-earth orbit"

A bistatic radar system and method. In the illustrative embodiment, a receiver is positioned in a horizontal plane. A transmitter is then positioned in Middle Earth Orbit at a position that is nearly vertical to the plane of the receiver. This configuration provides significant flexibility for the radar system. As such, the radar system may engage in flight patterns, in which the transmitter and receiver have velocity vectors in opposite directions (GMTI mode) , the same direction (SAR mode) and variations in between (mixed mode) . Lastly, a broad beam is generated from the transmitter and illuminates an area enabling several receivers to simultaneously observe the illuminated area. [A1207]

"Beam elevation display method and system"

The relative altitude of the center of a radar beam in relation to the aircraft's altitude at a plurality of distance ranges from the radar source is computed. A plurality of range rings representing the distance ranges are displayed. The computed relative altitude is displayed adjacent to each range ring displayed. [A1208]

"Method for removing RFI from SAR images"

A method of removing RFI from a SAR by comparing two SAR images on a pixel by pixel basis and selecting the pixel with the lower magnitude to form a composite image. One SAR image is the conventional image produced by the SAR. The other image is created from phase-history data which has been filtered to have the frequency bands containing the RFI removed. [A1209]

"System and method for bistatic SAR image generation with phase compensation"

A method and bistatic synthetic aperture radar (SAR) imaging system generate an image of a target area without knowledge of the position or velocity of the illuminator. The system includes an illuminator to illuminate a target area with a null-monopulse radiation pattern interleaved with a sum radiation pattern. The illuminator adjusts the phase terms of the sum radiation pattern to maintain a static electromagnetic field pattern at the target area. A receiver receives the radiation patterns reflected from the target area and generates phase compensation terms by correlating a measured electromagnetic vector field with the known static electromagnetic vector field. The phase compensation terms are used to generate an image of the target area. [A1210]

"Incursion alerting system"

A system for alerting the occupant of a vehicle that the vehicle is in or approaching a zone of awareness. for instance, the system may be used to alert the pilot or flight crew of an aircraft that the aircraft is on or approaching a runway, and may identify the specific runway. Thus, the invention also provides a method of reducing unintentional incursions of taxiing aircraft onto runways. The system generally includes a storage device or memory, a positioning system such as a GPS that typically repeatedly determines the location of the vehicle, an alerting device such as an alarm or display, and a processor, all of which are typically located on the vehicle. The processor typically compares the location of the vehicle with stored location information for various zones of awareness and initiates an alert when appropriate. The processor may take into consideration the velocity and direction of travel of the vehicle. Zones of awareness may be defined by coordinates, such as the end points of line segments. Audible alarms may include a voice warning, and may be able to be silenced until the vehicle leaves the zone of awareness. On aircraft, the system may reference the centerline of the runway, for example, alerting when the aircraft is within 150 feet of the centerline. The system may be disabled when the aircraft is in flight. [A1211]

"Tri-mode seeker"

A single receiving aperture used, for example, in an airborne seeker system collects energy for three discrete energy sensors/receivers including a laser spot tracker, an RF (millimeter wave) transmitter/receiver, and an infrared detector. The RF transmitter/receiver is located at the focus of a primary reflector located on a gimbal assembly. A selectively coated dichroic element is located in the path of the millimeter wave energy which reflects infrared energy from the primary reflector to an optical system which re-images the infrared energy on the infrared detector. The outer edge or rim of the primary reflector is deformed so that the incoming laser energy focuses to a location beyond the RF transmitter/receiver. The laser sensor is positioned adjacent the RF transmitter/receiver at this location in a back-to-back orientation. The laser energy is then detected using a secondary reflector and an optical system which directs the laser energy from the secondary reflector to a laser detector. [A1212]

"Vertical motion detector for air traffic control"

A process and apparatus are disclosed for estimating changes in the vertical mode of flight of an aircraft. The process and apparatus utilize a vertical motion detection method (VMD) and a modified altitude post processor logic to reduce the time delay for determination of vertical mode of flight changes. [A1213]

"Method and system for suppressing ground clutter returns on an airborne weather radar"

A system and method for suppressing ground clutter in avionics weather radars which includes automatically making multiple scans, closely spaced in time and space, and comparing the returning signals to known ground return signals over known tilt angle variations. [A1214]

"System, method and computer program product for reducing errors in synthetic aperture radar signals"

A system is provided for reducing errors in synthetic aperture radar signals from a plurality of range lines where each range line includes a plurality of azimuth positions. The system comprises an autofocus processor for receiving a plurality of slow-time samples. The autofocus processor can estimate a phase error for each slow-time sample by a maximum likelihood technique and thereafter compensate the plurality of slow-time samples by the estimated phase errors to obtain a plurality of range-line samples. The implementation of the maximum likelihood technique is done by a superresolution technique along slow-time samples which also estimates a plurality of Doppler frequencies and amplitudes for a plurality of point scatterers at each range line. Further, the autofocus processor can also predict the performance of the autofocus technique by computing a resulting root mean square error of the estimated phase error which is derived form the corresponding Cramer Rao bound. [A1215]

"Method for detecting wires using the ROSAR system"

A ROSAR wire detection method is based upon ROSAR focusing of entire segments of wire. By generating a wire reference signal comprised of a sum of coherent reference signals, the basis for reliable wire detectability is provided. [A1216]

"Shipboard point defense system and elements therefor"

A combined defense and navigational system on a naval vessel is disclosed. The disclosed system includes a track-while-scan pulse radar which is controlled to provide either navigational information or tracking information on selected targets. Additionally, the disclosed system includes a plurality of guided missiles, each of which may be vertically launched and directed toward intercept of a selected target either by commands from the track-while-scan radar or from an active guidance system in each such missile. [A1217]

"Precision approach radar system having computer generated pilot instructions"

A computer generated pilot instruction system for providing spatial information to a pilot corresponding to the difference between the actual landing fight path and optimal landing flight path. [A1218]

"Subsurface exploratory radar detector for a hand tool device"

A radar detector for exploration of subsurface embedded objects comprising an antenna array (1) for high-frequency electromagnetic waves, which is connected and individually switchable with at least one transmit/receive unit, a time-controlled signal processor, an evaluation device for SAR and a display device. The antenna array (1) exhibiting at least three antennas (sx, rx, sy, ry) scanning an area by their positioning. [A1219]

"Hazard and target alerting for weather radar"

A system, method, and computer program product for alerting a flight crew of weather radar return data collected, yet not presently being displayed. The system includes a memory, a processor, and an output device. The memory stores radar return information in a three-dimensional buffer. The processor determines if any radar return information stored in a three-dimensional buffer is within a threshold distance from an aircraft's present position and generates an image based on target data stored in the three-dimensional buffer and selected display parameters. The processor also generates a target alert if any target data is determined to be within a threshold distance from the aircraft's present position and is not included in the generated image. The output device presents the generated target alert. [A1220]

"Detection and removal of self-alerts in a tracking system"

Improved methods and systems for detecting self-alerts from upload messages in a TIS system to thereby eliminate the likelihood of TIS self-alerts appearing on CDTI displays. The present invention determines whether a self-alert was present in a previous traffic information uplink to determine whether a target in a current information uplink is real. Using a weighting algorithm, typically a fuzzy logic algorithm, a system in accordance with the present invention can distinguish between targets in consecutive radar sweeps to identify self-alerts. If the self-alert was not present in previous uplinks, then the system removes the self-alert from subsequent views on the CDTI. Thus, the present invention provides an improved visual display system for pilots and air traffic controllers. [A1221]

"Site-specific doppler navigation system for back-up and verification of GPS"

A system and method for identifying the position of an airborne platform on a flight path includes at least three radar transceivers that are directed along respective beam paths to generate return signals. Each of the return signals respectively indicate a speed and a direction of the platform relative to points on the surface of the earth. A computer uses the return signal to establish a ground speed, an altitude and a direction of flight for the platform. This information is then used to identify the position of the platform on its flight path. Additionally, the system can include a last known position, or a site-specific radar clutter model, to establish a start point for the platform. The computer can then calculate the position of the platform relative to the start point. [A1222]

"Autonomous landing guidance system"

An aircraft guidance system uses radar imaging to verify airport and runway location and provide navigation updates. The system is applicable to flight operations in low visibility conditions. [A1223]

"Method and apparatus for reducing false taws warnings and navigating landing approaches"

A system for reducing nuisance alerts and warnings in a terrain awareness and warning system for an aircraft, including determining if the aircraft is within a predetermined geometric volume surrounding an airport. If the aircraft is within the geometric volume, then determining the aircraft's current projected flight path for a selected distance or time and comparing it with at least one approach volume extending from a runway at the airport towards an outer boundary of the geometric volume. If the aircraft's current projected flight path is such that the aircraft is expected to be within the approach volume and stay within the approach volume to the runway, then inhibiting selected alerts and warnings associated with non-threatening terrain. [A1224]

"Method and system for determining air turbulence using bi-static measurements"

A method and system for determining atmospheric disturbances or turbulence is disclosed. The system includes a plurality of sensor arrays, including at least one sensor element, distributed in a predetermined manner. Each of the sensor elements is in communication with a corresponding receiving system that is operable to receive and process energy received from the aircraft. A determination is then made regarding air turbulence by determining a rate of change of signal phase among selected sets of signals received at the receiving systems. A turbulence map is then determined from the determined rate of change of the phase and the angle of the received signal. When the rate of phase change exceeds known levels an indication of turbulence is made. [A1225]

"Method and system for identification of subterranean objects"

A radar source is configured on a vehicle, which may be an airborne vehicle such as a helicopter. An arrangement of at least one computer system is provided in communication with the radar source and configured to accept instructions from an operator and to operate the radar source. As the vehicle moves in the vicinity of a subterranean volume along a navigation path, a radar signal is propagated with the radar source into the subterranean volume. A reflected radar signal from a subterranean object within the subterranean volume is received. Physical characteristics of the subterranean object are ascertained from the reflected radar signal. [A1226]

"Automobile distance warning and alarm system"

An automobile distance warning and alarm system (ADWAS) in which the warning system is armed when the vehicle exceeds a threshold speed. The vehicle speed is used, along with road or weather conditions, to determine a safe vehicle separation time and corresponding distance. A range finder then determines the actual separation distance between the driver's vehicle and a forward or following vehicle. If the safe separation distance is not maintained for a selected dead time interval, the driver is alerted by an alarm, which may be both an audible and visual alarm. The driver of a following vehicle is also alerted by a rear indicator light. [A1227]

"Distributed power amplifier architecture for TCAS transmitter"

A transmitter and method for transmitting transponder or TCAS signals uses linear amplification to save on circuit component weight, cost and size while enabling precise amplification and control of the transmitted signal. [A1228]

"Track prediction method in combined radar and ADS surveillance environment"

A track position prediction method used in combined radar and ADS surveillance environment is disclosed. Since the time interval between two successive ADS-A reports is too long, air traffic control system must be able to predict aircraft position within this time interval to increase safety. The present invention provides a way to satisfy this requirement. [A1229]

"Transponder data processing methods and systems"

This invention is a radar/tag system where pulses from a radar cause a tag (or transponder) to respond to the radar. The radar, along with its conventional pulse transmissions, sends a reference signal to the tag. The tag recovers the reference signal and uses it to shift the center frequency of the received radar pulse to a different frequency. This shift causes the frequencies of the tag response pulses to be disjoint from those of the transmit pulse. In this way, radar clutter can be eliminated from the tag responses. The radar predicts, to within a small Doppler offset, the center frequency of tag response pulses. The radar can create synthetic-aperture-radar-like images and moving-target-indicator-radar-like maps containing the signature of the tag against a background of thermal noise and greatly attenuated radar clutter. The radar can geolocate the tag precisely and accurately (to within better than one meter of error) . The tag can encode status and environmental data onto its response pulses, and the radar can receive and decode this information. [A1230]

"Helicopter-borne radar system"

A helicopter-borne radar system has a synthetic aperture with rotating antennae (ROSAR) . The antennae for transmitting and receiving radar pulses are arranged at the end of each arm rotating with the rotor, and are connected with the radar system which has at least one transmitting module, one electronic module with a central control device and an image processor as well as a display. In order to align the imaging on the display of the radar system with an inertial axis of the helicopter, and to limit the influence of a change of the rotational rotor on the imaging, a signal generator arranged at the rotor of the helicopter generates signals indicative of rotating positions of the rotor. The latter signals are transmitted to an electronic module of the radar system, which marks the flank of an individual signal from the signal sequence for a rotation of the rotor. This flank of a signal is defined as a "basic position" and is counted. The invention permits azimuthally phase-accurate synchronization between the viewing angle of a helicopter-borne radar system and an inertial axis of the helicopter, as well as a defined alignment of the image on the video screen with respect to an inertial axis of the helicopter (and thus with respect to the flight direction of the helicopter) . The viewing direction of the radar system (ROSAR) can be adjusted by means of an electric regulator wheel, so that the pilot can set a desired defined viewing direction of the radar image on the video screen. [A1231]

"Shipboard point defense system and elements therefor"

A combined defense and navigational system on a naval vessel is disclosed. The disclosed system includes a track-while-scan pulse radar which is controlled to provide either navigational information or tracking information on selected targets. Additionally, the disclosed system includes a plurality of guided missiles, each of which may be vertically launched and directed toward intercept of a selected target either by commands from the track-while-scan radar or from an active guidance system in each such missile. [A1232]

"Tandem-cycle target/track assignment method in combined radar/ADS surveillance environment"

A target/track assignment method for a combined radar/ADS surveillance environment uses tandem cycles to help the air traffic control system update the order of system tracks, thereby permitting numerous target reports to be processed in real time. [A1233]

"Method of synthesizing topographic data"

Synthetic aperture radar (SAR) data (118) of a target (108) is collected (12) over a substantially circular arc (128) , wherein a.chord (130) of the arc (128) establishes (20) a radar aperture (102) having a substantially perpendicular construct baseline (104) through the target (108) . The radar aperture (102) is partitioned (26) into first and second partial apertures (120) having substantially the construct baseline (104) . First and second points (150) substantially vertically coincident with the construct baseline (104) are then determined (38) at means (152) of the first and second partial apertures (120) , and first and second vectors (106) from the target (108) are established (40) by the first and second points (150) , respectively. First and second portions (148) of the SAR data (118) are accumulated (32) over the first and second partial apertures (120) , respectively, and first and second vector complex image data (164) of the target (108) is derived (54) in response thereto. The first and second vector complex image data (164) is then interferogrammetrically integrated (80) and the topographic data (116) of the target (108) is produced (14) thereby. [A1234]

"Shipboard point defense system and elements therefor"

A combined defense and navigational system on a naval Vessel is disclosed. The disclosed system includes a track-while-scan pulse radar which is controlled to provide either navigational information or tracking information on selected targets. Additionally, the disclosed system includes a plurality of guided missiles, each of which may be vertically launched and directed toward intercept of a selected target either by commands from the track-while-scan radar or from an active guidance system in each such missile. [A1235]

"Method and apparatus for improving utility of automatic dependent surveillance"

The surveillance system provides a means to augment Automatic Dependent Surveillance--Broadcast (ADS-B) with "look alike ADS-B" or "pseudo ADS-B" surveillance transmissions for aircraft which may not be ADS-B equipped. The system uses ground based surveillance to determine the position of aircraft not equipped with ADS-B, then broadcasts the identification/positional information over the ADS-B data link. ADS-B equipped aircraft broadcast their own position over the ADS-B data link. The system enables aircraft equipped with ADS-B and Cockpit Display of Traffic Information (CDTI) to obtain surveillance information on all aircraft whether or not the proximate aircraft are equipped with ADS-B. [A1236]

"Tracking data fusion method in combined radar/ADS surveillance environment"

A tracking data fusion method used in a combined radar/ADS surveillance environment defines track states, track types, and track types transition rules to track aircraft. The best available flight services could be provided if the proposed method is used in an air traffic control system. [A1237]

"Method for determining conflicting paths between mobile airborne vehicles and associated system and computer software program product"

A method of determining conflicting flight paths between a first and a second airborne vehicle is provided, wherein each vehicle comprises an aircraft-to-aircraft navigational communication system having a navigational device. First, a position and a velocity vector are determined for each of the airborne vehicles. A cylindrical volume is then defined about the first airborne vehicle. A separation distance is then determined between the vehicles at a selected time and using a great circle earth model. An accuracy factor is thereafter determined for the position of each vehicle. The separation distance is then modified by the accuracy factor. A determination is then made as to whether the modified separation distance is within the cylindrical volume about the first airborne vehicle during a time range to thereby determine whether conflicting flight paths exist between the vehicles. An associated system and computer software program product are also provided. [A1238]

"Method and system for determining a position of an object using two-way ranging in a polystatic satellite configuration"

A method and system for determining a position of an object utilizes two-way ranging and polystatic techniques. A first communication transceiver at a first known location provides a bidirectional communication path between the first communication transceiver and the object wherein the first communication transceiver transmits a first ranging signal to the object and the object transmits a second ranging signal to the first communication transceiver in response to the first ranging signal. The first communication transceiver further provides a first unidirectional communication path between the first communication transceiver and the object wherein the first communication transceiver performs one of transmitting a third ranging signal to the object and receiving a fourth ranging signal from the object. A second communication transceiver at a second known location provides a second unidirectional communication path between the second communication transceiver and the object wherein the second communication transceiver performs one of transmitting a third ranging signal to the object and receiving a fourth ranging signal from the object. A signal processor determines a first path length corresponding to a first time length of the bidirectional communication path, a second path length corresponding to a second time length of the first and second unidirectional communication paths, and the position of the object based on the first and second known locations and the first and second path lengths. [A1239]

"Usage of second mode S address for TCAS broadcast interrogation messages"

A method of a Traffic Alert and Collision Avoidance System (TCAS) , includes the step of utilizing an MID Subfield for a TCAS Broadcast Interrogation Message that is different than a Mode S address assigned to the own aircraft, the aircraft on which a TCAS is installed. A Traffic Alert and Collision Avoidance System includes a TCAS processing unit that performs a method including the step of utilizing an MID Subfield for a TCAS Broadcast Interrogation Message that is different than a Mode S address assigned to the own aircraft. [A1240]

"Apparatus and method for determining wind profiles and for predicting clear air turbulence"

A clear air turbulence (CAT) detection system performs a nowcast algorithm to detect CAT along the flight path of an aircraft. The aircraft stores computer simulation information of key storm features and utilizes the information in combination with returns from an on-board weather detection and ranging sensor and limited additional meteorological data to predict CAT properties, such as intensity, location, time and probability of occurrence. The additional meteorological data is provided by on-board sensors and/or data link from ground sources. A nowcast predicting turbulence along the flight path in the near future alerts the pilot to the likelihood of encountering clear air turbulence. [A1241]

"Shipboard point defense system and elements therefor"

A combined defense and navigational system on a naval vessel is disclosed. The disclosed system includes a track-while-scan pulse radar which is controlled to provide either navigational information or tracking information on selected targets. Additionally, the disclosed system includes a plurality of guided missiles, each of which may be vertically launched and directed toward intercept of a selected target either by commands from the track-while-scan radar or from an active guidance system in each such missile. [A1242]

"Shipboard point defense system and elements therefor"

A combined defense and navigational system on a naval vessel is disclosed. The disclosed system includes a track-while-scan pulse radar which is controlled to provide either navigational information or tracking information on selected targets. Additionally, the disclosed system includes a plurality of guided missiles, each of which may be vertically launched and directed toward intercept of a selected target either by commands from the track-while-scan radar or from an active guidance system in each such missile. The invention herein described was made in the course of or under a contract or subcontract thereunder, with the Department of Defense. [A1243]

"Track grouper"

There is provided a method for tracking a group having at least two targets. The method may comprise selecting the at least two targets from a plurality of targets. The at least two targets may be selectable based upon their respective target datum thereof. Thereafter, a dual gate surrounding each respective one of the at least two targets is defined, wherein a movement of each dual gate is synchronized with a movement of respective one of the at least two targets corresponding thereto. The dual gate of each respective one of the at least two targets may then be associated with each other to form the group. [A1244]

"Multiple altitude radar system"

A multiple altitude radar system for an aircraft performs a main radar sweep at an altitude of the aircraft and at least one secondary radar sweep at an angle from the altitude of the aircraft to a ground altitude. [A1245]

"Method of correcting azimuthal position of moving targets in SAR-images"

The positions of moving targets in the azimuthal direction which result from the SAR processing are falsified by components of the vehicle movement in the Doppler spectrum of the received signal, so that without the implementation of additional signal processing, moving targets are imaged in the SAR image at a false azimuth position. A method of repositioning moving targets in SAR images which consist of multi-channel range/Doppler measurement data X with N.sub.ND Doppler resolution cells, defines on the basis of the filtering coefficients of the STAP transformed into the frequency domain, a family of N.sub.DZ pattern functions M, and determines testing functions T assigned to the measurement data. The true azimuth position of a moving target is then computed on the basis of the position of the maximum of the correlation between the testing functions and the pattern functions. [A1246]

"Shipboard point defense system and elements therefor"

A combined defense and navigational system on a naval Vessel is disclosed. The disclosed system includes a track-while-scan pulse radar which is controlled to provide either navigational information or tracking information on selected targets. Additionally, the disclosed system includes a plurality of guided missiles, each of which may be vertically launched and directed toward intercept of a selected target either by commands from the track-while-scan radar or from an active guidance system in each such missile. [A1247]

"Launch and aim angle determination for an object"

The launch angle of an object in flight after being launched from a initial position, such as a golf ball struck by a golf club, is determined by measuring the velocity of the object using a sensor, such as a Doppler Radar transceiver, positioned, for example, at a known distance forward of the initial position along an expected straight aim line. The launch angle is calculated using a mathematical model, describing the relationship between the measured velocity as a function of elapsed time since launch and the geometrical relation between the sensor and the initial position. The aim angle of the object may be determined by performing independent launch angle calculations corresponding with velocity measurements from a plurality of sensors positioned, for example, in a line at a known distance forward of the initial position. The aim angle is obtainable from the ratio of the calculated launch angles. [A1248]

"Method for working out an avoidance path in the horizontal plane for an aircraft to resolve a traffic conflict"

The preparation of an avoidance path in the horizontal plane so that an aircraft can resolve a conflict of routes with another aircraft that entails a risk of collision within 5 to 10 minutes. This avoidance path minimizes the negative effects of the resultant route diversion on the flight plan of the aircraft. A method prepares an avoidance path with two parts. The first part is an evasive part with an initial heading such that the threatening aircraft takes a path, in relation to the threatened aircraft, that is tangential, on one side or the other, to the edges of the angle at which the threatening aircraft perceives a circle of protection plotted around the threatened aircraft. The radius of this circle of protection is equal to a minimum permissible separation distance. The second part of the evasive path is that of homing in on the initial route. This method of preparing an avoidance path can be implemented by a flight management computer. Once the avoidance path has been accepted by the aircraft crew, the flight management computer ensures that the avoidance path is followed by the automatic pilot. [A1249]

"Radar systems and methods"

A mobile radar system including Electronic Support Measures (ESM) which is adapted to detect and decode Identify Friend or Foe (IFF) signals. The system includes means for decoding or decrypting received IFF signals. The system uses an Electronic Counter Measure (ECM) transmitter which is adapted to transmit IFF response and interrogation signals. The IFF signals to be transmitted can be encrypted. Integrating IFF means into the ESM and ECM components results in mass and volume savings due to shared use of the transmitting and receiving resources. As the IFF signals are transmitted using ESM antennas, they can be directed towards a particular aircraft, thereby reducing spurious transmissions. [A1250]

"Integrated datalinks in a surveillance receiver"

A surveillance transceiver system is provided for receiving extended squitters from Mode S transponders, translating the squitters into ADS-B state vectors in UAT format, and transmitting the ADS-B state vectors using a Universal Access Transceiver (UAT) datalink. The surveillance transceiver system bridges the gap created by differently-equipped aircraft by using multiple datalinks to provide seamless ADS-B surveillance. The module for processing the extender squitters includes a 1090 MHz receiver and a computer processor in communication with the UAT processor for parsing the squitter and composing the ADS-B state vector in UAT format for broadcast. [A1251]

"Shipboard point defense system and elements therefor"

A combined defense and navigational system on a naval vessel is disclosed. The disclosed system includes a track-while-scan pulse radar which is controlled to provide either navigational information or tracking information on selected targets. Additionally, the disclosed system includes a plurality of guided missiles, each of which may be vertically launched and directed toward intercept of a selected target either by commands from the track-while-scan radar or from an active guidance system in each such missile. The invention herein described was made in the course of or under a contract or subcontract thereunder, with the Department of Defense. [A1252]

"Multisource target correlation"

An improved method for correlating between targets in an air traffic control system. A methods or systems according to the invention compare selected components of a first target report to the components of a second target report, produce a confidence level on each component comparison, and determine whether to declare the targets similar based on the confidence level on each component compared. The first and second target reports may include ADS-B target reports and TIS target reports. The individual components of the reports may be range, bearing, track angle, and relative altitude. The methods or systems may use a fuzzy logic probability model to produce a continuous confidence level on each component comparison. [A1253]

"Time delay determination and determination of signal shift"

The delay between a first signal and a second signal is evaluated by deriving from the first signal substantially aperiodic events, possibly by using a zero-crossing detector on a random signal, and using these events to define respective segments of the second signal. The segments are combined, e.g., by averaging, to derive a waveform which includes a feature representing coincidences of parts of the second signal associated with the derived events. The delay is determined from the position within the waveform of this feature. [A1254]

"Airborne turbulence alert system"

A parent unit is provided having: a precedent base for accumulating data from child units, an element data determination unit for processing the data into element data, an element data classification unit for creating a classification, an element data change classification unit for determining which classification the element data belongs to, and calculates transition probabilities among the classifications, and a display unit for displaying data. The child unit collects air current data, processes the data, obtains the transition probabilities, and calculates a probability of encountering air turbulence. The child unit then displays certain data when the probability of encountering air turbulence satisfies predetermined conditions. [A1255]

"Loop powered radar rangefinder"

A pulse-echo radar measures non-contact range while powered from a two-wire process control loop. A key improvement over prior loop-powered pulse-echo radar is the use of carrier-based emissions rather than carrier-free ultrawideband impulses, which are prohibited by FCC regulations. The radar is based on a swept range-gate homodyne transceiver having a single RF transistor and a single antenna separated from the radar transceiver by a transmission line. The transmission line offers operational flexibility while imparting a reflection, or timing fiducial, at the antenna plane. Time-of-flight measurements are based on the time difference between a reflected fiducial pulse and an echo pulse, thereby eliminating accuracy-degrading propagation delays in the transmitters and receivers of prior radars. The loop-powered rangefinder further incorporates a current regulator for improved signaling accuracy, a simplified sensitivity-time-control (STC) based on a variable transconductance element, and a jam detector. Applications include industrial tank level measurement and control, vehicular control, and robotics. [A1256]

""On aircraft" elevation boresight correction procedure for the E-3 antenna"

On an element-by-element basis, measure phases between signals at Port A to Port B of the antenna feed network to get a phase measurement angle that corresponds to an angular difference between outgoing radar signals and target echo return signals, apply a least squares fit equation to the angular distance to get a correction phase slope across the array, .delta..sup.0, and applying a phase slope correction of .delta. to the phases of the transmitted signal. [A1257]

"Midair collision avoidance system"

A midair collision avoidance system (MCAS) employs an existing design of Traffic Alert and Collision Avoidance System (TCAS) as a module and seamlessly integrates it with a customized tactical module which is capable of providing unique tactical avoidance guidance control and display. The tactical module handles all phases of a tactical mission, including formation flight (e.g., formation fall-in, arming formation flight, engaging formation flight following, and formation break-away) , and an air-refueling sequence (e.g., rendezvous, linkup, re-fueling, and disengaging air-refueling) . The tactical module divides the air space around the aircraft into advisory, caution, and warning zones and for each provides display, tone and voice alerts to facilitate pop-up avoidance guidance commands. Military aircraft can thus effectively avoid mid air and near mid air collision situations in all three different operation modes: air traffic control (ATC) management mode, tactical mode, and a mixed mode. [A1258]

"System and method for determining the 3D position of aircraft, independently onboard and on the

ground, for any operation within a "gate-to-gate" concept"

A system and method for determining simultaneously and independently onboard of each aircraft and on the ground at ATC centers utilizing substantially identical surveillance modules for determining the 3D position of all aircraft in an ATC area utilizing a UTC clock to further synchronize all of the surveillance modules on the aircraft and at ground stations. Five ground stations including a master and four slaves communicate with each other and all aircraft in the ATC areas. The same precise 3D position of all aircraft operating in that ATC airspace is simultaneously computed by all the aircraft in that ATC area utilizing the measured distance between the aircraft and ground stations in that area providing full automated support for landing, take-off and taxi operation of the aircraft to a Gate or from a Gate, by using a ground infrastructure of radio communication stations which are operating worldwide within a 16 MHZ frequency spectrum from the existing DME 962-1213 MHZ spectrum. During functioning of the system, any mobile equipped with a dedicated receiver could determine its 2D position on the ground within an airport area or within any ATC area, such mobile being a truck, a car, a boat, a train, a mobile phone, or any other mobile operating in that ATC area and tuned on the frequency of operation of that ATC area. [A1259]

"Radar signature evaluation apparatus"

An improved radar signature evaluation apparatus for measuring and evaluating the radar signature for an aircraft, missiles, and other vehicle. The radar signature apparatus includes an instrumentation system for generating radar cross section data for the vehicle being evaluated and a computer for processing the radar cross section data and a printer for printing various plots derived from the radar cross section data. [A1260]

"Method and apparatus for detecting and eliminating signal angle-of-arrival errors caused by multipath"

This present invention advantageously eliminates the critical deficiencies of current multipath interferometer processing demonstrated in field testing. In particular the present invention substantially improves AOA estimation accuracy and reliability when utilizing super resolution algorithms. The present invention also overcomes the data-gap drawback of data editing methods, especially for emitters at low elevations. The present invention does this by detecting phase processing errors and substituting correct AOA estimates for the corrupt ones. In the preferred implementation, the detection and substitution time extends only slightly the super resolution or data editing processing time. By thus requiring little additional processing time, the present invention allows the interferometer to output accurate angle estimates at the receiver's emitter-revisit rate for all emitter-array geometries and signal polarizations. The present invention eliminates both the gross errors caused by abnormally large phase noise variance, typically created by diffuse multipath, and the interfering signal errors induced by specular multipath. [A1261]

"Passive coherent location system and method"

A system and method for enhancing object state awareness is disclosed. The system includes a receiver subsystem that receives reference signals from an uncontrolled transmitter and scattered transmissions originating from the uncontrolled transmitter and scattered by an object. The system also includes a front-end processing subsystem that determines a radial velocity of the object based on the received transmissions. The system also includes a back-end processing subsystem that determines object state estimates based on the determined radial velocity. [A1262]

"Synthetic aperture radar system capable of detecting moving targets"

A Synthetic Aperture Radar (SAR) system and method capable of detecting moving targets which includes a platform that moves over a number of objects, such as a ground surface, and supports radar equipment which reproduces the objects by means of a fast backprojection synthetic aperture technique via at least two antennas without requirement as to directivity or fractional bandwidth. The imaging process is divided into three steps which are carried out in a determined order, the steps and the order being formation of sub-aperture beams at one speed, performing clutter suppression, and detection of moving targets. [A1263]

"Positioning and data integrating method and system thereof"

An improved positioning and data integrating process and system can substantially solve the problems encountered in system integration for personal hand-held applications, air, land, and water vehicles, wherein an integrated global positioning system/inertial measurement unit, enhanced with optional other devices to derive user position, velocity, attitude, and body acceleration and rotation information, and distributes these data to other onboard systems, for example, in case of aircraft application, flight management system, flight control system, automatic dependent surveillance, cockpit display, enhanced ground proximity warning system, weather radar, and satellite communication system. [A1264]

"Signal processing method"

A signal processing method is particularly for use in object detection systems which allows a sensed target signal to be "held" once it has raised above a detection-threshold. The method involves reducing the detection-threshold values of the detection-threshold function within the target region. This method is useful for such applications as automotive radar sensors, airbag deployment systems, communication systems demodulation, security sensor systems, sanitary flushing systems and lighting systems. [A1265]

"Rosar method for landing helicopters under adverse weather conditions and for recognizing and detecting concealed targets"

In a method for operating a rotating synthetic aperture radar system that works with pulse frequency or in FM-CW operation in order to detect, penetrate and evaluate objects that are located vertically below the helicopter carrying the ROSAR device, pixels are determined using their own specific doppler histories. [A1266]

"Method and system for terrain aided navigation"

A method and system for terrain aided navigation which provide more precise and more accurate position, velocity, altitude, and attitude for an air vehicle. The present method is a continuous, active, all-weather, day/night, self-contained vehicle system used for terminal and en route navigation. The present method utilizes on-vehicle sensing elements which require no external stimulation, eliminating dependence on external ground and space-based navigation aides. The present method also provides a drift-free solution. The present method is more difficult to detect (sense) and more difficult to disrupt. [A1267]

"Traffic information service (TIS) uplink own aircraft heading correction"

An apparatus, method and computer program product for correcting own aircraft heading and displaying proximate aircraft traffic data on a Traffic Information Service display. The apparatus, method and computer program minimize slewing of the other aircraft data across the display during aircraft maneuvers and provides a more reliable and consistent depiction of traffic relative to own aircraft position. [A1268]

"Location position system for relay assisted tracking"

An extensible short-range tracking system is disclosed. The tracking system disclosed is a multi-level tracking system. At the first level is an RF tag, which is a transmit-only unit that transmits information including minimally an identification number. The transmission from the RF tags are sporadic with timing depending upon the application at implementation. Generally, the transmission timing comprises a transmission, which is repeated periodically at random times. Transmissions from the RF tags are received in a series of relays. The relays may calculate the position of the tags by knowing the position of the relays and the time difference of arrival of the signals from the RF tags by several relays or may pass the information needed to calculate position to a base station. Alternately, the RF tags may generate position information and transmit that information along with the RF tag identifier to the relays. The relays, which may be networked among themselves, then relay the information from the tags to a base station unit. The base station unit may be part of various applications such as a fire control system in a military application or an inventory system in an industrial application. [A1269]

"Adaptive radar scanning system"

An adaptive radar scanning system for an aircraft includes a radar antenna that is angularly movable to scan across a full scan range. A control system operates the radar antenna to scan in an adjusted scan range based on information related to a heading of the aircraft. As a result, the radar system is able to provide more weather information in the direction of a turn, by truncating the scan range of the radar antenna in the direction away from the turn. [A1270]

"System and method for avoidance of collision between vehicles"

A system and a method for avoidance of collision between vehicles, wherein a possible avoidance manoeuvre trajectory for the respective vehicle is calculated and compared with the avoidance manoeuvre trajectories calculated for the other vehicles for controlling whether the avoidance manoeuvre trajectory of the vehicle in every moment during its calculated lapse is located at a stipulated or predetermined minimum distance from the avoidance manoeuvre trajectories of the other vehicles. A warning is presented to a person manoeuvring the vehicle and/or the vehicle is made to follow an avoidance manoeuvre trajectory previously calculated and stored for the vehicle if the comparison shows that the avoidance manoeuvre trajectory of a vehicle in any moment during its calculated lapse is located at a distance from the avoidance manoeuvre trajectories of any of the other vehicles that is smaller than the stipulated minimum distance. [A1271]

"Method of signal treatment and processing using the ROSAR system"

A method of signal conditioning and processing uses a ROSAR system for obtaining high-resolution elevation data using a fixed transmitting antenna, without requiring a turnstile. A telescope-like extensible transmitting antenna having large vertical dimensions illuminates an area to be imaged in a fanned pattern, creating overlapping elevation sectors. Reflected signals are relayed to a fixed receiving antenna via rotating transponders. [A1272]

"Apparatus and method of checking radio altitude reasonableness"

In a ground proximity warning system for an aircraft, a signal representing clearance of the aircraft from the underlying terrain is produced from a sea level related altitude signal and a terrain database in addition to the radio altitude signal of the aircraft's radio altimeter. An indication of reasonableness of the aircraft radio altitude signal is formed jointly responsive to the aircraft radio altitude signal and the terrain clearance signal. [A1273]

"Aircraft weather information system"

A system and method that downlinks weather data, generated by existing weather and data sensors, to a groundstation. The groundstation utilizes data from multiple aircraft to form refined weather information, and uplinks the refined weather information to the aircraft. The refined weather information is stored at the aircraft and picture generating equipment, such as an existing on-board ground proximity terrain picture and symbol generator, generates pictorial information depicting the weather information. The pictorial information is displayed, for example by an existing EFIS or weather radar display, in the form of polygons. [A1274]

"Missile launch point estimation system"

In a system for estimating the launch point of a missile, Doppler shifted signals reflected from the missile as it travels from its launch point are used in a Kalman filter to estimate the missile position, velocity and acceleration, in earth centered fixed coordinates. The coordinate system is rotated to a rotated earth fixed (REF) coordinate system in which the X-axis passes through the estimated missile launch point and the Z-axis is made parallel to the missile azimuth as represented by the missile velocity determined by the Kalman filter. The error in the downrange component of the missile launch point is then reduced to a minimum in the REF coordinate system using a square root information filter. The coordinate system is then rotated to a second rotated earth fixed coordinate system in which the X-axis passes through the updated launch point position and the Z-axis is positioned at 45 degrees from the missile azimuth. The Z-axis component and the Y-axis component of the error in the launch point is then reduced to a minimum in the new REF coordinate system using a square root information filter. [A1275]

"High precision range measurement technique"

Electronic Warfare (EW) systems aboard aircrafts are used to protect them from guided missile by denying threat radar systems the ability to track the aircrafts. In a typical operation, a threat radar system transmits RF signals aimed at the target aircraft. The surface of the target reflects a portion of the incident signal back towards the threat radar antenna where the reflected signal is detected, allowing the threat radar system to determine the target's range, angle and velocity. The present invention relates to EW systems that are dependent on measuring the RF phase of a signal transmitted by a target tracking threat radar. The use of the invented technique will make it possible to implement a robust Electronic Counter-Measures (ECM) technique, known as Cross-Eye, using two airborne platforms. The technique is very effective in preventing a threat radar from tracking a target aircraft and guiding a launched missile to the target aircraft. [A1276]

"System and method for processing squint mapped synthetic aperture radar data"

A method for processing squint-mapped synthetic aperture radar data of the present invention. The inventive method includes the steps of effecting range compression of the data, deskewing the data, performing a Fourier transform with respect to the deskewed data, providing a range migration interpolation of the transformed data, effecting a frequency remapping of the range interpolated data, and performing an inverse Fourier transform with respect to the deskewed data. [A1277]

"Method and apparatus for predictive altitude display"

Embodiments of the invention provide a method and apparatus for indicating aircraft height relative to an obstruction in a terrain awareness warning system. The method includes receiving data indicative of geographic features of an obstruction, lateral distance of the geographic feature from an aircraft, height and flight path of the aircraft, calculating a projected height of the aircraft at the location of the obstruction using the data, generating a result signal, and displaying a colored indication on a display screen based on the result signal. The apparatus includes inputs for signals from instruments measuring height, flight path, and location of an aircraft, as well as an input for an instrument providing information about geographic features of terrain surrounding the aircraft. The apparatus includes a means for employing the signals to calculate an effective height of the aircraft relative to the terrain, and a screen display for graphically displaying the results of the calculation. [A1278]

"Microwave icing avoidance system"

A passive microwave icing avoidance system (MIAS) senses atmospheric conditions that lead to aircraft icing when the aircraft is flying at an altitude above the earth's surface. The MIAS includes a 37 GHz receiver and an 89 GHz receiver coupled to an antenna for sensing two microwave frequencies at different angles creating six passive microwave beams. The two receivers output data to a processor that processes the data to determine the amount of cloud liquid water and generates signals to an indicator/display to instruct the pilot of an aircraft to divert or proceed along the flight path. [A1279]

"Close formation aircraft collision avoidance"

Collision avoidance systems are provided for groups of aircraft operating in close proximity, as during formation flights or cooperative missions. Fixed and rotary airfoil aircraft with separations of 30 feet to 5 miles, for example, participate in a local radio sub-net. An aircraft receiving CAS sub-net signals derives signal transit time values representing differences between send and receive times and which are used to derive data on inter-aircraft range and closing rate. With synchronized clocks, highly-accurate one-way ranging uses assigned time slots with predetermined sub-net time-of-day timing of transmissions. Round-trip ranging operates with less accurate time synchronization, and systems may operatively select between one-way and round-trip ranging. By exchange of range and closing rate data among aircraft, 3-D data for current three-dimensional location of aircraft enables evasive action determination. Data is thus made available for provision of audio and visual flight crew communications indicating alerts and warnings of impending collision danger and appropriate evasive action. [A1280]

"Method for reducing transmit power for traffic alert and collision avoidance systems and airborne collision avoidance systems"

The present invention provides a method for efficient use of the transmit power of a Traffic Alert Collision Avoidance System (TCAS) that allows enhanced surveillance range and limits radio frequency (RF) interference in crowded airspace. The method reduces power density in crowded airspace by modifying Mode S, Mode A and Mode C interrogations. During Mode S broadcasts, tracking interrogation power is reduced as a function of range. Further transmit power reduction is achieved by broadcasting a variable power density whisper-shout interrogation technique for Mode A/C aircraft when garbling is detected. If garbling is observed during a medium whisper-shout interrogation sequence, the method of the present invention attempts to clear the garbling by using focused high-density whisper-shout steps but only in the ranges where garbling was detected. Formation members can account for other formation members that are TCAS equipped using a special E-TCAS Broadcast Interrogation. The presence of other E-TCAS will be used in the RF interference limiting calculations. Aircraft flying in formation further minimize broadcast power by sharing information between the formation leader and formation aircraft. [A1281]

"Method for the calibration of an FM/CW type radio altimeter, and radio altimeter designed for the implementation of this method"

A radio altimeter using a linear oscillator to transmit a saw-toothed signal comprises, in addition to this first oscillator, a second linear oscillator to transmit, in synchronism with the first linear oscillator, another saw-toothed signal with a given saw-tooth duration Td. The plateau of the sawteeth of the two saw-toothed signals are at a distance from each other equal to a value f. The test consists in obtaining a height h' by beats between the two saw-toothed signals and computing a standard height he=f.c.Td/dF.2 where c is the speed of light and dF the duration of each saw-tooth of the other signal. Application to all FM/CW radio altimeters. [A1282]

"Method and system for displaying target icons correlated to target data integrity"

A method is provided for determining the integrity of incoming target data and for assigning and displaying a target icon correlated to the target data integrity. Target data integrity depends on the both accuracy and the timeliness of the position data being broadcast about the target. Target data integrity is monitored continuously to display a target icon correlated to the current integrity level. Changes in the target icon alert the flight crew or other user to changes in target data integrity. The icon attributes used to communicate a change in integrity do not interfere with other icon attributes used to communicate other characteristics of a target. [A1283]

"Surveillance system for terrestrial navigational and airport landing systems"

The invention deals with a surveillance system for terrestrial navigational and landing systems, in which the navigational signals being transmitted for aeroplanes or other airborne objects by the navigational and airport landing systems are received and evaluated by a ground-based receiving and control facility. In this system: the receiving and control facility is equipped with a plurality of additional receiving stations, these additional receiving stations operate in the frequency range of the navigational signals, the additional receiving stations are arranged geographically distributed within the transmitting range of the navigational or airport landing system, the signals recorded by the additional receiving stations are forwarded to a central evaluating unit. [A1284]

"Transponder landing system"

A ground-based, precision aircraft landing system provides CAT I precision approach and landing guidance. The aircraft elevation position is determined by measuring differential carrier phase and time-of-arrival of the aircraft ATCRBS transponder reply. The transponder reply is received at a plurality of sensor antenna locations where it is then conveyed to a sensor, demodulated and digitized. The data is transmitted to a central processor where calibration and multipath corrections are applied. Aircraft transponder diversity antenna switching is isolated from the jitter and colored noise of transponder reply multipath by correlating differential phase jumps measured between separate sensor antennas. An estimate of the diversity antenna separation is maintained by Kalman filter processing, the estimated separation is used to correct the differential phase measurement data of aircraft elevation. The corrected phase measurement and time-of-arrival measurement is processed using another Kalman filter to achieve the desired aircraft elevation positioning accuracy. A similar differential carrier phase and time-of-arrival subsystem is applied to achieve an azimuth measurement of the aircraft position. The combined azimuth and elevation of the aircraft is then compared to the desired approach path, and the aircraft position error relative to the desired approach is communicated to the aircraft. [A1285]

"Passive identification friend or foe (IFF) system"

A system is provided for passively producing at least two distinct signal patterns. The system can be used for passively identifying friend or foe in an environment and operates in a hyper spectral mode that accommodates multiple bands simultaneously. Exemplary embodiments receive radiated energy within a resonant cavity, and use an absorber and a reflector to absorb and reflect desired frequencies of the incoming energy. A controller is connected to the IFF system and controls the switching back and forth between the absorber and the reflector to produce a signal having a desired data format. The encoded data can be used to determine the status of the candidate target. [A1286]

"Differential time of flight measurement system"

A bi-static radar configuration measures the time-of-flight of an RF burst using differentially-configured sampling receivers. A precise differential measurement is made by simultaneously sampling a reference signal line and a free-space time-of-flight RF burst signal using separate sampling receivers having common sample timing. Two alternative sample timing systems may be used with the sampling receivers: (1) a swept delay using a delay locked loop (DLL) , or (2) two precision oscillators slightly offset in frequency from each other. The receiver outputs are processed into a PWM signal to indicate antenna-to-antenna time-of-flight range or to indicate material properties. Applications include robotics, safety, material thickness measurement, material dielectric constant measurement, such as for fuel or grain moisture measurement, and through-tank fill-level measurement. [A1287]

"Method of detecting objects that change with time by means of a SAR radar"

A method of detecting, by means of a SAR radar, objects that change with time within a ground area. The SAR radar is supported by a platform in essentially rectilinear motion during a synthetic aperture and the ground area is reproduced at least twice in succession from different synthetic apertures. A two-dimensional SAR image is generated from each synthetic aperture. The SAR images are matched with each other by a method in which each image position in one image is associated with the same ground area in the other image, the images being filtered, knowing location data for the antennae and based on the fact that the cylinder geometry of the SAR images is projected onto the ground surface, so that only common spectral components of the reflectivity of the ground are extracted and used in the matching. [A1288]

"Method and system for high precision altitude measurement over hostile terrain"

A system and method for providing highly accurate measurements of the altitude above ground level (AGL) of an aircraft flying over local terrain. A current AGL altitude of the aircraft over local terrain is obtained by activating a radar altimeter on the aircraft for a single short duration or pulse. A mean sea level (MSL) elevation of the local terrain is determined by identifying the terrain from the then-current aircraft geographical position coordinates and utilizing known terrain topography data. The actual MSL altitude of the aircraft can then be determined. An uncorrected MSL altitude of the aircraft is then determined from conventional static air pressure measurements and the difference between the actual MSL altitude and the uncorrected MSL altitude of the aircraft yields a local barometric correction factor for use in determining MSL altitude measurements of the aircraft as the aircraft flies over and continues its flight away from the local terrain. [A1289]

"Close/intra-formation positioning collision avoidance system and method"

A passive Traffic Alert and Collision Avoidance System (TCAS) and method is based on receiving and processing Mode-S transponder messages without the TCAS computer having to interrogate the transponders of the respective aircraft flying in formation (i.e., a passive TCAS) . A TCAS computer and Mode-S transponder are used to provide distributed intra-formation control among multiple cells of aircraft flying in formation or close-in. The Mode-S transponder provides ADS-B Global Positioning System (GPS) squitter data to the TCAS computer, the TCAS computer receives and processes the data without having to interrogate the transponders of the multiple cells of aircraft. The method and system allow a safe separation between 2 to 250 aircraft flying in formation at selectable ranges. [A1290]

"Nowcast of conviction-induced turbulence using information from airborne radar"

A convection induced turbulence (CIT) detection system performs a nowcast algorithm to detect CIT along the flight path of an aircraft using power returns from an airborne whether radar. Additional meteorological data is optionally provided by onboard sensors and/or data link from ground sources. A nowcast predicting turbulence along the flight path in the near future alerts the pilot to the likelihood of encountering clear air turbulence. [A1291]

"Air traffic control support system"

An air traffic control support system comprises: a wake turbulence detecting unit adapted to detect a wake turbulence occurring in a runway sky due to taking off or landing of an aircraft, a decay time predicting unit adapted to predict decay time of the wake turbulence, a weather information acquiring unit adapted to acquire weather information in the surroundings around the runway, and a display unit adapted to display the decay time, wherein the decay time predicting unit predicts the decay time of the wake turbulence detected by the wake turbulence detecting unit on the basis of the weather information. [A1292]

"Apparatus and method for microwave interferometry radiating incrementally accumulating holography"

A satellite architecture and method for microwave interferometry radiating incrementally accumulating holography, used to create a high-gain, narrow-bandwidth actively-illuminated interferometric bistatic SAR whose VLBI has a baseline between its two bistatic apertures, each on a different satellite, that is considerably longer than the FOV, in contrast to prior art bistatic SAR where the interferometer baseline is shorter than the FOV. Three, six, and twelve satellite configurations are formed of VLA satellite VLBI triads, each satellite of the triad being in its own nominally circular orbit in an orbital plane mutually orthogonal to the others of the triad. VLBI pairs are formed by pairwise groupings of satellites in each VLA triad, with the third satellite being used as a control satellite to receive both Michelson interferometric data for phase closure and Fizeau interferometric imaging data that is recorded on a holographic disc, preserving phase. [A1293]

"Method and apparatus for correlating flight identification data with secondary surveillance radar data"

A system for correlating secondary surveillance radar (SSR) data and ACARS data which results in a real time correlation of data which are unique to the separate existing systems. More specifically, a method is provided to attach flight identification data from ACARS signals to real time SSR data from Mode S transponders. Aircraft Mode S addresses are decoded and then converted to aircraft registration numbers using an algorithm or lookup table. Registration numbers are then correlated with registration numbers from decoded ACARS signals. The result is a real-time system which may provide an aircraft's registration information, including registration number, owner, make, and model, as well as its current flight identification number, and ACARS messages. As part of an aircraft multilateration system, the system provides an independent air traffic control picture complete with aircraft position and identification by flight number without the use of active radar equipment. [A1294]

"Retrofit solution for the integration of ground-based weather radar images with on-board weather radar"

A method of integrating ground-based radar information into an existing on-board aircraft radar system, where a radar indicator displays on-board radar images as a function of data words received from a receiver/transmitter of the on-board aircraft radar system, includes receiving ground-based radar data indicative of a ground-based radar image. A data word from an output stream of the receiver/transmitter of the on-board aircraft radar system is captured, with the captured data word being encoded in a first data word format. A position and heading of the aircraft is determined, and the ground-based radar data is sampled to obtain sampled ground-based radar data corresponding to the position and heading of the aircraft and to a radial scan angle for the captured data word. The sampled ground-based radar data and the captured data word are combined into a composite data word, with the composite data word being encoded in the first data word format. The composite data word is provided to the radar indicator for use in displaying a composite weather radar image having both on-board weather radar imagery and ground-based weather radar imagery. [A1295]

"SAR radar system"

The present invention relates to a radar system which comprises a platform which moves over a number of objects. The number of objects can be very large and the objects can appear in the form of, for example, a ground surface. The platform supports radar equipment which reproduces the objects by means of synthetic aperture technique (SAR) via at least one antenna without requirements as to directivity or fractional bandwidth. Moreover, the movement of the platform is, during the recording of data for a SAR image, essentially rectilinear and uniform. The invention is characterized mainly in that it comprises a signal-processing device which records received radar echoes from each transmitted radar pulse and records or calculates the position of the used antenna or antennae, and which calculates a one-parameter quantity of two-dimensional SAR images as a function of two image co-ordinates where the parameter is the relative speed. Here use is made of the fact that each object, i.e. a radar echo with certain image co-ordinates, is reproduced at a maximum ratio of desired to undesired signal for a predetermined value of the relative speed parameter, which value is established to be the magnitude of the relative velocity vector between the object and the platform. In the calculation, the signal-processing device backprojects radar raw data in a hierarchical scheme, where each level is based only on the immediately preceding one, and where the summation of radar raw data occurs in the form of subapertures having a gradually increasing length. [A1296]

"Method for checking an fm/cw type radio altimeter, and radio altimeter designed for the implementation of this method"

A radio altimeter using a linear oscillator to send out a continuous wave that is frequency modulated linearly between two boundary values sends the antenna installation an incident signal, collects the signal reflected by the installation and examines it. This incident signal may be that of the linear oscillator. for the reception antenna installation, this means providing for a rerouting in order to direct a small part of the signal of the oscillator to this installation. In the case of the transmission antenna installation it is enough to provide for a rerouting that injects the signal reflected by this installation into the reception channel. Application to all the FM/CW radio altimeters. [A1297]

"Airbag sensor system"

The aim of the invention is to generate a timely triggering signal for an effective unfolding of an airbag and, at the same time, to take the relative velocity of the collision opponent into account as a triggering criterion. To this end, the invention provides that two interspaced sensors, which emit millimeter waves, are integrated in each vehicle body door. The measuring signals of said sensors are generated by means of a multi-frequency modulation method. The invention also provides that during a signal processing operation using radar technology, the obtained measuring signals are turned into velocity values (Vn) and distance values (R) according to individual echo centers of the collision object. In addition, the transversal velocity (V.sub.q) with regard to the door surface is detected from said values in a series-connected situation analysis module. A classification of the collision object results from the measured values and a criterion is obtained from a subtraction of both sensor measurement outcomes. The invention can be used for triggering a side airbag in a motor vehicle. [A1298]

"System and method for displaying vertical profile of intruding traffic in two dimensions"

A circuit and method for displaying a vertical profile view of situational awareness information. [A1299]

"Autonomous landing guidance system"

An aircraft guidance system uses radar imaging to verify airport and runway location and provide navigation updates. The system is applicable to flight operations in low visibility conditions. [A1300]

"Positioning and data integrating method and system thereof"

An improved positioning and data integrating process and system can substantially solve the problems encountered in system integration for personal hand-held applications, air, land, and water vehicles, wherein an integrated global positioning system/inertial measurement unit, enhanced with optional other devices to derive user position, velocity, attitude, and body acceleration and rotation information, and distributes these data to other onboard systems, for example, in case of aircraft application, flight management system, flight control system, automatic dependent surveillance, cockpit display, enhanced ground proximity warning system, weather radar, and satellite communication system. [A1301]

"Subaperture processing for clutter reduction in synthetic aperture radar images of ground moving targets"

A radar tracking system extracts moving target content from a single radar pulse stream. The radar tracking system has a single phase center antenna for receiving the radar pulse stream. The tracking system further includes a signal processing system for converting the radar pulse stream into a plurality of SAR images. Each image has a corresponding moving target content and a corresponding clutter content. The tracking system also includes a targeting system for canceling identical clutter content between the images. The signal processing system includes a synthetic subaperture system for generating a plurality of synthetic subapertures and defining a common reference point. The common reference point has known slant ranges with respect to the plurality of synthetic subapertures. A deramping module uses a unique deramping function to compute a deramped signal for each synthetic subaperture based on the known slant ranges. The signal processing system further includes an imaging system for generating SAR images for the deramped signals. The processing of a radar pulse stream from a single antenna allows antenna size to be reduced by a factor of two or more, and allows tracking of slowly moving targets. [A1302]

"Single antenna FM radio altimeter operating in a continuous wave mode and an interrupted continuous wave mode"

A single antenna FM radio altimeter operates in continuous wave (CW) and interrupted continuous wave (ICW) modes to provide an altitude indication. An altimeter transmitter generates a constant FM period CW signal below a critical altitude and a variable FM period ICW signal above the critical altitude. The single antenna, connected to the transmitter and receiver, radiates and receives the CW and the ICW signals. The receiver provides a beat frequency signal. A processor compares the beat frequency signal and the variable FM period signal to critical altitude reference signals and switches the altimeter between the modes accordingly. The processing function provides the transmitter a constant period modulation signal below the critical altitude and a variable FM period signal above the critical altitude. The processing function provides the altitude indication from the beat frequency signal below the critical altitude and from the variable FM period signal above the critical altitude. [A1303]

"Error correction for IFSAR"

IFSAR images of a target scene are generated by compensating for variations in vertical separation between collection surfaces defined for each IFSAR antenna by adjusting the baseline projection during image generation. In addition, height information from all antennas is processed before processing range and azimuth information in a normal fashion to create the IFSAR image. [A1304]

"System for A multi-purpose portable imaging device and methods for using same"

The present invention is a multi-purpose portable imaging device. The device is small enough to be hand-held or wearable and has embedded on its surface at least one sensor. These sensors may be active or passive. Analog energy received from the sensors is converted into a digital format and sent to an advanced computer. The computer is constructed on parallel architecture platform. The computer has the capability of taking data from multiple sensors and providing sensor fusion features. The data is processed and displayed in a graphical format in real time which is viewed on the imaging device. A keypad for entering data and commands is available on the device. The device has the capability of using a removable cartridge embedded with read only memory modules containing application software for manipulating data from the sensors. The application cartridge provides the imaging device with its multi-purpose functionality. Methods of utilizing expert systems to match generated images, or dielectric constants is provided. [A1305]

"Method and device for liquid level measurement by means of radar radiation"

The invention relates to a method and a device for measuring a level in a receptacle using radar. Via an aerial (1) directed down into the receptacle, an electromagnetic wave is transmitted and a reflected and time-delayed wave is received, the level being calculated from the time delay. Via one and the same aerial (1) at least two waves are transmitted and received, which are mutually distinguishable by a detectable characteristic for each wave. The device according to the invention is characterized in that connected to the aerial (1) is at least one further radar measuring channel (3, 4) , the radar waves of which are mutually distinguishable and distinguishable from the radar wave used in a first radar measuring channel. [A1306]

"Low probability of intercept coherent radar altimeter"

A radar altimeter for determining altitude of an air vehicle with respect to ground comprises a digital sequencer for digitally modulating a first signal. A transmitter coupled to the digital sequencer transmits a radar signal including the modulated first signal toward the ground. A receiver receives a reflected radar signal from the ground. The received radar signal includes the modulated first signal. A digitizer coupled to the receiver generates digital samples of the modulated first signal. A digital signal processor coupled to the digitizer receives digital samples of the modulated first signal from the digitizer, demodulates the received digital samples, processes the demodulated digital samples and outputs altitude data based on the demodulated digital samples. [A1307]

"Path planning, terrain avoidance and situation awareness system for general aviation"

A number of navigation functions are performed on terrain navigation space. One function is to define a dynamic dangerous zone based on flight altitude by locating and aggregating a set of nodes of terrain height over a minimum flight altitude. Algorithms such as collision check, mountainous area boundary and region growing techniques are developed as basic operations for this terrain model. In addition, a visibility graph approach for dynamic route selection may be adapted to reduce the real-time computational requirements. This approach reduces the size of the search space by establishing a partial visibility graph of terrain and avoids details of the terrain, which do not influence the choice of flight path, independent of the size of the navigation space. By exploiting the multiple and variable resolution properties of Oct-tree terrain models, a series of CFIT warning functions using terrain data as reference are implemented efficiently with existing on-board terrain data resources. [A1308]

"Projection of multi-sensor ray based data histories onto planar grids"

A method and apparatus which perform efficient projection of 4-dimensional data (3 spatial and 1 time dimension) onto planar grids are described. Multiple frames of data are drawn from a limited time history data buffer and projected onto a planar grid, which need not be flat, defined in its own coordinate system. Higher dimensional data structures can also be formed from multiple projection grids. Measurement data from multiple data frames is projected into the planar grid such that distance out of plane is the z-dimension. Computational efficiency is achieved by processing only those data samples that are relevant to the planar grid. To be considered relevant, the impulse response of the sensor's measurement rays must cross the planar grid. Samples of relevant rays must also map onto the planar grid's coordinate mesh to be relevant. Multiple data measurements may determine the planar grid's final amplitude result. Amplitudes at the planar grid coordinates are determined by the most relevant measurement (s) of those within the extent of the measurement system's impulse response. [A1309]

"Multi-channel moving target radar detection and imaging apparatus and method"

A radar detection and imaging system provides for the simultaneous imaging of the stationary objects on the earth's surface and the detection and imaging of moving targets. The radar system includes at least one transmitting aperture and a plurality of receiving apertures that are simultaneously operated in a synthetic aperture radar (SAR) mode caused by the motion of the satellite or airborne platform on which they are mounted. Each receiving aperture is connected to its own coherent receiver and the digitized signals from all receivers are processed to image both stationary clutter and moving targets. The system employs space-time adaptive processing (STAP) algorithms to better compensate for channel mismatches, better suppress stationary clutter, and to suppress mainbeam jamming. Moving target detection and estimation modules are also included and are their performance is improved as a result of the STAP algorithms. The system also employs SAR processing algorithms to create high-resolution images of stationary objects, and to image moving targets. The SAR and STAP algorithms are uniquely integrated in the radar signal processor (RSP) to provide improved performance while reducing the computational requirements, facilitating real-time implementation. [A1310]

"En route spacing system and method"

A method of and computer software for minimizing aircraft deviations needed to comply with an en route miles-in-trail spacing requirement imposed during air traffic control operations via establishing a spacing reference geometry, predicting spatial locations of a plurality of aircraft at a predicted time of intersection of a path of a first of said plurality of aircraft with the spacing reference geometry, and determining spacing of each of the plurality of aircraft based on the predicted spatial locations. [A1311]

"Method for monitoring data flows, specially to provide radar data for air traffic control systems, and device to implement said method"

The invention relates to a method and device for monitoring data flow, specially to provide radar data for air traffic control systems. In order to detect data supply failures and to provide an automatic replacement supply, the data which is transmitted is computed at the output of the data transmission device at parameterable time intervals, whereupon the data flow is reproduced, the measuring values are stored during several intervals and compressed into an average value. When a new value is inputted, the oldest value is erased. The average value is used as a starting value for a sensitivity curve which generates a time window for periodic comparison of added measuring values for an error detector which signalizes a total failure of measuring values in a predetermined time unit and initiates a selection mode to access a predefined data source in an appropriate data network and the data is inputted into the respective data supply system via interfaces. [A1312]

"Aircraft or spacecraft based synthetic aperture radar"

In the inventive aircraft based or spacecraft based radar system with synthetic antenna aperture (SAR=Synthetic Aperture Radar) a transmit antenna and a receive antenna are provided according to a bistatic radar, which are arranged above the earth's surface, physically separate and on different platforms of which at least one is moving, so that a relative movement results between the transmit antenna and the receive antenna. Either the transmit antenna, the receive antenna, or both antennas are designed for ambiguity suppression. The radar system according to the invention is useful particularly for the systematic imaging of the earth's surface. [A1313]

"Circuit for generating and/or detecting a radar signal"

The invention relates to a circuit for generating and/or detecting a radar signal for synthetic aperture radar in which the radar signal is subdivided into N sub-bands which are processed in parallel in N processing channels, each having a first mixer for processing in-phase signals, and a second mixer for processing quadrature signals. In the circuit the mixers of the N processing channels are in the form of identical mixer modules each comprising at least one mixer, and each module is associated with at least one external element for adjusting the mixer module in correspondence with the sub-band with which it is associated. [A1314]

"System and method for bistatically determining altitude and slant range to a selected target"

A bistatic passive radar system is used in conjunction with a host transmitter that is a determinable distance D from the radar system for determining the distance D and for displaying video images of a selected target, the position of the radar system and the position of the transmitter on a display. The invention is characterized by a system and method of using the display to determine the slant range S and the altitude H of the selected target relative to the position of the radar system. Three alternative embodiments of the invention are disclosed. [A1315]

"Method and apparatus for correlating flight identification data with secondary surveillance"

A system for correlating secondary surveillance radar (SSR) data and ACARS data which results in a real time correlation of data which are unique to the separate existing systems. More specifically, a method is provided to attach flight identification data from ACARS signals to real time SSR data from Mode S transponders. Aircraft Mode S addresses are decoded and then converted to aircraft registration numbers using an algorithm or lookup table. Registration numbers are then correlated with registration numbers from decoded ACARS signals. The result is a real-time system which may provide an aircraft's registration information, including registration number, owner, make, and model, as well as its current flight identification number, and ACARS messages. As part of an aircraft multilateration system, the system provides an independent air traffic control picture complete with aircraft position and identification by flight number without the use of active radar equipment. [A1316]

"Linearizing device for a frequency-modulation ramp and its application to a radio altimeter"

The invention relates to a device for the linearization of a frequency modulation ramp comprising a voltage controlled oscillator associated with a phase locked-loop. The device comprises a digitally controlled oscillator of which only the most heavily weighted bit is used, and a digital phase comparator receiving, on the one hand, said most heavily weighted bit and, on the other hand, a signal supplied by the voltage controlled oscillator. Application to very high linearity and very high accuracy radio altimeters. [A1317]

"Method to generate a three-dimensional image of a ground area using a SAR radar"

The present invention relates to a method for generating a three-dimensional image of a ground area by means of a radar with a synthetic aperture, a SAR radar, which is supported by a platform moving in an essentially rectilinear manner. The method is characterized by the following steps. Advancing the platform such that at least two images of the ground are created with great difference in the angle of illumination. Transmitting radar pulses with a fractional bandwidth which is larger than or equal to 0.1, and using in the computations an aperture angle which is larger than or equal to 0.1 radians. Detecting the reflected radar pulses with amplitude and phase. for each pulse, measuring and storing the position of the antenna that transmits and the antenna that receives the pulse. Computing a two-dimensional SAR signal per synthetic aperture. Starting from the amplitude and phase of the two SAR signals as well as position data for the antennae, reconstructing a three-dimensional position description of the area relative to antenna position data. [A1318]

"Consistent combination of altimeter data from multiple satellites"

A method and apparatus are provided to allow altimeter data sets from multiple altimeter satellites to be used together. The measurable portion of geographically correlated orbit error (GCOE) is removed from the altimeter data sets, thereby allowing the data sets to be combined consistently. The GCOE structure for a reference data set is estimated through crossover difference analysis. The unmeasurable portion of the GCOE is not removed, although the spatial structure of this portion is determined. A reference mean sea level (SL) is corrected for the measurable GCOE and is then used as a reference surface for estimating the GCOE structure for an independent altimeter data set. This is performed by examining crossover differences between the altimeter mean SL and the reference mean SL at the multimission crossover points. The change in sea surface height (SSH) between the input data set and the reference data set is determined. The SSH change allows data sets from different altimeter satellites to be used together. [A1319]

"Aerial work platform with pothole and/or obstacle detection and avoidance system"

The aerial work platform including a pothole and/or obstacle avoidance system according to the present invention includes a non-contact distance measuring device mounted to an end of the aerial work platform chassis. The non-contact distance measuring device measures a distance to the ground along a predetermined angle, and generates a first signal based on the measured distance. In response to the output of the non-contact distance measuring device, a motor controller and/or brake controller of the aerial work platform control operation of a motor and/or brakes, respectively, to assist an operator of the aerial work platform in avoiding potholes and/or obstacles. [A1320]

"Six-degree of freedom tracking system having a passive transponder on the object being tracked"

This invention discloses a system for tracking one or more objects (22) within a region of interest, including at least one electromagnetic field generator (20) , fixed with respect to an external frame of reference, at least one passive transponder (30) , fixed to an object (22) being tracked, wherein an electromagnetic field generated by the electromagnetic field generator (20) causes the transponder (30) to generate electromagnetic signals and at least one electromagnetic sensor (24) , fixed with respect to the external frame of reference, which receives electromagnetic signals generated by the transponder (30) and determines the three-dimensional position and three-axis rotational orientation of the object (20) using these signals. A method of tracking translation and rotation of one or more objects within a region of interest is also disclosed. [A1321]

"Method and system for determining a position of a transceiver unit utilizing two-way ranging in a polystatic satellite configuration"

A method and system for determining a position of an object utilizes two-way ranging and polystatic techniques. A first communication transceiver at a first known location provides a bidirectional communication path between the first communication transceiver and the object wherein the first communication transceiver transmits a first ranging signal to the object and the object transmits a second ranging signal to the first communication transceiver in response to the first ranging signal. The first communication transceiver further provides a first unidirectional communication path between the first communication transceiver and the object wherein the first communication transceiver performs one of transmitting a third ranging signal to the object and receiving a fourth ranging signal from the object. A second communication transceiver at a second known location provides a second unidirectional communication path between the second communication transceiver and the object wherein the second communication transceiver performs one of transmitting a third ranging signal to the object and receiving a fourth ranging signal from the object. A signal processor determines a first path length corresponding to a first time length of the bidirectional communication path, a second path length corresponding to a second time length of the first and second unidirectional communication paths, and the position of the object based on the first and second known locations and the first and second path lengths. [A1322]

"Icing hazard avoidance system and method using dual-polarization airborne radar"

An icing hazard avoidance system and method utilizes a forward-looking, single frequency, dual-polarization pulse radar system as well as temperature sensing means to determine if supercooled liquid water (SLW) drops are present in an aircraft's flight path. A processor determines the ratio of co-polarized and cross-polarized returns. This ratio and the temperature of the atmosphere indicate if SLW drops exists. If an icing hazard is determined, an indicator in the cockpit of the aircraft alerts pilots so that avoidance measures may be taken. [A1323]

"Location of aircraft with time difference of arrival"

A system and method for determining the position of an aircraft. An aircraft signal is received by a first antenna and a second antenna, the first antenna being at a known baseline distance from the second antenna. A processor is used to calculate the time difference of arrival range between the second antenna and the aircraft using a common time reference signal. The position of the aircraft is determined by a position determinator based upon the baseline distance between the first and second antennas, the range between the first antenna and the aircraft, and the time difference of arrival range between the second antenna and the aircraft. [A1324]

"DME system with broadcasting function"

Frequency resources of a DME/TACAN band specified for the aircraft band are effectively utilized, and a GPS reinforcing data is overlapped onto distance information to be broadcast. A header is added to a DGPS reinforcing data, and the transmitting pulse level of a conventional ground DME system is modulated, and the data is broadcast to an airborne system. In the airborne system, a threshold value of "1" and "0" is generated by a level detecting device (5) , and the start point of the data is detected by a header detecting device (6) , and the reinforcing data is supplied to the airborne system. Consequently, the function of broadcasting a data by overlapping the data onto the distance information of the DME is achieved. Since the DME uses the L band, the radio interference with the existing ILS, VOR, aircraft radio transmission, and broadcasting station can be avoided. [A1325]

"Precision radar altimeter with terrain feature coordinate location capability"

A radar altimeter for determining altitude of an air vehicle comprises a transmitter for transmitting radar signals toward the ground. A first and a second antenna receive reflected radar signals from the ground. A signal processor is coupled to the first and the second antennas. The signal processor includes filter means for rejecting signals other than signals reflected from a selected ground swath. The signal processor determines the above ground level altitude of the air vehicle based on the radar signals output from the filter means. A phase ambiguity resolution means resolves phase ambiguities that arise due to multiple wavelength separation of the first and the second antenna. The signal processor also determines the horizontal position of the highest point in the selected ground swath. In a preferred embodiment, the phase ambiguity resolution means comprises a third antenna spaced closely to the first antenna such that there are no phase ambiguities between the reflected radar signals received by the third antenna and the first antenna. [A1326]

"Radar for space-borne use"

Faraday Rotation causes rotation of the plane of polarization of plane polarised radiation emitted by a radar e.g. a synthetic aperture radar and, if returns polarized in orthogonal planes are measured at the synthetic aperture radar in order to determine polarimetric characteristics of the ground, which could show up features of the ground such as crop patterns, the measurements made at the SAR are contaminated by the Faraday Rotation. In the invention, the transmitted plane polarized beam is pre-rotated in transmitter 9, the radar returns in receiver 13 are mathematically adjusted in signal formatting 14, 15 to compensate for just the pre-rotated angle, to produce data streams on downlink 16 uncontaminated by the Faraday Rotation. The Faraday Rotation may be estimated by external means 11, 12, or by performing correlation 10 of the orthogonally polarized radar returns to establish a minimum, while the pre-rotation angle and mathematical correction of the returns are being iteratively adjusted, at which Faraday Rotation is assumed to be compensated. [A1327]

"Ground based millimeter wave imaging system"

System and methods for a ground based millimeter wave imaging system that provides real-time millimeter wave images of an airport to one or more aircraft from one or more ground stations (18) . The system includes at least one millimeter wave transceiver (19) that is located in each one or more ground stations. Each at least one millimeter wave transceiver collects real-time millimeter wave images of the airport. At least one image processor (21) is operatively connected to the at least one millimeter wave transceiver, and processes the real-time millimeter wave images of the airport. At least one data link (22) allows communication of information between the one or more aircraft and the one or more ground station. The one or more ground stations transmit the processed realtime millimeter wave images to the one or more aircraft using the at least one link. [A1328]

"Automatic airport information transmitting apparatus"

There is provided an automatic airport information transmitting apparatus comprising: airport-inside-target detecting means for detecting a target inside an airport, target judging means for judging a target moved in a place within the airport, which is required to surveille an aircraft based upon target position information derived from the airport-inside-target detecting means, and transmitting means for transmitting information of the target inside the airport judged by the target judging means to an aircraft which is flying around the airport in a wireless manner. In a relatively small-scaled airport where no controller is present, the automatic airport information transmitting apparatus improves a flight security of aircraft which are flying around the airport and are landing at this airport. [A1329]

"High accuracy, high integrity scene mapped navigation"

An aircraft including an approach and landing system, including a navigation unit for providing navigation information, a weather radar unit for providing radar information, a processor which receives navigation information from the navigation unit and information from the weather radar unit, the processor unit providing an output representing information concerning the aircraft in accordance with the provided navigation information and radar information, a memory for storing information representing a scene, the processor unit correlating the stored scene information with the output representing information concerning the aircraft to provide a mapped scene, a display unit for displaying the output of said processor and the mapped scene, and a steppable frequency oscillator for providing a signal which is stepped in frequency to the weather radar unit, thereby providing an increased range resolution. [A1330]

"Passive SSR system"

A reply is received from aircrafts for calibration in response to an interrogation of SSR stations to detect transmission timing of the interrogation of the SSR stations and directly-facing timing of antennas of the SSR stations and thus detect a position of an arbitrary aircraft based on the transmission timing and directly-facing timing and the reply from the aircraft. [A1331]

"Anti-two block device using non-contract measuring and detecting devices"

In the anti-two block device, a non-contact measuring device detects in one form or another the distance between a boom nose and a load-bearing member supported thereby. If the distance detected is less than a predetermined threshold value, the device triggers a warning or other operation to assist an operator in preventing anti-two blocking. [A1332]

"Method and system for determining a position of a transceiver unit utilizing two-way ranging in a polystatic satellite configuration including a ground radar"

A method and system for determining the position of an object, such as an aircraft, utilizes two-way ranging with a polystatic satellite configuration and ground radar. A ground transceiver at a first known location provides a bidirectional communication path between the ground transceiver and the object wherein the ground transceiver transmits a first ranging signal to the object and the object transmits a second ranging signal to the ground transceiver in response to the first ranging signal. A first communication transceiver at a second known location provides a first unidirectional communication path between the first communication transceiver and the object wherein the first communication transceiver performs one of transmitting a third ranging signal to the object and receiving a third ranging signal from the object in response to the first ranging signal. A second communication transceiver at a third known location for providing a second unidirectional communication path between the second communication transceiver and the object wherein the second communication transceiver performs one of transmitting a fourth ranging signal to the object and receiving a fourth ranging signal from the object in response to the first ranging signal. A signal processor determines a first, second and third path length, and determines the position of the object based on the first, second and third known locations and the first, second and third path lengths. [A1333]

"Method for determining storm predictability"

A method and apparatus for determining the predictability of an element in a weather radar image. An image filter approximating the envelope of the organized storm radar image is applied to a pixel in a received weather radar image to generate a processed pixel value. A variability value is determined from the variation in the pixel values of the neighboring pixels which lie within the image filter. The predictability is generated from the processed pixel value and the variability. Pixels having high processed pixel values and low variabilities typically correspond to pixels within a strong organized storm and, therefore, are more predictable. Pixels having low processed pixel values and high variabilities, such as pixels representative of airmass storms, generally have lower predictabilities. [A1334]

"A-scan ISAR classification system and method therefor"

A target recognition system and method wherein only target amplitude data, i.e., coherent A-scan data, is interrogated for target recognition. Target aspect angle is ignored within the angular segmentation of the feature library without degrading classification performance. Observed signature characteristics are collected at various aspect angles and through unknown and arbitrary roll, pitch and yaw motions of each anticipated target and provided to a neural network as training sets. The neural network forms feature vectors for each target class which are useful for valid classification comparisons in all sea states, especially in calm and littoral waters. These feature vectors are useful for valid classification comparisons over at least 30 degrees of target aspect angle. [A1335]

"SSR station and aircraft secondary surveillance network"

An SSR reply, which is sent out from an aircraft, is received and separated into one SSR reply to one SSR station and the other SSR reply to the other SSR station, thereby generating aircraft information of the aircraft based on one of the one SSR reply and the other SSR reply. [A1336]

"Cepstral method and system for detecting/classifying objects from air-based or space-based images"

A system and method for detecting and/or classifying an obscured discrete cultural object and/or an obscured replicated object using image data from an optical, infrared or synthetic aperture radar imaging system is disclosed. Generally, the method and system of the present invention are directed to performing a cepstral analysis on the image data to attentuate the corruption signal in the image data and/or to enhance the discrete cultural object signal and/or the replicated object signature, and displaying an output of the cepstral analysis in the pixel and/or the spatial quefrency domain to detect and/or classify the discrete cultural object and/or the replicated object. [A1337]

"Apparatus and method for downhole well equipment and process management, identification, and actuation"

A method for actuating or installing downhole equipment in a wellbore employs non-acoustic signals (e.g., radio frequency signals) to locate, inventory, install, or actuate one downhole structure in relation to another downhole structure. The method comprises the steps of: (a) providing a first downhole structure that comprises a non-acoustic (e.g., radio frequency) identification transmitter unit that stores an identification code and transmits a signal corresponding to the identification code, (b) providing a second downhole structure that comprises a non-acoustic receiver unit that can receive the signal transmitted by the non-acoustic identification transmitter unit, decode the signal to determine the identification code corresponding thereto, and compare the identification code to a preset target identification code, wherein one of the first downhole structure and the second downhole structure is secured at a given location in a subterranean wellbore, and the other is movable in the wellbore, (c) placing the second downhole structure in close enough proximity to the first downhole structure so that the non-acoustic receiver unit can receive the signal transmitted by the non-acoustic identification transmitter unit, (d) comparing the identification code determined by the non-acoustic receiver unit to the target identification code, and (e) if the determined identification code matches the target identification code, actuating or installing one of the first downhole structure or second downhole structure in physical proximity to the other. [A1338]

"System for processing directional signals"

A system for calculating the bearing of a signal source, with a directional antenna, provides corrections for distortion, such as due to a small fuselage of the monitoring aircraft and the elevation angle of an intruder aircraft with respect to the monitoring aircraft. A correction is applied to the bearing estimate that is based on relevant factors, such as the fuselage size and the elevation angle of the intruder aircraft. The correction can be calculated or applied through the use of a look-up table, which may be either pre-selected or selected after calculation of the elevation angle of the intruder aircraft. [A1339]

"Path planning, terrain avoidance and situation awareness system for general aviation"

A number of navigation functions are performed on terrain navigation space. One function is to define a dynamic dangerous zone based on flight altitude by locating and aggregating, a set of nodes of terrain height over a minimum flight altitude. Algorithms such as collision check, mountainous area boundary and region growing technique are developed as basic operations for this terrain model. In addition a visibility graph approach for dynamic route selection may adapted to reduce the real-time computational requirements. This approach reduces the size of the search space by establishing a partial visibility graph of terrain and avoids details of the terrain, which do not influence the choice of flight path, independent of the size of the navigation space. By exploiting the multiple and variable resolution properties of Oct-tree terrain models, a series of CFIT warning functions using terrain data as reference are implemented efficiently with existing-on-board terrain data resources. [A1340]

"Transponder having directional antennas"

A method and apparatus for transmitting a directional reply signals in response to Air Traffic Control Radar Beacon System and Mode Select signals interrogation signals. Two directional antennas independently acquire an interrogation signal and are connected by means of a configurable switch to a transponder. The antennas may include multiple directional antenna elements. [A1341]

"Coded phase modulation communications system"

A coded phase modulation communications system which relates to communications systems in which undesired detectability of the radiated signal is materially reduced, and wherein the vulnerability of the system to interfering signals, such as, intentional jamming signals, is substantially reduced. In the system, a radio frequency communications signal is phase modulated by a random or random appearing, but repeatable pattern of noise signal. The received signal is modulated by an identical noise signal, which when synchronized with the original noise modulation results in erasing the noise, and thereby recreating the original, continuous, communications signal. The noise source of the system is a pseudo noise generator that may be readily synchronized with an identical noise source or sources. The pseudo noise generator provides an apparently orderless noise-like sequence that may be exactly reproduced at the same or at a remote location or locations. [A1342]

"Method of optimizing the coverage area of a sensor"

A method is provided of optimizing, within an area which itself contains a number of part areas, the coverage of a sensor which has an angle-dependent range in a least one plane, and which sensor is in addition arranged on a mobile platform. The method includes determining at least two movement directions for the sensor platform, determining a center of movement for the two movement directions, and also determining periods of time during which the sensor platform is to move in each of the two movement directions. The center of movement of the platform is preferably located within the search area. [A1343]

"Remotely triggered collision avoidance strobe system"

Disclosed is an aircraft collision avoidance system having remote triggering means, multicolored lamp display, audible alarm, and a stroboscopic light for providing adequate early warning to an aircraft tug operator and other surrounding individuals that a possible emergency situation may exist. The system comprises four assemblies: (1.) a portable unit, (2.) a tug unit, (3.) a station unit, and, (4.) one or more hand wand transmitters. The station unit comprises a strobe light mounted to a building or gate and is positioned so as to be visible by a tug operator and flightcrew. The tug unit comprises an audible alarm mounted within the tug vehicle which is audible to the tug operator when triggered and a highly visible strobe light. The portable unit comprises an audible alarm that sounds when triggered and a highly visible strobe light. The portable unit may be utilized in place of the tug unit or may be utilized in conjunction with the tug unit at other positions, depending on the degree of warning needed. Each watch person carries a hand wand transmitter which he manually activates in case of impending collision or other emergency. The hand wand transmitter generates a radio frequency signal that is detected by a receiving circuitry contained within the portable unit, the tug unit and the station unit, thereby activating the respective alarming systems of each unit to warn the tug operator and others that an emergency situation exists and that all movement should cease. [A1344]

"Method and apparatus for using statistical data processing in altimeter and terrain awareness integrity monitoring systems"

A baro altitude and terrain warning system with an integrity monitoring function which uses a radar altimeter to generate instantaneous altitude signals used to confirm the validity of a baro altitude signal, generated by a baro altimeter and an expected terrain clearance signal, provided by the terrain warning system, and for generating an alert when insufficient correlation exists between such signals. [A1345]

"Wire detection system and method"

A system for wire detection comprising a transmitter for transmitting multi-polarity waves, means for receiving waves reflected off target and means for analyzing the polarization of the reflected waves to detect linearly polarized echoes characteristic of wires and to issue a warning indicative of the presence of a wire. The wavelength of the transmitted waves is larger than the diameter of the wires to be detected. A method for wire detection comprising the following steps, for each of a plurality of angles U between 0 and 180 degrees: a. Transmit pulses of electromagnetic waves having a linear polarization at an angle U to horizontal, b. Receive echoes at the same polarization angle U, c. Prepare a map M (U, R) with the magnitude of the received echo for each angle U and each ground cell at range R. [A1346]

"Target type estimation in target tracking"

The present invention is in general related to target type estimation in target tracking systems. The invention enables a low complexity estimation of target type, using, e.g. ESM sensor data, by the introduction of an ambiguity restoring procedure in certain likelihood calculations. The invention further enables the systematic use of target type probability information in the calculation of strobe track crosses and their associated quality which is particularly useful for deghosting purposes. Methods for utilisation of target type probability information in the processes of strobe tracking, association, track quality evaluation and multiple hypothesis tracking are also disclosed. [A1347]

"Midair collision and avoidance system (MCAS)"

A midair collision avoidance system (MCAS) employs an existing design of Traffic Alert and Collision Avoidance System (TCAS) as a module and seamlessly integrates it with a customized tactical module which is capable of providing unique tactical avoidance guidance control and display. The tactical module handles all phases of a tactical mission, including formation flight (e.g., formation fall-in, arming formation flight, engaging formation flight following, and formation break-away) , and an air-refueling sequence (e.g., rendezvous, link-up, re-fueling, and disengaging air-refueling) . The tactical module divides the air space around the aircraft into advisory, caution, and warning zones and for each provides display, tone and voice alerts to facilitate pop-up avoidance guidance commands. Military aircraft can thus effectively avoid mid air and near mid air collision situations in all three different operation modes: air traffic control (ATC) management mode, tactical mode, and a mixed mode. [A1348]

"Radome polarization error compensation"

Disclosed is a method and apparatus for improving airborne vehicle tracking and guidance systems by reducing boresight error induced by polarization of the RF energy impinging on the vehicle radome. The radome wall is formed with a taper which gradually increases from the base near the vehicle antenna to the tip according to a disclosed formula which accounts for frequency, incidence angle, look angle, and the dielectric constant of the radome material. This taper of the radome minimizes the crossplane boresight error component magnitude which is polarization sensitive and produces a polarization insensitive inplane boresight error component. Also disclosed is a method of electronically compensating such radomes for boresight error where the radome boresight error data accumulated during testing is digitized and processed for compensating data in the vehicle electronic system to provide compensated tracking data for the vehicle guidance system. [A1349]

"Method and apparatus for improving performance of aircraft display utilizing TCAS computer and mode S transponder"

An improved TCAS indicating system and method for displaying information from the MODE S TRANSPONDER or other subsystem, directly to the TCAS DISPLAY by coding the information and programming the TCAS COMPUTER and the MODE S TRANSPONDER to pass the coded information through to the TCAS DISPLAY. [A1350]

"Midair collision avoidance system"

A midair collision avoidance system (MCAS) employs an existing design of Traffic Alert and Collision Avoidance System (TCAS) as a module and seamlessly integrates it with a customized tactical module which is capable of providing unique tactical avoidance guidance control and display. The tactical module handles all phases of a tactical mission, including formation flight (e.g., formation fall-in, arming formation flight, engaging formation flight following, and formation break-away) , and an air-refueling sequence (e.g., rendezvous, linkup, re-fueling, and disengaging air-refueling) . The tactical module divides the air space around the aircraft into advisory, caution, and warning zones and for each provides display, tone and voice alerts to facilitate pop-up avoidance guidance commands. Military aircraft can thus effectively avoid mid air and near mid air collision situations in all three different operation modes: air traffic control (ATC) management mode, tactical mode, and a mixed mode. [A1351]

"Target acquisition system and radon transform based method for target azimuth aspect estimation"

A Radon transform based method that provides for target azimuth aspect estimation and target shape measurement. A Radon transform is applied to a binary (N.times.N pixels) target chip to extract target features that are then used to measure length, width, and diagonal features of the target. In parallel, these features are used to estimate the azimuth aspect angle, or size, of the target. The method is effective in discriminating targets from clutter. The method is also very time efficient and highly flexible in its operation because the features can automatically account for any target rotation or shift. The present invention also provides for a target acquisition system that employs the Radon transform based method for target azimuth aspect estimation. [A1352]

"Method and apparatus of automatically monitoring aircraft altitude"

An apparatus and method for automatically and independently determining aircraft altitude and alerting the pilot to deviations from a target altitude exceeding a specified tolerance. The alerter comprises an altitude sensing means for sensing the present altitude of the aircraft. The invention discloses three sources for altitude information namely, a self-contined sensor such as a pressure transducer, a Global Positioning System receive, or an altitude encoder. A target entry means is used for entering the target altitude. An indicating means signals an altitude alerting condition upon the detection of a condition wherein the absolute difference is larger than the tolerance value. The altitude alerting apparatus may also comprise a display means for display of the present aircraft altitude information. [A1353]

"Passive altimeter employing GPS signals"

A passive radio frequency signal-enabled aircraft altimeter employing signals of one or more global position system satellites as a source of terrain illumination. The altimeter determines altitude of the host aircraft with respect to specific terrain features beneath the aircraft rather than an altitude above a mean or nominal level of the earth's surface--as is already provided in a global position system signal. The altimeter employs two signal paths between the global position system satellite and the host aircraft, one direct signal path and one earth-reflected signal path, together with elementary geometric/trigonometric relationships, involving length difference in these paths and signal angle of arrival, in determining aircraft altitude. Equal angles of satellite signal incidence and reflection at the point of satellite signal reflection from the earth is an enabling principle in the altimeter. [A1354]

"Degasser guide"

Radar is used to measure not only the level of slag on molten steel but also its thickness, the measurement is used to calculate the volume of slag, and, in turn the amount of additives for slag treatment. Time-of-flight data are used to identify peaks representing the distances of the surfaces of the slag and the surface of the underlying steel. The concept is applicable to other materials of differing composition, and particularly where the underlying material is relatively more conductive than the overlying material. Degassing is more efficiently practiced by using the radar slag thickness determinations to assist in vertical placement of snorkels. [A1355]

"Method of characterization of an overflown ground from a FM/CW radio altimeter signal"

The invention proposes a novel method for using the signals provided by an airborne FM/CW radio altimeter, allowing to perform an analysis of the ground overflown by an aircraft for the purpose of, for example, identifying it, or alternatively of recognizing it. The method of the invention consists in analyzing, in the frequency domain, the shape of the spectrum of the beat signal generated by said radio altimeter to characterize said ground so as to extract from it information relating to the reflectivity of said ground. [A1356]

"Method for range alignment and rotation correction of a high resolution image in an inverse synthetic aperture radar system"

A method for range alignment and rotation correction of a high resolution image in an inverse synthetic aperture radar (ISAR) system is provided that includes an ISAR image generator (14) . The ISAR image generator (14) receives a full aperture (24) of data samples (20) that is then subdivided into a plurality of subapertures (26) . A coarse image generator (40) generates a coarse image (70) for each subaperture (26) . A composite image generator (42) generates a composite magnitude image (72) and a composite power image (74) from the coarse images (70) . A point select module (44) uses the composite magnitude image (72) and the composite power image (74) to select a set of prominent points (76) . A range alignment module (46) uses the coarse images (70) and the prominent points (76) to determine a range alignment correction for each coarse image (70) . A rotation correction module (48) uses the composite power image (74) and the prominent points (76) to determine a point of rotation and rotational correction for each coarse image. A coarse image correction module (50) applies the range alignment correction and the rotational correction to each coarse image (70) . An autofocus module (52) uses a phase gradient autofocus algorithm to correct phase errors occurring across coarse images (70) . Coarse image combiner (54) combines the set of coarse images (70) into a single higher resolution image (75) . Image formatter (56) generates ISAR image (58) for display on a display device (15) from high resolution image (75) . [A1357]

"Radar-acoustic hybrid detection system for rapid detection and classification of submerged stationary articles"

A region of water is insonifed with a series of pulses. A synthetic apeture radar (SAR) is flown about the region and images the water surface above the sonified area. The radar has a carrier frequency (F.sub.r) the acoustic source has a nominal carrier frequency of F.sub.a. This acoustic frequency F.sub.a is selected such that the acoustic wavelength is nearly, or exactly, half the wavelength of the radar carrier F.sub.r where modified by the Sine of the incident of angle. Also practical are those acoustic wavelengths that are integer multiples of the wavelength that is half the radar wavelength. This arrangement will result in the Bragg condition in portions of the radar image of the water surface. The pulse repetition frequency (PRF) of the radar and the acoustic sources are equal (or can be such that the acoustic PRF is an integer multiple of the radar PRF) , and locked in phase together by a radio frequency link between the SAR and the sonar transmitter. The sonar signal is repeatable and coherent with the radar signal. As a result, the SAR image can be processed, eliminating random surface wave motion, to detect and classify the structures that underlie the water surface. [A1358]

"Anti-collision system"

An anti-collision system is provided to enhance the conspicuousness of an aircraft to a second aircraft presenting a collision threat. When the computer of an airborne Traffic Collision Avoidance System (TCAS) designates a second proximately located aircraft as a collision threat a traffic advisory is issued. A light controller responds to a traffic advisory signal from the TCAS computer by illuminating one or more of the aircraft's external lighting systems. TCAS II systems can also issue resolution advisory when the intruder poses a more immediate threat. A resolution advisory signal from the TCAS computer can be used to alter the lighting systems being activated or the rate of flashing to make the aircraft more noticeable. Alternating illuminating and obscuring of landing lights, taxi lights, deicing lights, strobe lights or rudder illumination lights enhances the conspicuousness of the aircraft to the crew of a second aircraft seeking to avoid a collision. [A1359]

"Obstacle detection system for low-flying airborne craft"

Obstacle warning system for low-flying airborne craft in which case the edge contours of the obstacles are visualized for the pilot in a display. [A1360]

"Integrity monitor for TCAS mutual suppression"

An integrity monitor for TCAS mutual suppression checks the interface circuits and cabling of the suppression system that lies between the TCAS processor and the transponder. The monitor starts by interrogating the transponder while disabling suppression. If no reply is received, the transponder is not functional. If a reply is received, interrogation of the transponder occurs again, however, this time suppression is enabled. If a reply is received, the suppression system has failed and TCAS alarms will be inhibited. If a reply is not received, the suppression system is working. [A1361]

"UWB dual tunnel diode detector for object detection, measurement, or avoidance"

A highly sensitive, high-speed dual tunnel diode detector is described for use in Ultra Wideband (UWB) object detection systems, such as a radar. The extended capability of the detector to both extremely short (sub-foot) and long distance (tens of thousands of feet) ranges is unique and permits the application of low power UWB radar to a wide variety of applications including high resolution radar altimetry at altitudes exceeding 10,000 feet and for autonomous on-deck landing operations (e.g., one-foot altitudes) , the detection of extremely low radar cross section (RCS) targets for such applications as suspended wire detection for helicopters and other manned and unmanned craft, etc. High noise and interference immunity of the detector permits co-location of a UWB radar sensor with other active systems. The invention has immediate and significant application to all areas, both military and commercial, of precision distance measurement, intrusion detection, targeting, etc. over a wide range of distances. [A1362]

"Efficient data association with multivariate Gaussian distributed states"

We describe an efficient algorithm for evaluating the (weighted bipartite graph of) associations between two sets of data with gaussian error, e.g., between a set of measured state vectors and a set of estimated state vectors. First a general method is developed for determining, from the covariance matrix, minimal d-dimensional error ellipsoids for the state vectors which always overlap when a gating criterion is satisfied. Circumscribing boxes, or d-ranges, for the data ellipsoids are then found and whenever they overlap the association probability is computed. for efficiently determining the intersections of the d-ranges a multidimensional search tree method is used to reduce the overall scaling of the evaluation of associations. Very few associations that lie outside the predetermined error threshold or gate are evaluated. Empirical testing for variously distributed data in both three and eight dimensions indicate that the scaling is significantly reduced from N.sup.2, where N is the size of the data set. Computational loads for many large scale (N>,10-100) data association tasks may therefore be significantly reduced by this or related methods. [A1363]

"Method and apparatus for implementing automatic tilt control of a radar antenna on an aircraft"

A method and apparatus for automatically controlling the tilt of a radar antenna to avoid ground clutter returns while scanning the weather formations of most interest. In one embodiment a terrain database is utilized to determine tilt angles for different terrain cells. The tilt angle is determined starting at the aircraft position and working out to the radar range. If a tilt angle for a more distant cell is less than for a nearer cell it is ignored taking shadowing into account. In another embodiment the weighted tilt angle frequencies are entered into a histogram and the histogram is scanned to obtain a tilt angle resulting in an acceptable amount of ground clutter. [A1364]

"Aircraft position validation using radar and digital terrain elevation database"

A radar gathers terrain data which is compared to a stored terrain data base using a test statistic. The test statistic can be used to validate the terrain data base information and/or the aircraft position data. [A1365]

"Passive three dimensional track of non-cooperative targets through opportunistic use of global positioning system (GPS) and GLONASS signals"

A method and apparatus for utilization of GPS, GLONASS or other existing RF signals is disclosed. These existing RF signals are scattered by targets, with a receiver of these scattered signals providing processing to extract three dimensional track of these objects. Angle-of-Arrival (AOA) information of a received signal may be used, but is not required. Modifications of standard GPS signal processing allows observables such as range-sum, range-difference, and bistatic Doppler frequency to be observed. These observables, when coupled with standard bistatic/multistatic location equations, provide unambiguous and even redundant information on target coordinates. The method/device employs a modified code (range) /carrier (Doppler) search routine for initial target search/acquisition, wherein a direct path signal is used as a reference from which chip delay and Doppler shift excursions are examined. In this manner, the range and Doppler components observed will correspond to [range-sum-direct path] range, and true bistatic target Doppler irrespective of the satellite or receiver induced Doppler shifts. [A1366]

"Method of and apparatus for determining the relative weight and weapon class of battlefield projectiles insensitive to errors in meteorological data and radar measurements"

The application measures a projectile velocity and an acceleration from radar track data. The air temperature and an air pressure are measured. The measured air temperature and the measured air pressure are extrapolated to the projectile's location for each instant in time a radar measurement made by the radar. The projectile's drag parameter is estimated at each time in the projectile's flight that the projectile's velocity and acceleration are estimated. The projectile's Mach number is estimated at each time in the projectile's flight. The drag coefficient is estimated. A functionally normalized drag parameter (FNDP) is formed. The FNDP is defined as the ratio of drag parameter of a reference projectile at each Mach number the drag is measured to the in-flight projectile's drag parameter at the corresponding Mach numbers. A weighted average of the resulting FNDP values is performed with respect to Mach number. The most likely of three regions the FNDP parameter lies is statistically determined. The relative weight of the in-flight projectile is inferred as one of light, medium or heavy based on the most likely of the three regions. [A1367]

"Method of processing spotlight SAR raw data"

For two-dimensional processing of spotlight SAR data into exact image data, the spotlight SAR raw data are divided into azimuth sub-apertures and transformed into the range-time/azimuth-frequency domain through short azimuth FFTs. The obtained data are multiplied by a frequency-scaling function H.sub.f (f.sub.a, t.sub.r , r.sub.0) and transformed into the two-dimensional frequency domain through short range FFTs, multiplied by an RV-phase-correction function H.sub.RVP (f.sub.r) and subsequently transformed back into the range time/azimuth-frequency domain through short range IFFTs. The data formed in this manner are multiplied by the inverse frequency-scaling function H.sub.g (f.sub.a, f.sub.r) , then transformed back into the two-dimensional frequency domain, multiplied by the phase-correction function H.sub.korr (f.sub.a, f.sub.r) and the azimuth-scaling function H.sub.a (f.sub.a, f.sub.r) , and transformed back into the range-frequency/azimuth-time domain through short azimuth FFTS. Then the azimuth sub-apertures are re-assembled, multiplied by a de-ramping function H.sub.der (t.sub.a) and transformed into the two-dimensional frequency domain through long azimuth FFTs. [A1368]

"System and method for measurement"

A method and a system for determining an altitude of an object of interest, for example, an airplane that transmits electromagnetic radiation in the form of radar signals. A number of sub-units that can detect the radar signals are spread out in an area, preferably in a large geographical area, where the radar signals of the airplane/object it is possible to detect. The sub-units communicate to the information center when they are able to detect the radar signals. The information center determines the altitude of the airplane based on the airplanes line of sight, i.e., its radar horizon, and thus which sub-units can detect the radar signals. [A1369]

"Multifunction aircraft transponder"

A combined airborne Air Traffic Control Radar Beacon System/Mode-Select (ATCRBS/Mode-S) surveillance system and Traffic Alert and Collision Avoidance (TCAS) collision avoidance system device having common antennas and a switch coupling the common antennas to the relevant functions. [A1370]

"Landing area obstacle detection radar system"

An aircraft including an approach and landing system, including a navigation unit for providing navigation information, a weather radar unit for providing radar information, a processor which receives navigation information from the navigation unit and information from the weather radar unit, the processor unit providing an output representing information concerning the aircraft in accordance with the provided navigation information and radar information, a memory for storing information representing a scene, the processor unit correlating the stored scene information with the output representing information concerning the aircraft to provide a mapped scene, a display unit for displaying the output of said processor and the mapped scene, and a steppable frequency oscillator for providing a signal which is stepped in frequency to the weather radar unit, thereby providing an increased range resolution. [A1371]

"Apparatus for and method of determining positional information for an object"

Apparatus for determining positional information for an object transmits a probe signal towards the object. The probe signal as returned by the object is received at a plurality of spaced apart locations. The relative timing of the returned probe signals as received at the plurality of locations is detected, whereby positional information for the object can be determined. A number of realizations of the invention are disclosed. [A1372]

"Terrain correlation system"

A terrain correlation system for use in conjunction with an inertial navigation system of a vehicle is provided which can update position information and which is both independent of altitude and compatible with varying course paths. In the preferred embodiment, reference terrain altitude maps are converted to reference map transformation values. The reference map transformation values are used in conjunction with a terrain correlation process to establish vehicle position. The system also is able to select reference map scenes to the left, right, front or rear of present vehicle position so that curved travel paths can be updated in a manner similar to more conventional straight line vehicle paths. [A1373]

"Method and system for creating an approach to a position on the ground from a location above the ground"

A method and system for creating a precision approach for an aircraft to a position on the ground from a location above the ground is disclosed. The system comprises a display unit onboard the aircraft that displays a digital moving map, a database onboard the aircraft that contains digital terrain elevation data and obstacle data, a global positioning receiver that identifies the in flight position of the aircraft and an input device use to select the position on the ground displayed on the digital moving map. A processor that is also onboard the aircraft is communicably linked to the display unit, the database and the global positioning receiver. The processor generates the digital moving map on the display unit from the digital terrain elevation data and obstacle data and creates an approach derived from global positioning system data for the aircraft to the position on the ground selected on the digital moving map based upon the in flight position of the aircraft. [A1374]

"Adaptive dwell timing for radar tracking"

In an air traffic control radar system, a processor is described for correlating primary target data received from a target with a target report and a target track, wherein the processor has a search acquisition time that is adapted to the distance of the target from the radar site. The search acquisition time is shorter for more distant targets. The processor can employ a shorter cycle time (time quantum) to establish a correlation between target data and target reports than would otherwise be possible with conventional fixed search acquisition times. The average total dwell time may be reduced while complying with the mandated maximum processing time for more difficult radar reports. [A1375]

"Surface-based passive millimeter-wave landing aid"

A passive millimeter-wave imaging system (10) that includes a millimeter-wave camera (12) positioned at the end of an aircraft landing strip (14) to provide an image (20) of the aircraft (16) approaching the landing strip (14) along a landing glidepath (18) . The camera (12) broadcasts the image (20) of the aircraft (16) approaching the landing strip (14) to the aircraft (16) and to a control tower (24) . With this information, the pilot of the aircraft (16) sees his aircraft's position relative to the glidepath (18) , and can make landing adjustments accordingly. Likewise, the tower personnel can monitor the aircraft landing glidepath (18) to insure that the aircraft (16) maintain a safe distance relative to the ground. In one embodiment, a closed-loop communication is provided between the aircraft (16) and the camera (12) , where the aircraft (16) transmits a signal to the camera (12) that is combined with the image (20) to give the pilot an indication of which aircraft (16) in the image (20) is his aircraft (16) . The coded signal transmitted by the aircraft (16) can also be used to give a range of the aircraft (16) from the landing strip (14) . [A1376]

"Collision avoidance system for use in aircraft"

A collision avoidance system mountable on an aircraft for providing to the pilot of that aircraft an early warning of the presence of another nearby threat aircraft within the surrounding air space. The system operates autonomously from that aircraft and does not require the presence of any matched system on board the threat aircraft. The system includes an omni-directional L-band microwave antenna formed by a dielectric sphere cut into eight equal "orange wedge" sectors covering eight distinct beam patterns. Eight L-band microwave signals are transmitted simultaneously from all eight dielectric sectors to provide a sphere of detection around the aircraft. The sectors also act as receivers for detecting a microwave signal reflected back from the threat aircraft, and indicating means provides information to the pilot regarding the direction, closeness and rate of closure of the threat aircraft. [A1377]

"Radar augmented TCAS"

An improved traffic alert and collision avoidance method and device wherein TCAS data is augmented by higher resolution radar data. By using radar to search out targets, altitude information can be developed for those aircraft not equipped with altitude reporting transponders. The improved accuracy also allows angle/angle perspective display of air traffic and thus provides enhanced situational awareness. [A1378]

"Synthetic aperture radar system and platform position measuring apparatus used in the same"

A synthetic aperture radar system fluctuation compensating apparatus includes a synthetic aperture radar mounted on a flying unit, a data acquiring unit, a position measuring unit and a position determining unit. The data acquiring unit receives a reception data by the synthetic aperture radar. The position measuring unit measures a position of the flying unit to generate a position data. The position determining unit determines a correct position of the flying unit based on the reception data and the position data to generate a compensated position data. [A1379]

"Dual target tracking altimeter"

The apparatus has the capability to detect the distance between an aircraft and the ground and at the same time to the nearest point to the aircraft such as buildings or trees. The apparatus includes an altimeter, determining the nearest point, as well as a device for determining the distance to the second target. [A1380]

"System and method for obtaining precise missile range information for semiactive missile systems"

A system (10) for determining the range between a missile (14) and a target (18) adapted for use with a semi-active missile system. The system (10) includes a first circuit (12) for generating a periodic signal (24) that is periodically frequency modulated. A second circuit (16) determines a closing rate at which the missile 14 is approaching the target 18 via the periodic signal 24. A third circuit (16) determines a value containing information corresponding to the range and the closing rate via the periodic signal. A fourth circuit (16) determines the range from the closing rate and the value. In a specific embodiment, the first circuit (12) includes an illumination system (12) . The illumination system (12) includes a periodically modulated carrier signal generator (32) that generates the periodic signal (24) . The periodically modulated carrier signal generator (32) includes a frequency source, a frequency modulator, and an illumination system computer. The illumination system computer runs software for adjusting the modulation parameters of the frequency modulator. The second, third and fourth circuits (16) are included in a receiver system (16) onboard the missile (14) . The receiver system (16) includes a front receiver located near the front of the missile and a rear receiver located near the rear of the missile (14) . A receiver system computer runs software that implements the fourth circuit (16) . The receiver system (16) includes a local oscillator for providing a reference frequency for the receiver system. The local oscillator derives the reference frequency from the periodic signal provided by the first circuit. In illustrative embodiment, the fourth circuit (16) runs computer software that subtracts the closing rate from the combination of closing rate and range and provides the range in response thereto. [A1381]

"Method for monitoring the earth surface"

The invention relates to a method for monitoring the earth's surface with a moving aircraft using a radar sensor with a synthetic aperture. In order to produce high resolution radar images, the flight parameters of the aircraft are also required. According to the inventive method, key parameters, such as speed and acceleration, are detected in the sight line of the radar sensor from the radio signals received. One of the advantages of the invention is that an inertial navigation system (INS) is no longer required for this purpose. [A1382]

"Three dimensional bistatic imaging radar processing for independent transmitter and receiver flightpaths"

A process for correcting data from a three dimensional bistatic synthetic aperture radar system to eliminate distortions and resolution limitations due to the relative positions and motions of the radar transmitter and receiver with respect to a target. [A1383]

"Automatic storm finding weather radar"

An automatic storm finding weather radar is disclosed that uses a storm finding algorithm to automatically control the weather radar to eliminate manual control. The storm finding algorithm uses the 0.degree. C. isotherm altitude where precipitation is most likely to first occur to calculate an altitude search layer to find storms. The storm finding algorithm calculates the antenna upper and lower tilt angles and the number of scans to search the altitude search layer. A list of useable antenna tilt values is formed to drive the antenna controller. The antenna controller scans the antenna at the lower tilt angle and then moves to the next tilt angle until the search is complete. The search is then repeated using any new data. [A1384]

"Methods and apparatus for annunciation of vehicle operational modes"

A vehicle control system contains a behavior annunciation function for generating a behavior mode output. The behavior mode annunciation system has a vehicle operational parameters database and a vehicle behavior mode database. In particular, the vehicle behavior annunciation system generates a behavior mode output by processing data from the vehicle operational parameters database and the vehicle behavior mode database to generate a behavior mode output. The behavior mode output is then communicated to the vehicle operator in a manner describing the general behavior of the vehicle. [A1385]

"Frequency adjusting arrangement"

A frequency adjusting arrangement is disclosed whereby the frequency of a local oscillator, incorporating an Yttrium-Iron-Garnet filter as the frequency determining element, is controlled to follow a coded waveform having a bandwidth wider than the bandwidth of the circuit in which such filter is used. [A1386]

"Speckle mitigation for coherent detection employing a wide band signal"

Multiple independent spectral measurements of light reflected from a target are produced concurrently by illuminating the target with a train of laser pulses wherein the train of pulses produces a line spectrum within the illuminating signal. A characteristic dimension of the receiving aperture is established based on illuminating wavelength, a cross-sectional dimension of illuminated region of a target, and the range between a target and the receiving aperture or image plane. The characteristic dimension corresponds to the spacing of peaks in a speckle pattern of an image plane. The use of multiple receiving telescopes having the characteristic dimension allows for independent measurements concurrently by each of the receiving telescopes. The train of illuminating pulses is generated by mode-locked operation of the laser for synchronization of sinusoidal components at line frequencies of the pulse train spectrum, and wherein the spacing of the spectral lines is at least a decorrelation frequency. The number of spectral lines preferably equals the number of independent measurements concurrently attainable during reception of the reflected pulse train. Alternatively, the laser frequency may be linearly swept such that the overall bandwidth is equal to the bandwidth encompassed by the line spectrum of the generated pulse. [A1387]

"Apparatus and method for determining wind profiles and for predicting clear air turbulence"

A clear air turbulence (CAT) detection system performs a nested grid modeling algorithm to detect CAT along the flight path of an aircraft. The aircraft stores coarse simulation information and utilizes the information to perform large scale weather modeling over a large grid. On board sensors are utilized to generate observational information to model atmospheric conditions within a smaller grid, nested within the larger grid, and including the flight path of the aircraft. A nowcast predicting turbulence along the flight path in the near future alerts the pilot to the likelihood of encountering clear air turbulence. A data link may be utilized to receive coarse simulation data or observational data from sources external to the aircraft. Additionally, the coarse simulation information may include turbulence forecast data and the observational information is used to refine the turbulence forecast to more accurately predict clear air turbulence along the flight path of the aircraft. [A1388]

"Target locating system and approach guidance system"

The invention comprises a mulli-wave radar system for obtaining first target position information of a flying object by capturing and tracking the flying object from a maximum detection distance, a stereo-camera system for taking over the tracking of the flying object in the vicinity of a landing point by acquiring the first target position information of the flying object from the milli-wave radar system, and obtaining second target position information having higher precision than the first target position information, and a controller for managing the first target position information of the milli-wave radar system and the second target position information of the stereo-camera system, controlling the milli-wave radar system to capture and track the flying object to the vicinity of the landing point, and controlling the stereo-camera system to capture and track the flying object at the time of landing of the flying object. [A1389]

"Reference-based autofocusing method for IFSAR and other applications"

A reference-based autofocusing procedure is particularly suited to existing and future interferometric SAR systems, though the principles are generally applicable to signal processing systems for which there are two partially correlated data sets having relative spectral errors. In an airborne or spaceborne system, the technique only requires some additional steps in the ground processor functions. The invention takes advantage of the fact that in a bistatic system, one antenna phase center both transmits and receives with the usual common-mode cancellation, and can thus be expected to form a reasonably well-focused image. In the second system, with the degraded phase error response, the image provided by the first system is used as a coherent reference to aid the estimation and removal of the relative phase errors between the two. Thus, the methodology uses the initially degraded image pair correlation data to help estimate and remove errors in a way which naturally maximizes the final correlation level obtained. The data may represent an entire image, or a selected subregion or subregions of the whole image to be operated upon. [A1390]

"Airfield hazard automated detection system"

An airfield hazard automated detection device having a radar for scanning the airfield for obstacles and an automated target recognition system, operably connected to the radar, for comparing the images of the scans of the obstacles to images of known potential hazards and for instructing a directed imaging system to verify the potential hazard by scanning the potential hazard and indicating the result. [A1391]

"Moving receive beam method and apparatus for synthetic aperture radar"

A method and apparatus for improving the performance of Synthetic Aperture Radar (SAR) systems by reducing the effect of "edge losses" associated with nonuniform receiver antenna gain. By moving the receiver antenna pattern in synchrony with the apparent motion of the transmitted pulse along the ground, the maximum available receiver antenna gain can be used at all times. Also, the receiver antenna gain for range-ambiguous return signals may be reduced, in some cases, by a large factor. The beam motion can be implemented by real-time adjustment of phase shifters in an electronically-steered phased-array antenna or by electronic switching of feed horns in a reflector antenna system. [A1392]

"Focused narrow beam communication system"

A system for establishing and utilizing a wireless communication system using a lens antenna having a dielectric material lens. The lens focuses output radio frequency (rf) signals into narrow beam rf signals which are directed to a specific receiving communication device. The lens focuses input rf signals onto signal processing equipment. A communication system between two or more communication devices which utilizes a dielectric material lens and signal processing equipment can be used for point-to-point or point-to-multipoint communication. [A1393]

"Preemptive processor for mode S squitter message reception"

A preemptive processor for a tactical collision avoidance system (TCAS) selects mode S squitter messages from closer airplanes on a priority basis. The receiver has a higher sensitivity level to receive squitter messages at greater ranges. The high-level squitter messages preempt the lower-level squitter messages. The preemptive processor can be implemented as part of a application-specific integrated circuit (ASIC) . [A1394]

"TCAS bearing measurement receiver apparatus with phase error compensation method"

A TCAS receiver, including a relative bearing measurement radio receiving apparatus for use with an antenna array having four antennas where each antenna has associated with it, its own receiver capable of demodulating both I and Q components of transmissions from an intruding aircraft. [A1395]

"Measuring the thickness of materials"

Radar is used to measure not only the level of slag on molten steel but also its thickness, the measurement is used to calculate the volume of slag, and, in turn the amount of additives for slag treatment. Time-of-flight data are used to identify peaks representing the distances of the surfaces of the slag and the surface of the underlying steel. The concept is applicable to other materials of differing composition, and particularly where the underlying material is relatively more conductive than the overlying material. [A1396]

"Range dependent time delay target detecting device"

A target detecting device which measures the range to the target and genees a variable d.c. voltage that is a function of the range. The range voltage is then applied to a time delay computer, along with range rate voltage, to permit a time delay computation which is a function of both the distance to the target and the missile-target closing velocity. [A1397]

"Fourier-transform-based adaptive radio interference mitigation"

A signal process is provided for radar interference mitigation in SAR data and to perform several functions. Initially, the algorithm separately removes the average range bias of the I-channel and the Q-channel data. Next, I- and Q-channels are equalized by properly compensating their phase difference and gain imbalance due to either constant or random timing jitters. The current implementation well compensates relative I/Q timing jitters within two sampling time intervals which, for the FOPEN III receiver, are 4 nanoseconds. Graceful performance degradation of the algorithm is expected when timing jitter exceeds two sampling intervals. for example, phase jitter on the order of 5 sampling intervals will be partially but not perfectly corrected. Following the I/Q equalization, adaptive RFI rejection is performed. The FOPEN III data bandwidth may also be reduced 50% with hardly any information loss. The operation is allowed principally because of over-sampling, the FOPEN III A/D rate of 500 MHz exceeds the receiver bandwidth of 200 MHz by more than a factor of 2. [A1398]

"Image synthesizing method using a plurality of reflection radar waves and aircraft image radar apparatus using the method"

The present invention provides a small-size image radar apparatus to be mounted on an aircraft, having a high resolution not only the flying direction but also in the direction vertical to the flying direction. The image radar apparatus comprises a transmission antenna 2, a plurality of independent reception antennas 5.sub.1, 5.sub.2, and a computer 10 for simultaneously executing a two-dimensional phase synthesis. The synthesis result is obtained as a two-dimensional image. [A1399]

"Speed, spin rate, and curve measuring device using multiple sensor types"

A device for measuring a movable object, such as a baseball, football, hockey puck, soccer ball, tennis ball, bowling ball, or a golf ball. Part of the device, called the object unit, is embedded, secured, or attached to the movable object of interest, and consists of an accelerometer network, electronic processor circuit, and a radio transmitter. The other part of the device, called the monitor unit, is held or worn by the user and serves as the user interface for the device. The monitor unit has a radio receiver, a processor, an input keypad, and an output display that shows the various measured motion characteristics of the movable object, such as the distance, time of flight, speed, trajectory height, spin rate, or curve of the movable object, and allows the user to input data to the device. [A1400]

"Large aperture vibration compensated millimeter wave sensor"

A millimeter wave imaging system includes a plurality of millimeter wave radiometer elements disposed in a sparse antenna array integrated into a lower surface of an airborne vehicle. The antenna elements preferably form a cross or T-shaped sparse array. Images are formed using interferometric techniques. Each radiometer element includes a receive antenna coupled to an electronic mirror which provides beam steering. To compensate for deflection of the airborne vehicle, a mechanical deflection measurement system is provided. Additional radiometer elements having transmitter antenna elements may be integrated into the sparse array to provide active illumination to enhance image formation and to operate as target designators. [A1401]

"Scan management and automatic tilt control for airborne radars"

A method for automatically managing the scan and tilt of an airborne radar. [A1402]

"Speed, spin rate, and curve measuring device using magnetic field sensors"

A device for measuring a movable object, such as a baseball, football, hockey puck, soccer ball, tennis ball, bowling ball, or a golf ball. Part of the device, called the object unit, is embedded, secured, or attached to the movable object of interest, and has a spin detection circuit, electronic processor circuit, magnetic field sensor circuit, and a radio transmitter. The other part of the device, called the monitor unit, is held or worn by the user and serves as the user interface for the device. The monitor unit has a radio receiver, a processor, an input keypad, and an output display that shows the various measured motion characteristics of the movable object, such as the time of flight, speed, trajectory height, spin rate, or curve of the movable object, and allows the user to input data to the device. [A1403]

"Infrared transparent radar antenna"

A dual mode missile seeker system utilizing an infrared transparent radar tenna is disclosed. The infrared transparent radar antenna is mounted in front of and on the same axis as the infrared detector within a missile dome. The radar antenna includes spaced apart patches of infrared transparent semiconductor material and a ground plane of the same material deposited on opposite sides of an infrared and microwave transparent dielectric substrate for transmitting and receiving microwave radiation and for shielding the infrared detector array mounted behind. A radome or separate lens redirects incoming infrared radiation so as to pass through the radar antenna and focus on the infrared detector array. [A1404]

"Automatic correction of phase unwrapping errors"

In a phase unwrapping and correction system, phase wrapped data is unwrapped with an unwrapping algorithm to obtain unwrapped image data. The unwrapped image data is further processed to correct the unwrapped image data by dividing the image represented by the unwrapped image data into regions defining boundaries corresponding to inconsistencies in the image data. The regions are then corrected by comparing them with one another and adjusting the multiples of 2.pi. assigned to each region to minimize discontinuities between the regions. [A1405]

"Process for combining multiple passes of interferometric SAR data"

Interferometric synthetic aperture radar (IFSAR) is a promising technology for a wide variety of military and civilian elevation modeling requirements. IFSAR extends traditional two dimensional SAR processing to three dimensions by utilizing the phase difference between two SAR images taken from different elevation positions to determine an angle of arrival for each pixel in the scene. This angle, together with the two-dimensional location information in the traditional SAR image, can be transformed into geographic coordinates if the position and motion parameters of the antennas are known accurately. [A1406]

"Speed, spin rate, and curve measuring device"

A device for measuring a movable object, such as a baseball, football, hockey puck, soccer ball, tennis ball, or a golf ball. Part of the device, called the object unit, is embedded, secured, or attached to the movable object of interest, and consists of an accelerometer network, electronic processor circuit, and a radio transmitter. The other part of the device, called the monitor unit, is held or worn by the user and serves as the user interface for the device. The monitor unit has a radio receiver, a processor, an input keypad, and an output display that shows the various measured motion characteristics of the movable object, such as the distance, time of flight, speed, trajectory height, spin rate, or curve of the movable object, and allows the user to input data to the device. [A1407]

"Method of identifying a target as a friend of foe, and arrangement for executing the method"

The invention relates to a system for identifying targets as a friend or foe, which is operated in the millimeter-wavelength range by means of an interrogator and a transponder, with the interrogator and the transponder having essentially the same electronic assemblies and operating in essentially the same middle transmitting and receiving frequency, and with a large frequency difference between the two being tolerable. The interrogator operates with a directional transmitting/receiving antenna, whereas the transponder possesses an omnidirectional transmitting/receiving antenna. [A1408]

"Terrain awareness system"

A terrain awareness system and method which provides increased warning times to the pilot of an aircraft of a hazardous flight condition while minimizing nuisance warnings. An important aspect of the invention is that the terrain background information as well as the terrain advisory and warning indications may be displayed on a navigational or weather display, normally existing within an aircraft, which reduces the cost of the system and obviates the need for extensive modifications to existing displays, such as a navigational and weather radar type display. [A1409]

"Continuous wave doppler system with suppression of ground clutter"

In a continuous wave Doppler system in which a fixed transmitter transmits a continuous wave signal to be reflected by moving targets and by fixed structure, an aircraft receives the reflective signals at two spaced apart antennas. The signals reflected from moving targets are distinguished from ground clutter reflected from fixed structure by the phase difference between the Doppler signals receive by the two antennas. The signals reflected from moving targets are distinguished from the ground clutter in response to the phase difference between the Doppler signals received by the two antennas being not equal to a phase difference value determined to be the phase difference for clutter signals. The phase difference value for clutter signals is determined from a function expressing the phase difference value as a linear variation with the Doppler frequency of the signals. [A1410]

"Alarm sensor, in particular for a target tracking apparatus"

A pseudo-noise-modulated spread spectrum is irradiated undirectedly--or, encoded by different modulation, into mutually displaced spatial sectors--and the energy (20) received after reflection at a potential target (13) is cross-correlated, using the pseudo-noise code which is predetermined at the transmission end, in order to provide a spherical monitoring effect which is continuous but which cannot be located in respect of its origin, to provide a warning in particular for marine craft, land vehicles and aircraft against an attacking guided missile as the target (13) to be repelled, and in order to be able to transfer to a target tracker (12) distance and speed information obtained from the correlation product, with the alarm signal, if the alarm sensor (11) is not itself also used as the tracking sensor. [A1411]

"Onboard radar apparatus"

The present invention relates to an onboard radar apparatus having a receiving and transmitting device for transmitting electromagnetic waves to objects and receiving the electromagnetic waves reflected by the objects repeatedly, and a signal processing device for repeatedly calculating relative ranges and relative velocities of the objects based on the transmitting electromagnetic waves and the receiving electromagnetic waves, wherein false images are judged by comparing their relative velocities, calculated from differences between the relative ranges of the objects in previous measurement and the relative ranges of the objects in current measurement, with said relative velocities of the objects, calculated based on the transmitting electromagnetic waves and the receiving electromagnetic waves in the current measurement, and thus judged false images are deleted from outputs of the apparatus, whereby the false images are not recognized as target objects and probability of occurrence of false images can be reduced. [A1412]

"Method and apparatus for geodetic surveying and/or earth imaging by satellite signal processing"

A method of geoid measurement and/or earth imaging, characterized in that at least one directional antenna (2) is used to pick up a radio signal from a satellite and reflected on the ground, and said signal is processed using a reference signal that corresponds to the radio signal from the satellite in order to obtain a geodesic measurement and/or an image of the zone (Z) towards which the directional antenna (2) is pointed. [A1413]

"Continuous wave radar system"

A continuous wave radar system, for example a radar altimeter, comprises a memory (24) for storing an array of return signals, means for performing a time integration (25) of the array to improve its signal-to-noise ratio, means responsive to the time integrated array (26) to compare (30) the noise level (28) thereof with the peak level (27) thereof to obtain the signal-to-noise ratio of the array, and control means (31) responsive to the signal-to-noise ratio thus obtained to set either the period over which the said time integration is performed for each renewal of the time integrated array (26) , or the power of the transmitted signal, of both, in accordance with predetermined criteria to the minimum necessary to ensure an adequate signal-to-noise ratio. [A1414]

"Integrated hazard avoidance system"

A hazard alert device for aircraft prioritizes various alerts according to predefined criteria. The device enables more optional alerting of hazardous conditions than a system of separate independent and discrete devices. [A1415]

"System for identifying and generating geographic map display of aircraft icing conditions"

A satellite data processing aircraft icing detection and display mechanism comprises a communication link coupled with an earth-imaging satellite containing a terrestrial-directed imagery sensing system, which conveys data associated with multiple images representative of characteristics of the earth's atmosphere in a viewed terrestrial area. A digital imagery data processor is coupled to the communication link, and is operative to process the data to provide an indication of intensity and height of potential areas of aircraft icing. An icing display subsystem is coupled with the digital imagery data processor and is operative to generate a multi-pixel map image showing the geographical location, intensity and height of an identified aircraft icing layer. [A1416]

"Aircraft ground collision avoidance system and method"

A system and method for avoiding collision between objects and wingtips of an aircraft when the aircraft is on the ground includes mounting detecting devices such as a low cost radar unit and a video camera in the wingtip. These detection devices are coupled with one or more indicators to provide an operator of the aircraft such as a pilot that an imminent collision with an object is about the occur. The indication can be an audio or visual signal, either within or outside of the aircraft. [A1417]

"Method of minimizing leakage energy in a synthetic aperture radar process"

A method of minimizing leakage energy in a synthetic aperture radar (SAR) system is based a Lagrangian function constructed from image-domain magnitude, and a "penalty function" based upon the choice of aperture. Broadly, the choice of penalty function is related to an estimate of undesirable energy lying outside of the main lobe of the impulse response introduced by the given aperture. Since there are no non-analytic constraints, the output image is purely an analytic function of the input, resulting in a more straightforward analysis and implementation while lessening the likelihood of pseudo-random phenomena. A tunable relative coefficient betveen the sidelobe energy estimate and the output magnitude allows control over a physically well-understood tradeoff between clutter contrast and point resolution. The generality of the technique may be extended to a multi-parameter minimization with possible applications in super-resolution, gap-filling, interferometry, and ultrasonic imaging, and ATR. [A1418]

"Optical RF support network"

This invention relates to advanced RF support systems which utilize optical fibers or direct lasers to achieve RF transmission and reception of navigation signals from widely separated supporting sites. The functional goals of these systems are to support navigation, guidance, control, and survey systems. A RF supporting network according to the present invention comprises a master supporting site, a number of secondary supporting sites, and a network of optical RF link systems which links secondary supporting sites with the master supporting site. The stable clock, GPS signal generators, and receivers are located only at the master site, which is also the processing, command, and control center. A network architecture of the present invention will provide a low cost mean to users in need of precision navigation and time information. Furthermore, the present invention furnishes an advance means in determining the instantaneous velocity of GPS satellites with high accuracy. The present invention drastically increases our navigation and survey capabilities as well as other applications. [A1419]

"Averaging-area-constrained adaptive interferometric filter that optimizes combined coherent and noncoherent averaging"

A family of multiple scale adaptive filters and filtering methods that automatically adapt their impulse response width to local data characteristics, optimizing the accuracy, yield, and/or detail of interferometric measurements. A prefilter with fixed impulse response width is applied to a complex interferogram. The phase of the prefiltered complex interferogram is unwrapped. Then, a weighted combination of the phase-unwrapped, fixed-filtered interferograms is computed using a data-dependent criterion function. The resulting weighting function at each resolution element is typically a nonlinear function of interferogram magnitude and coherence for each fixed filter output at that resolution element. [A1420]

"Multi-indicator aviation pilot collision alert"

A collision alert system employs combined binaural acoustic effects combined with optical indicators to direct the attention of a person in a desired direction. The pilot utilizes normal delay and acoustic modification of high frequencies to determine roughly the direction to look for the target. A corresponding optical indicator is energized in a position corresponding to the target angle to confirm and refine the angle to the target. [A1421]

"RF identification system with restricted range"

A method of adjusting the 2-way communication range of an RFID system to assist a human operator to individually handle and interrogate a plurality of tagged objects, such as suitcases, that each include an RFID tag transceiver. An RFID interrogator transceiver is mounted on the human operator. The 2-way communication range between the interrogator transceiver and the tag transceivers is adjusted to only slightly exceed the closest distance between the interrogator and the tag while the operator is handling the tagged object. Preferably, the 2-way communication range is short enough that other tagged objects will remain outside the communication range and will not respond to messages from the interrogator. Another aspect of the invention is a method of verifying whether an object to be transported has reached its intended destination. In this aspect, an interrogator transceiver at a first destination interrogates an RFID tag transceiver on the object, and in response the tag transmits its intended destination. [A1422]

"3D AIME.TM. aircraft navigation"

The apparatus of the present invention uses radar altimeter measurements and stored terrain altitude profiles to provide pre-filtered observations to a Kalman filter for estimating barometric offset at the airport runway, and barometric scale factor for offsets above the runway. These offsets are used with the smoothed baro-inertial output from an inertial reference system to provide 3 dimensional constant rate of descent approach procedures to replace non-precision approach procedures based on constant barometric altitude step approaches. The horizontal positions used as reference for the stored terrain altitude profiles are obtained from a prior art navigation apparatus. The integrity of all measurements is assured by using long term averages of the Kalman filter residuals to detect failures. In addition, the estimated baro offset at the runway is compared for consistency with the baro offset obtained by the pilot from the airport by radio. [A1423]

"Multilateration auto-calibration and position error correction"

The accuracy of multilateration systems can be greatly improved by using a correction method based on the SLS (Sideband Lobe Suppression) signal produced by a Secondary Surveillance Radar (SSR) . Multilateration is a cooperative surveillance technique for aircraft equipped with Air Traffic Control Radar Beacon System (ATCRBS) , Mode S, or Automatic Dependent Surveillance Broadcast (ADS-B) transponders. When one of these transponders aboard a vehicle is interrogated, it responds by broadcasting a message based on what the interrogation requests. These reply messages may be multilaterated to determine the source position of the transmission. Multilateration is a Time Difference of Arrival (TDOA) technique similar to triangulation. Multilateration can be performed to locate the transmission source of any SSR signal. Error detection and correction may be performed on the system by conducting a comparison of a known TDOA for the receiver/transmitter geometry, to the measured TDOA from a Side Lobe Suppression (SLS) pulse emanating from a primary radar. [A1424]

"Monopulse system for target location"

A monopulse system generates sum (.SIGMA.) , elevation difference (.DELTA..sub.EL) , azimuth difference (.DELTA..sub.AZ) , and double difference (.DELTA..sub..DELTA.) signals, and generates a covariance matrix. The covariance matrix is decomposed to produce at least the principal eigenvector. The location or angular direction within the main beam of a single target is determined from the real component of the quotient of elements of the principal eigenvector, by the use of a look-up table. In another embodiment of the invention, the eigenvalues are generated from the covariance matrix, and the number of significant eigenvalues determines the number of targets within the main beam. If a single target is found, its location is found as described above. If two targets are found in the main beam, the locations of the two targets are determined by a closed-form solution of quadratic equations. A missile using a monopulse radar according to an aspect of the invention determines the presence of two targets within the main beam, which targets may be a real target and a decoy, and uses extrinsic information to identify a selected target as being the true target. The missile is homed in the direction of the selected target. [A1425]

"Air traffic control system"

An apparatus and techniques for correlating crossing targets in an air traffic control system is described. The technique utilizes a target/track correlation made on the basis of three conditions: (1) separation distance between a target pair, (2) target polarity and (3) a value of a threshold separation value indicator. [A1426]

"Digitally programmable multifunction radio system architecture"

A system that partitions or divides the functions of a radio into channels and divides the functions of each channel into two major functions: 1) antenna interface and power amplification, and 2) hardwired mixing, modulation/demodulation and signal processing and further partitions the mixing through signal processing functions into the functions of a) programmable analog mixing and b) programmable digital modulation/demodulation and signal processing. Control and user interface functions, if needed for a particular application can also be functionally partitioned. A typical received signal pathway will encounter an antenna module, an antenna interface and power amplification module, a receiver module partitioned into an analog submodule that performs mixing and down conversion to produce a common intermediate frequency signal and a digital submodule that further down converts the intermediate frequency signal, demodulates the signal and performs the other signal processing necessary to provide a useful information signal. A typical transmitter pathway includes a transmitter module partitioned into a digital submodule that performs signal processing and modulation and an analog submodule that performs upconversion and mixing, followed by a power amplification and interface module and an antenna module. Control and user interface modules can also be provided along with modules that perform additional processing and information security functions. [A1427]

"Modulator slope calibration circuit"

In order to provide for dynamic calibration of a radio altimeter which utilizes frequency modulated continuous waves having a triangular wave form, a selected frequency output of the altimeter is compared, during a calibration interrupt of the output of the altimeter, to a predetermine value for that frequency and if it differs, the frequency is adjusted to the correct value. Each frequency in the triangular wave is individually calibrated during separate calibration mode interrupts. Specifically, each frequency is calibrated by coupling a portion of the altimeter signal to a prescaler circuit and using the prescaler circuit in combination with a modulation frequency counter to input a value representing the frequency to a control microprocessor. The microprocessor then compares this value to a desired frequency and adjusts a value in a memory that is used to control the frequency output of a voltage controlled oscillator that is used to generate the frequency modulated continuous wave. [A1428]

"Method for the processing of the reception signal of a deramp type synthetic aperture radar"

A Deramp type radar used in synthetic aperture radar for radar imaging transmits coherently repeated linear frequency-modulated pulses and carries out a sort of pulse compression in reception by demodulation of the echo signals received by means of a frequency ramp that reproduces all or part of a transmitted pulse, and by a Fourier transform performed in range. The application to a Deramp type radar signal of a standard SAR processing is disturbed by the fact that, in this signal, the effectively demodulated part of an echo signal due to a target has a position with respect to this echo signal and a duration that are variable as a function of the distance from the target to the radar. The proposed method makes it possible to eliminate this disturbance by means of a particular choice of a common temporal support used for the demodulation of the signals of all the targets of the useful swath and a phase correction applied to the level of the pulse response of the image focusing filter of the SAR processing. Secondarily, a second phase correction can be applied to the complex reflection coefficients obtained for the dots of the image at the end of the SAR processing. [A1429]

"Pulse compression radar"

The invention concerns a method of synthesizing a replica used in the compression filter of pulse compression radar. The replica is calculated from the spectrum of a required impulse response. The required impulse response is preferably obtained from an analytical function, such as a sinc function or a weighted sinc function, and a template. It is preferable to use calibration signals of the instrument to calculate the replica. The invention also applies to synthetic aperture radar. [A1430]

"Obstacle avoidance and crushing protection system for outriggers of a chassis"

The protection system for outriggers of a chassis includes a non-contact distance measuring device, associated with at least one of the outriggers and the chassis, mounted on one of the outriggers and the chassis. The non-contact distance measuring device measures the distance to the ground along a predetermined angle, and generates a warning signal based on the measured distance. A controller stops operation of the outriggers in response to the warning signal. [A1431]

"Method and system for predicting ship motion or the like to assist in helicopter landing"

A method for a short-term prediction of future ship motion in open water to furnish visual cueing information that can be remotely presented to a pilot during an aircraft landing is described. Two sets of samples of the sea surface geometry along a radial azimuth line from a ship as a function of elevation of a sensor are first acquired. These are compensated to remove the components due to the ship's motion. Two wave traces are then separately derived in Cartesian format from the two sets of acquired samples. These wave traces are subjected to a Fast Fourier

Transform to detect the amplitudes and phases of the individual wavelength components. The direction of the wavelength components is determined using a measure of their phase change in the scan direction during the time interval between the two scans together with their measured wavelength. The amplitude, direction and phase of each component is utilized together with the known motion characteristics of the moving ship in order to derive a short-term prediction of future ship motion in the time domain. A quiescent period of the ship motion is located by comparing the short-term prediction with the pre-defined operating limit criteria. Finally, a message signal is transmitted to the pilot of the aircraft indicating Time-to-Land and the duration of the quiescent period. [A1432]

"Phased array radar system for tracking"

A phased array radar system for target tracking having a track initiation unit, a track prediction unit, a scheduling unit, a track selection unit, and a transmitter/receiver unit. The track initiation unit initiates new tracks representing detected aircraft targets. The track prediction unit predicts the expected position and the calculated position uncertainty of the target as a function of time and the minimal, maximal and optimal time difference to the next measurement. The scheduling unit performs an independent calculation of a sequence of possible time intervals to the next measurement in accordance with specified conditions, and then performs an intersection operation between the calculated sequences of time intervals in order to calculate the optimal time interval to the next measurement. A track selection unit selects that track which has the shortest remaining time interval, K.sub.i, to the next measurement and decreases the time interval to the next measurement for all other tracks with K.sub.i. The transmitter/receiver unit registers an echo from the target and calculates, in a known manner, values for distance, speed, bearing and uncertainty in the distance and speed calculations, which are transferred to the track prediction unit for further calculations. [A1433]

"Helicopter rotorblade radar system"

A radar system for a helicopter having a mast and a plurality of blades coupled to the mast by shaft portions of the blades includes a transmitter and a receiver respectively transmitting and receiving a pulsed radar beam through a feed horn, a generator for generating the radar beam energy for transmission by the transmitter, a processor, a display, and a passive reflectarray deposited on the underside of at least one blade of the helicopter. The reflectarray is a preferably flat array of passive microstrip elements which can impart a phase to the radar beam. A typical microstrip element is a patch whose dimensions may be controlled, and the size of which determines the phase for the location within the array of that element. The reflectarray is provided with a pattern which is designed to scatter the radar beam in a desired shape and direction to produce uniform mapping of the terrain over which the helicopter travels. According to another embodiment, a passive reflectarray is provided to the underside of at least one blade, while another passive reflect is provided to the topside of at least one blade, thereby permit both terrain and sky mapping. The radar system of the invention provides a radar system utilizing a lightweight and inexpensive passive radar reflector for use on helicopters of all sizes, and achieves 360.degree. coverage. [A1434]

"Fault tolerant data bus"

A fault tolerant bus architecture and protocol for use in applications wherein data must be handled with a high degree of integrity and in a fault tolerant manner. As applied to an integrated flight hazard avoidance system, the system is constructed of two or more microprocessor-driven modules that generate data, two independent bus interface controllers per module, and an inter-module backplane data bus that links each module. The system allows comparison of identical data from multiple sources. If invalid data is detected, the system either passes the correct data copy or generates a system fault message. The bus architecture utilizes a distributed synchronization protocol, and does not require a master synchronization source. [A1435]

"Pulsed doppler radar system with small intermediate frequency filters"

A process and a system for selecting a pulse repetition frequency that causes clutter pulse repetition frequency lines from the negative carrier frequency and from the clutter harmonic frequencies to lay on top of clutter pulse repetition frequency lines from the positive carrier frequency. A pulsed Doppler radar receiver of the system has one or more channels each comprising of a radio frequency input section for receiving a radio frequency carrier. Following the radio frequency input section are one or more serially arranged intermediate frequency sections that terminate in a last intermediate frequency section. The last intermediate frequency section is followed by analog-to-digital conversion and down-conversion to baseband in-phase and quadrature channels. In-phase and quadrature data from the in-phase and quadrature channels is processible by a computational system to detect and track a target in the presence of clutter. A pulse repetition frequency space is determined that consists of all pulse repetition frequencies equal to one or two times the intermediate frequency of the last intermediate frequency section divided by an integer. The computational system is then directed to choose a pulse repetition frequency from the pulse repetition frequency space to use in tracking the target. The system may be in a guided missile or other flying object. [A1436]

"Display management method, system and article of manufacture for managing icons, tags and leader lines"

A display managing system, method and article of manufacture displays icons, tags and leader lines based on tracking information that includes position information of a plurality of objects, determines if a tag or leader line conflicts with repositioned icons, and relocates the conflicting tag or leader line to prevent a tag or leader line from overlapping and thereby obscuring the icon. Furthermore, the tags and leader lines associated with the repositioned icons are, themselves, repositioned. If these repositioned tags and leader lines conflict with an existing icon, tag or leader line, then the conflicting tag and/or leader line are moved to unoccupied display grid coordinates or a tag location is time-shared between two conflicting tags. Leader line stretching may also be used to prevent tags from jumping around as the icon is moved. An organized data base, which may be in the form of x-y trees, is employed to encode the positions of the display elements to permit efficient searches to locate tags, leader lines and icons and to resolve conflicts therebetween. The invention may also be applied to manage the display of a fleet dispatcher or in a fleet dispatch system. [A1437]

"Phase gradient auto-focus for SAR images"

A SAR image auto-focus method uses statistics extracted from the image data to develop a phase pure hyperbolic correction function. The method processes an uncorrected azimuth line vector selected from an unfocused array into a corrected azimuth line vector. The method includes forming a bright spot list based on the selected uncorrected azimuth line vector where the bright spot list has at least one bright spot entry. Then, the uncorrected azimuth line vector is unpacked into an uncorrected segment set that has a first uncorrected segment corresponding to a first bright spot entry in the bright spot list. Then, the first uncorrected segment is processed into a first corrected segment based on an average phase slope corresponding to the first bright spot entry, the first corrected segment is packed into the corrected azimuth line vector, and the process repeated for all bright spots. The step of processing the first uncorrected segment into a first corrected segment includes processing the first uncorrected segment through a Fourier transform into an uncorrected spectrum vector, correcting the uncorrected spectrum vector to form a corrected spectrum vector, processing the corrected spectrum vector through an inverse Fourier transform into the first corrected segment. The step of correcting the uncorrected spectrum vector includes computing phase gradient .phi..sub.dot (f) at each frequency f in the uncorrected spectrum vector based on: then computing the average phase slope by averaging the phase gradient determined at each frequency in the uncorrected spectrum vector. Then a correction function vector corresponding to the average phase slope is generated, and the uncorrected spectrum vector is multiplied by the correction function vector, element by element, to form the corrected spectrum vector. [A1438]

"Method and arrangement for traffic monitoring"

A method for traffic monitoring, particularly at airports, is disclosed including the localization of a traffic object is carried out by direction finding and by additional information. The radio communication between the traffic object and a control center is recorded and fed to a speech recognition unit on the side of the control center, an identification phrase transmitted together with the message of the traffic object is identified in the speech recognition unit on the side of the control center and allocated to the localized traffic object, and that the allocated identification of the localized traffic object is continuously maintained, the source of the identification being on the side of the traffic object. [A1439]

"Terrain warning system"

An integrated flight safety device for general aviation aircraft includes a radio altimeter and flight data recorder. [A1440]

"Dynamic, multi-attribute hazard prioritization system for aircraft"

Signals from warning systems are passed to a hazard prioritization computer. The prioritization computer also receives inputs from the aircraft's air data and inertial reference system. The alert prioritization computer includes three functional modules: (1) hazard detection, identification and monitoring, (2) threat assessment and (3) display and alert prioritization logic. The hazard prioritization computer processes the warning system signals, along with stored data from a hazard database to compute a severity component of threat and a proximity component of threat. These two components are processed to produce an overall threat value for each hazard. This overall threat value is then processed to provide alert and display generation and prioritization for the flight crew and/or the aircraft's auto-flight system. [A1441]

"Aircraft weather information system"

A system and method for downlinking weather data, generated by existing weather and data sensors, to a ground station. The ground station utilizes data from multiple aircraft to form refined weather information, and uplinks the refined weather information to the aircraft. The refined weather information is stored at the aircraft and picture generating equipment, such as an existing onboard ground proximity terrain picture and symbol generator, generates pictorial information depicting weather. The pictorial information is displayed, for example by an existing EFIS or weather radar display, in the form of polygons. [A1442]

"Method for determining an impact point of a fired projectile relative to the target"

The method of determining an impact point of a fired projectile relative to a target. The target is first tracked with the first beam. In the meantime, a second beam is directed above the target and waits for the projectile to be situated within the beam. The projectile's impact point is subsequently predicted by extrapolating the measuring data from the second beam. [A1443]

"Enhanced motion compensation technique in synthetic aperture radar systems"

Compensating for motion of the host vehicle in a synthetic aperture radar system includes collecting inertial data with an inertial navigation system during an imaging period in which a synthetic aperture radar pulse is directed to a target. During the imaging period global positioning system corrections to the inertial data are collected. A smooth representation of the global positioning system corrections is formed and then the smooth representation of the global positioning system corrections is applied to the inertial data after completion of the imaging period. [A1444]

"Method for automatic focusing of radar or sonar imaging systems using high-order measurements"

Automatic focusing of radar or sonar imaging systems, for example, synthetic aperture radar (SAR) or synthetic aperture sonar (SAS) systems, is accomplished by using high order measurements, such as the quadruple product of the range compressed signal g (x) . The phase error is estimated by a recursive or non-recursive algorithm from the phase of the quadruple product. The estimated phase error is applied to the range-compressed SAR or SAS image data which is then azimuth compressed to obtain the focused image data. [A1445]

"Process for the detection and suppression of interfering signals in S.A.R. data and device for performing this process"

For the detection and suppression of interfering signals in SAR data, a time-domain noisy raw data signal U.sub.T (t) is Fourier-transformed by range lines in raw frequency-domain spectrum U.sub.T (f) . The resulting spectrum U.sub.T (f) is law-pass filtered according to a transmission-signal bandwith B.sub.s to yield a useful spectrum U.sub.T (f) and an autocorrelation function (t) of useful spectrum U.sub.T (f) is determined in the time domain. A weighting function w (t) is used to suppress portions of the useful signal in the autocorrelation function (t) , thereby intensifying the interfering signal in relation to the autocorrelation function (t) . The resulting signal (t) is transformed into a power spectral density (f) and a threshold value m is calculated from the power spectral density (f) with a MADMED function. A final notch filter W.sub.N (f) is generated by Fourier-transforming the ideal notch filter frequency response W.sub.N ideal (f) . [A1446]

"Interferomeric synthetic aperture radar altimeter"

Aircraft position determination system includes a transmitter to transmit a signal, and two receivers to receive the transmitted signal reflected from the terrain below the aircraft, and a phase comparison apparatus operating from the two receiver's inputs. A processor determines position based on the output from the phase comparison apparatus. [A1447]

"Radar detector for pre-impact airbag triggering"

A pulsed radar detector to be used for airbag triggering prior to a collision between a vehicle on a roadway and an impacting target object, has sets of transmitters and receiver separately disposed on a the side of a vehicle so as to create a bistatic antenna pattern. The transmitting antennae are mounted relative to receiving antennae so as to control the amount of direct radiation from each transmitter antenna and said receiver antenna so as to create a modulation of a received target signal. A signal processor determines the period of the modulation in order to obtain a measure of target velocity. The amplitude of the modulation is determined so as to have a measure of relative target size. Using this data, a computer continuous calculates the predicted time and point of impact in order to initiate release of an airbag at a predetermined time before impact between said object and the side of said vehicle. [A1448]

"Missile shield"

A covert and secure communication system which employs a very narrow bandwidth to permit receivers to be very sensitive to low power signals while maintaining acceptable signal-to-noise ratios. In the preferred embodiment, the system operates at the millimeter wavelength which, because of very high attenuation in atmosphere, will be undetectable beyond a very limited range. In another embodiment of the invention, the covert communication system is applied to an IFF system in conjunction with a homing missile. The IFF system of the present invention may be used as a back-up to confirm that a target is a foe by transmitting to and receiving a confirming signal from the target at the terminal portion of the engagement. for example, transmission between the target and missile may occur when the target and missile are less than 2,000 feet apart. The system is even less detectable and more secure because transmission only occurs during the very last portion of missile engagement which avoids the long range transmission of conventional IFF systems. [A1449]

"Method for generating microwave-resolution images of moving objects by inverse synthetic aperture radar"

A method of radar imaging moving objects, especially ground traffic at airports, uses inverse synthetic aperture radar (ISAR) . The two-dimensional location distribution of backscatter centers of the object is detected. A plurality of range bins are provided for suppressing of interference, created because of Doppler shifts, in microwave images represented in the form of pixels. Only those pixels are considered to be active which exceed a defined intensity threshold value, which had previously been determined as a fixed fraction of the maximally present pixel intensity. A range area with interference is determined with the aid of a method wherein the threshold is exceeded and wherein the number of active pixels in the individual successive range bins is counted, and wherein image opening is performed in the detected interfered range area, which consists of a succession of a single or several repeated "erosions" and "dilatations". An erosion cancels all those active pixels, in whose defined vicinity an inactive pixel occurs, and a dilatation activates all pixels in the defined vicinity of an active pixel. [A1450]

"Technique for implementing very large pulse compression biphase codes"

A processing method for use in providing improved SAR imagery at high duty factors that provides for enhanced radar sensitivity. Radar signals are transmitted that embody a high duty factor ultra-high resolution SAR waveform generated using a biphase code with a predetermined high pulse compression ratio. Received radar returns comprising a SAR map are Fourier transformed and multiplied by a stored set of complex weights. The resultant Fourier transformed complex weighted SAR map is then inverse Fourier transformed to obtain compressed range bins. The inverse Fourier transformed SAR map is then processed for display. [A1451]

"Method and apparatus of automatically monitoring aircraft altitude"

An apparatus and method for automatically and independently determining aircraft altitude and alerting the pilot to deviations from a target altitude exceeding a specified tolerance. The alerter comprises an altitude sensing means for sensing the present altitude of the aircraft. The invention discloses three sources for altitude information namely, a self-contined sensor such as a pressure transducer, a Global Positioning System receive, or an altitude encoder. A target entry means is used for entering the target altitude. An indicating means signals an altitude alerting condition upon the detection of a condition wherein the absolute difference is larger than the tolerance value. The altitude alerting apparatus may also comprise a display means for display of the present aircraft altitude information. [A1452]

"Flight control system user interface apparatus and control data display method thereof"

A flight control system user interface apparatus and a control data display method thereof are provided to reduce a workload on a controller and to increase the safety of flight. A main-control terminal on a man-machine interface apparatus for use in a flight control system has an aircraft position display area 102, an aircraft order display area 102, a simple strip display area 104, an aircraft data display area 104, and a control pilot data link communication display area. These areas are arranged in such a way that they are controlled by one input unit. [A1453]

"High-precision near-land aircraft navigation system"

An aircraft including an approach and landing system, including a navigation unit for providing navigation information, a weather radar unit for providing radar information, a processor which receives navigation information from the navigation unit and information from the weather radar unit, the processor unit providing an output representing information concerning the aircraft in accordance with the provided navigation information and radar information, a memory for storing information representing a scene, the processor unit correlating the stored scene information with the output representing information concerning the aircraft to provide a mapped scene, a display unit for displaying the output of said processor and the mapped scene, and a steppable frequency oscillator for providing a signal which is stepped in frequency to the weather radar unit, thereby providing an increased range resolution. [A1454]

"Scalable range migration algorithm for high-resolution, large-area SAR imaging"

An improved range migration algorithm or processing method that advantageously performs digital synthetic aperture radar image formation processing. The range migration algorithm provides high-resolution, large-area spotlight SAR imaging that is free from phase and gain discontinuities and geometric distortions. The range migration algorithm also provides for truly scalable and portable processing. The range migration algorithm may be used in a real-time implementation on a multi-processor platform. The range migration algorithm of the present invention does not perform range deskew, which results in more efficient processing and the imaging of very large swath widths. In addition, the range migration algorithm explicitly and efficiently treats the residual video phase term. Also, no overcollection of input data is required. [A1455]

"Isar method to analyze radar cross sections"

A method of analyzing the radar cross section of a target vehicle determines the contributions to total radar cross section of various vehicle design details. The method includes obtaining ISAR images of the vehicle with a radar at a known position relative to the vehicle. A visible three-dimensional set of images of the vehicle is created. The visible images have the same point of view as the ISAR images. Each visible image is matched by one or more corresponding ISAR images in terms of distance from the target and angular position of the target relative to the vehicle's axis of rotation. The corresponding ISAR images are used to paint the visible images so as to produce one or more rendered composite images of the vehicle. A relation is then found between chosen vehicle details and bright zones in the composite image. [A1456]

"Method for phase unwrapping in imaging systems"

An improved method is provided for phase unwrapping in coherent imaging systems which use two complex images to form an interferogram. In the improved method, the interferogram of phase differences is divided into a relatively large plurality of transform blocks, wherein each transform block comprises a matrix of o.times.p data samples, with o and p=2.sup.n +1, and n being an integer greater than 2. Further, adjacent transform blocks are preferably defined to partially overlap. The wrapped phase values of adjacent data samples within each transform block are then compared and if the difference therebetween exceeds a predetermined value, the entire block of data samples may be discarded for further use. Data samples of the retained transform blocks are then unwrapped to obtain phase values via an unweighted, least-squares technique implemented by Fast Fourier Transform. Using a known height value corresponding with a single data sample, an integration constant can be determined for a corresponding first transform block. Path-following may then be used to determine an integration constant for the other retained transform blocks. The phase values and integration constants may then be employed to determine height values for the interferogram. The disclosed method yields enhanced accuracy with reduced computational burden. [A1457]

"Terrain elevation measurement by interferometric synthetic aperture radar (IFSAR)"

An interferometric synthetic aperture radar (IFSAR) elevation measurement processor computes an elevation array by processing a first image array to generate an elevation corrected first image array, processing a second image array to generate an elevation corrected second image array, generating a phase interferogram from the elevation corrected first and second image arrays, and processing the phase interferogram to generate the computed elevation array. The layover correction is based on either (1) a predetermined elevation array, (2) an elevation array computed by radargrammetry, (3) an initial computed elevation array developed in an initial iteration by initial interferometry of uncorrected images followed by the layover correction in a subsequent iteration based on the initial computed elevation array, or (4) a combination of the above. The layover correction process removes range and Doppler distortion inherent in pixel data due to elevations variations in the imaged terrain. [A1458]

"On-ground radio altimeter calibration system"

To ensure that a radio altimeter indicates zero altitude when the aircraft is on the ground, an on-ground calibration system utilizes a calibration switch to initiate a calibration radio altimeter signal from the radio altimeter's transmitter section which is reflected off of the ground and received by the altimeter's receiver section. The time delay between transmission and reception of the signal is measured and a value representing the delay is stored in the altimeter's microprocessor. This value corresponds to zero altitude and can be used as the relative zero point for calculating altitudes of the aircraft when it is in flight. [A1459]

"Microwave transceiver utilizing a microstrip antenna"

A transceiver module for use in a police traffic surveillance radar system is provided which is of a smaller size and of a lighter weight than those traditionally available. The transceiver module includes a front, open-ended housing having a cavity, a transceiver assembly disposed within the cavity of the housing, and a radome fixedly secured over the opened end of the housing so as to enclose and hermetically seal the transceiver assembly within the cavity of the housing. The transceiver assembly is formed of an antenna card/plate subassembly, a diode housing subassembly, an oscillator/choke housing subassembly, and a printed circuit board subassembly all operatively interconnected together so as to form a fully integrated structure. As a result, the transceiver can overcome the space restrictions due to the requirement of passenger-side air bags. [A1460]

"Method for the processing of multiple paths"

The invention relates to the processing of the multiple paths in an interrogator station which, in response to a salvo of interrogations, receives responses in the form of pulses. The station comprises at least two reception channels. The responses to each interrogation of one and the same salvo are classified by order of appearance. A value of dispersion of the energies is estimated, for each channel and each salvo, on the responses having the same classification. Since the first classified response is, by assumption, considered to have arrived by a direct path, the following responses will be eliminated, on the grounds that they have been received after passing through multiple paths, if their values of dispersion of energy on the two paths are not equivalent to those of the first response. [A1461]

"Method of synchronizing navigation measurement data with S.A.R radar data, and device for executing this method"

In a method of synchronizing navigation measurement data according to the invention, first radar data are evaluated by means of the reflectivity-offset method, by means of which the aircraft deviation in the antenna viewing direction is determined. The aircraft deviation in this direction is also determined from the outputs of a navigation system. The temporal courses of the two obtained deviations are cross-correlated. The position of the cross-correlation maximum is determined, and indicates the temporal offset between two associated deviation signals. The radar data are delayed by this amount of time, so synchronization is effected between navigation measurement data and radar data. An optimum compensation of the motion errors can be effected with the synchronized data. The invention can be used in on-board aircraft SAR systems. [A1462]

"Integrated hazard avoidance system"

A hazard alert device for aircraft prioritizes various alerts according to predefined criteria. The device enables more optional alerting of hazardous conditions than a system of separate independent and discrete devices. [A1463]

"Method of spectral analysis, FM/CW type radio altimeter with digital processing"

A spectral analysis carried out on the beat signals obtained by the mixing of a transmission signal, the frequency of which is modulated in the form of recurrent sawteeth, with this same signal after it has been transmitted, reflected and then received. The spectral analysis is based on the computation of self-correlation coefficients enabling the definition of the spectral components. for this purpose, the coefficients are computed at each sawtooth and are combined with the coefficients determined with the most recent previous sawteeth to give so-called global coefficients, from which the spectral components sought are restituted in a conventional way. Application especially to altimeters for the measurement of small heights. [A1464]

"Data compression for TDOA/DD location system"

Compression of data representing waveform information is dynamically adapted to the waveform by performing a transformation on blocks of samples of the waveform to derive a plurality of coefficients representing a portion of the waveform corresponding to a block of samples and computing quantizer step sizes (quantitative increments of digitization) and quantizer sizes (number of bits for transmission of the coefficients) based on the relative magnitude and dynamic range of the coefficients and a user-specified parameter. The user-specified parameter may be used to set a lower limit on performance such as an upper limit on quantization noise or distortion (in which case data rate is automatically minimized) or a data rate for a communication link (in which case performance relative to quantization noise or distortion is maximized) . Relatively insignificant coefficients and quantizer sizes smaller than the quantizer step size may be set to zero to further reduce the data rate or improve data fidelity for the bandwidth of the data link. Forward error correcting codes and gray codes are preferably employed for data transmission. [A1465]

"Ground based pulse radar system and method providing high clutter rejection and reliable moving target indication with extended range for airport traffic control and other applications"

An MTI radar system transmits pulses with variable interpulse time periods and is structured with a lattice filter to process return signals to identify targets while substantially rejecting static and moving clutter. The MTI radar system also operates to reject adverse effects of transmitter instability in the processing of return signals. The MTI radar system is applied as an airport traffic control in which aircraft are detected as targets. [A1466]

"UHF synthetic aperture radar"

A synthetic aperture radar (SAR) which operates at UHF frequencies and which includes a two element antenna. The SAR generates a null in the backlobe of the antenna pattern at the location of a target which is steered rather than trying to obtain directivity in the mainlobe. Both analog and digital implementations are provided. In the analog approach, required phase shifts are performed at a frequency higher than the RF output frequency and the receive and transmit nulls are steered separately to increase the width of the null so as to allow for wider SAR swaths. The digital implementation involves steering the null only on receive and multiplying fast time samples by a complex phase correction similar to that used in the analog approach to form the beam. The phase correction is also performed prior to range resolution which employs "stretch" processing, so as to achieve high range resolution. [A1467]

"Method and apparatus for reducing range ambiguity in synthetic aperture radar"

A modified Synthetic Aperture Radar (SAR) system with reduced sensitivity to range ambiguities, and which uses secondary receiver channels to detect the range ambiguous signals and subtract them from the signal received by the main channel. Both desired and range ambiguous signals are detected by a main receiver and by one or more identical secondary receivers. All receivers are connected to a common antenna with two or more feed systems offset in elevation (e.g., a reflector antenna with multiple feed horns or a phased array with multiple phase shift networks. The secondary receiver output (s) is (are) then subtracted from the main receiver output in such a way as to cancel the ambiguous signals while only slightly attenuating the desired signal and slightly increasing the noise in the main channel, and thus does not significantly affect the desired signal. This subtraction may be done in real time, or the outputs of the receivers may be recorded separately and combined during signal processing. [A1468]

"Method and system for determining a position of a target vehicle utilizing two-way ranging"

A communication system transmitting messages includes two-way ranging by communicating between a target vehicle and a traffic controller station through a plurality of satellites. A set of the plurality of satellites may be used simultaneously or sequentially to transmit and receive signals from the ground station to a target vehicle, preferably an aircraft in the preferred embodiment. Each aircraft includes a particular ranging code combined with a message signal to selectively process the ranging data supplied to each vehicle. The ranging determination may be used in conjunction with alternative ranging devices, such as a global positioning system, in order to improve the accuracy of the estimations provided by the ranging processing. Nevertheless, the method and apparatus of the present invention provide relatively accurate state vectors without the need for precisely accurate timing synchronization at each of the stations connected by communication links. [A1469]

"Method for characterizing air traffic control radar beacon system antenna patterns"

A method for measuring and characterizing the Air Traffic Control Radar Beacon System without interrupting service which comprises a computer-controller system which captures the beacon radar system emissions during one radar rotation and software which extracts and plots the two antenna signal patterns. Data is collected for 50 microseconds during each degree of antenna rotation, triggered by the first pulse of the three pulse signals, and is then stored in separate omni-directional and directional arrays for subsequent plotting. Data is also collected for 50 microseconds during each one-tenth degree of antenna rotation within the directional antenna main lobe. [A1470]

"SAR radar system"

A synthetic aperture radar system (SAR) has a wide antenna beam. By using a Local Backprojection SAR Processor the requirment for computational power becomes practical. The SAR radar system is arranged to collect signal amplitudes over segments of the vehicle track, called subapertures, which are so short that the closest points imaged on the ground are in the far-field of said subapertures with respect to a wavelength, charactersitic of the radar signal, then to synthesize, from data obtained over each subaperture, a set of directive radar beams with an angular resolution determined by the subaperture length and the wavelength mentioned and each associated with a given position within the subaperture, to assume a topography for the ground surface, either based upon a topographical map or an assumption, for example that the ground is flat, and finally to compute the radar reflectivity of all ground points forming the image by a summation of the amplitudes for all subapertures at the range and beam direction determined by the platform position and the ground point. [A1471]

"Hierarchical information fusion object recognition system and method"

A hierarchical object recognition method for aggregation, interpretation and classification of information from multiple sensor sources on the detection feature attribute level. The system extracts information derived from each sensor source to obtain detections and their feature attributes. At least two processing streams, one for each sensor source, are provided for converting the detections and their feature attributes into hypotheses on identity and class of detected objects. The detections are shared and combined between the two processing streams using hierarchical information fusion algorithms to determine which ones of the hypotheses on identity and class of detected objects have sufficient probabilities for classifying the information. [A1472]

"Cooperative resolution of air traffic conflicts"

A system and computer-implemented conflict resolution method for resolving air traffic conflicts involving a plurality of aircraft. The system may comprise an air traffic control system having a computer that implements a conflict resolution method, and a radar coupled to the traffic control system that provides position and velocity information for each aircraft. A communication subnetwork is used to communicate between aircraft and the traffic control system. Each aircraft may have a computer that implements the conflict resolution method, and a data link for transferring position and velocity information between the aircraft and the traffic control system over the communication subnetwork. Thus, either the aircraft, or the air traffic control system, or both implement the present method. The conflict resolution method in each aircraft and traffic control system cooperate to process position and velocity information relating to each aircraft to generate a series of conflict-free maneuvers for each aircraft that optimize the flight path of each respective aircraft toward their respective destinations while eliminating or minimizing the possibility of interference between the aircraft. [A1473]

"Method and system for detecting moving objects using a synthetic aperture radar system"

A method and system for detecting moving objects using azimuth streaks in synthetic aperture radar (SAR) image data are disclosed. The method and system of the present invention are directed to processing amplitude data relating to a SAR image, the first amplitude data having at least first and second indications corresponding to at least a first object moving at a substantially constant linear velocity and clutter, respectively, to separate or filter at least the first indication from the second indication, reducing/altering a spatial frequency power of the clutter corresponding to the second indication relative to a first azimuth streak power of a first azimuth streak corresponding to the first indication, and thresholding a first amplitude of the first azimuth streak to detect the first azimuth streak. [A1474]

"Optimum edges for speakers and musical instruments"

A descriptor has the capabilities of providing state vectors to describe movable platforms, extended objects, information collecting and surveillance systems. An aggregator furnishes the descriptor with abilities to deliver the state vectors in dynamical situations of instabilities and chaos. The former comprises navigation antennas, optical RF link systems, and processing center for delivering the state vectors from received navigation RF signals. The latter comprises an RF delay loop for aggregating a train of RF signals into a single RF pulsed signal and means for outputting the pulsed signal for analysis. The aggregator has many applications. for instance, an aggregator is able to unscramble pseudo random signals with partial codes and to enhance the statistics of weak transient signals. [A1475]

"Low observable radar augmented GPS navigation system"

The present invention comprises a low-observable radar altimeter augmented GPS (global positioning system) aircraft navigation system. The system of the present invention includes a GPS receiver, an attitude sensor, and a low-observable radar altimeter. The GPS receiver receives GPS signals and determines a position therefrom. The attitude sensor is coupled to the GPS receiver. The attitude sensor is adapted to receive GPS signals and determine a three dimensional attitude of the aircraft therefrom. The low-observable radar altimeter is also coupled to the GPS receiver and is coupled to the attitude sensor. The radar altimeter is adapted to measure an AGL (above ground level) altitude of the aircraft. The radar altimeter measures the altitude by employing a low-observable radar transmitter slaved to the attitude sensor. The radar altimeter uses the attitude sensor to maintain a radar beam in a substantially vertical attitude (e.g., parallel to the local gravity vector) . The system of the present invention uses the AGL altitude to increase the accuracy of the position. [A1476]

"Along-track interferometric synthetic aperture radar"

An along-track interferometric SAR (Synthetic Aperture Radar) of the present invention includes a single SAR line and observes a target only once. SAR data derived from a single observation are subjected to look division in order to reproduce two SAR images deviated in time from each other. Interference processing is executed with the two SAR images in order to determine a phase difference. The phase difference is converted to the velocity of the target. This can be done without resorting to any additional hardware. [A1477]

"Simplified system for integrating distance information from an additional navigation system into an existing aircraft design"

A simplified system for integrating a distance measurement derived from an additional navigation system into an existing aircraft design by creation of a Distance integrator function that makes use of existing Distance Measuring Equipment to couple the additional navigation system into the aircraft's display and navigation systems. [A1478]

"Onboard radar system for a vehicle"

An onboard radar system for a vehicle using the FM-CW method is provided. The radar system includes a mode changer. The mode changer provides a first mode which is suitable to detect a target existing distant from the vehicle. The mode changer also provides a second mode which is suitable to detect a target existing nearby the vehicle. The radar system detects a pair of beat frequencies in the first mode. Further, the radar system detects another pair of beat frequencies in the second mode. The radar system detects a target based on a pair of base beat frequencies which are determined based on an analysis result of both pairs of the beat frequencies. [A1479]

"Integrated horizontal and profile terrain display format for situational awareness"

A visual display format for a terrain situational awareness system comprising a horizontal terrain elevation view and a profile terrain elevation view of potential terrain hazards integrated onto a single display. [A1480]

"Signal discriminator and positioning system"

A system is described for discriminating between a transmitted signal and background noise comprising a transmitter adapted to transmit a signal including first and second pulses, separated by a predetermined time interval, and a receiver including a pulse detector to detect pulses received from the transmitter, a delay circuit adapted to delay transmission of the first pulse for a predetermined period of time in communication with the detector to receive a pulse therefrom, and an and gate having an output, a first input in communication with the delay circuit and an second input in communication with the detector, the time of transmission between the pulses equaling the time delay of the delay circuit, whereby the and gate allows transmission of a signal only when simultaneously receiving pulses from the detector and the delay circuit. The system can be used in the determination of the distance between two points, or in the location of an object within an area, based upon calculation of the time between transmission of an initial signal and receipt of a return signal. [A1481]

"Method for decoding and error correcting data of tactical air navigation and distance measuring equipment signals"

A method and apparatus for encoding and decoding data on navigation signal pulse pairs utilizes pulse position modulation (PPM) . The pulse interval between a first pulse and a second pulse of the pulse pair is varied depending on whether the logic value of the data to be encoded is a logic "0" or a logic "1". A tri-graph encoding process converts the raw input data into encoded input data. Each input data bit is encoded into three bits with each bit having the same logical value as the input data bit. The encoded input data is then encoded on the navigation signal using a pulse position modulation (PPM) technique. A decoder recovers the encoded data and provides an error correction process for high data integrity that corrects certain bit errors that may occur during the transmission and reception of the data on the navigation signal. The error correction process detects and corrects errors such as a missing bit, an extra bit or a bit error. [A1482]

"Radar systems"

A target tracking radar system for a guided missile wherein sum and difference signals from a reception antenna are multiplexed at a variable rate into a single channel receiver, the multiplexing rate depending on an alternating reference signal. The output of the receiver is applied to a phase sensitive detector operating in synchronism with the alternating reference signal and whose output is utilised to guide the missile towards the target. The detector output is also integrated and applied to circuit means which produces the reference signal, thereby forming a closed loop. The integrated detector output is also applied to a servo motor which drives the antenna to track the target. [A1483]

"Synthetic aperture radar"

A method of operating a SAR system comprised of emitting a sequence of pulses toward a target, alternating characteristics of pairs of successive pulses, receiving reflected pulses from the target, passing the received reflected pulses through a filter, modifying parameters of the filter in step with the transmitted pulses to match the characteristics of the successive pulses in the event a time delay between pulse transmission and reception of a pulse reflected from a target is a fraction greater than an even multiple of a pulse period, and modifying the parameters of the filter in anti-synchronism with the successive pulses in the event a time delay between pulse transmission and reception of a pulse reflected from a target is less than a fraction greater than an even multiple of a pulse period. [A1484]

"Method and apparatus for accomplishing extended range TCAS using a dual bandwidth receiver"

A Traffic Alert and Collision Avoidance System (TCAS) uses a dual bandwidth receiver to achieve extended range operation. During normal operations TCAS radio signals are filtered by a bandpass filter which passes all TCAS radio signals of interest. When extended range operation is desired the TCAS radio signals are filtered by a more narrow bandpass filter. The narrower filter passes only selected TCAS radio signals and improves the signal to noise ratio and thus allows detection of selected TCAS radio signals at extended range. The TCAS system switches between the normal mode and the extended range mode to detect and track aircraft at both near and far distances. [A1485]

"Global phase unwrapping of interferograms"

An interferogram is an array of phases, often generated from the inverse tangent of a ratio of an imaginary component divided by a real component. The array is said to be a wrapped phase array when the phase angle is modulo between zero and 2.pi.. A method of processing a wrapped phase array into an unwrapped phase array includes computing a first array from the wrapped phase array, each element of the first array being based on a discrete Poisson difference equation, processing the first array through a two dimensional FFT to form a second array, scaling the second array by a scaling function to form a third array, and processing the third array through an inverse two dimensional FFT to form the unwrapped phase array. The step of computing a first array includes forming a twice unfolded array from the wrapped phase array, computing a row difference array, an element in the row difference array being based on a difference between an element in a particular row in the twice unfolded array and an element in an adjacent row in the twice unfolded array, computing a column difference array, an element in the column difference array being based on a difference between an element in a particular column in the twice unfolded array and an element in an adjacent column in the twice unfolded array, computing a double row difference array, an element in the double row difference array being based on a difference between an element in the particular row in the row difference array and an element in an adjacent row in the row difference array, computing a double column difference array, an element in the double column difference array being based on a difference between an element in the particular column in the column difference array and an element in an adjacent column in the column difference array, and adding the double row difference array to the double column difference array element by element to form the first array. [A1486]

"Method and apparatus for localizing an object within a sector of a physical surface"

A method and apparatus for localizing a point within a sector of a physical surface such as an airport surface that is represented by a plurality of line segments. After entering the physical surface representation, a list of polygons is generated wherein each entry in the list of polygons includes a list of constituent line segments. Then, the list of polygons is organized into a binary tree to encode the relative positions of the polygons. With this organized binary tree, the object can be localized within a polygonal sector by dropping a point representing the object down the binary tree to determine which polygon, if any, encloses the point. [A1487]

"Radio location system for precisely tracking objects by RF transceiver tags which randomly and repetitively emit wideband identification signals"

An asset management radio location system uses time-of-arrival differentiation for random and repetitive spread spectrum, short duration pulse `blinks` from object-attached tags, to provide a practical, continuous identification of the location of each and every object within an environment of interest, irrespective whether the object is stationary or moving. Correlation-based RF processors determine which signals received by tag transmission readers are first-to-arrive signals as transmitted from any blinking tag, and an object location processor carries out time-of-arrival differentiation of these first-to-arrive transmissions from any blinking tag to determine where the respective object is located within the environment. A low power interrogation wand may be employed to refine the location of an object by a user programmed transmission-response exchange between the wand and the tag associated with the object of interest. [A1488]

"Method and apparatus for identifying, locating, tracking, or communicating with remote objects"

A broadband transmitter element, located at a remote object, transmits a broadband signal at a prescribed transmission time. A broadband receiver element, located at a base platform spaced from the remote object, receives electromagnetic radiation during a reception search window. The broadband receiver element stores information characterizing the broadband signal. A synchronizer synchronizes the broadband transmitter element with the broadband receiver element for timing the transmission and reception. A processing device derives an estimated time of flight for the broadband signal to travel from the remote object to the base platform, and a correlation detector, located at the base platform, identifies the remote object and the arrival time of the broadband signal by correlating the stored information with signals received during the reception search window. [A1489]

"Fire control system"

A fire control system and a method for estimating periodic component of a target path. An efficient, fast-setting estimator is realized by first estimating the period and then the amplitude of the periodic component on the basis of the most recent measurements made. [A1490]

"Method for the processing of the reception signal of a synthetic aperture radar with frequency ramps"

A Deramp type radar used in synthetic aperture radar for radar imaging transmits coherently repeated linear frequency-modulated pulses and carries out a sort of pulse compression in reception by demodulation of the echo signals received by means of a frequency ramp that reproduces all or part of a transmitted pulse, and by a Fourier transform performed in range. With this type of pulse compression, a parasitic phase modulation appears on the signal delivered by a Deramp type radar. This parasitic phase modulation disturbs the standard SAR procession operations for the construction of radar images. The proposed method is used to eliminate the detrimental effects of this parasitic phase modulation on the construction of a radar image. It consists of the adoption of a particular temporal support for the demodulation and of the correction of the parasitic phase modulation that appears with this particular temporal supports chiefly by a phase correction in the pulse response of the image focusing filter and, secondarily, by a another phase correction in the complex reflection coefficients obtained for the points of the image at the end of the SAR processing. FIG. 7. [A1491]

"Group tracking"

A method for automatic group tracking detects target formations and group tracks corresponding to each formation. Pseudo-observations are formed to represent missing observations in each track group. The pseudo-observations update the track states of undetected targets. Track validity estimates eliminate false tracks resulting from series of pseudo-observations. A group average velocity applied to each track in the group helps to maintain velocity stability. The operator has the option of suppressing the display of all tracks except for the leader of each group to eliminate the distraction of intra-group switching. This method can be applied to trackers that maintain a single track for each target or to trackers that maintain multiple track branches on each target, such as MHT. [A1492]

"Integrated precision approach radar display"

An improved precision approach radar (PAR) system using an integrated digital display for displaying the relative position of one or more targets, e.g., aircraft, to a preferred glide path and azimuth course line. A preferred PAR system uses a radar head which emits a pair of scanned radar beams and interprets reflected responses to individually determine aircraft targets, weather patterns and/or obstructions and displays each reflection category as a different pattern, preferably color coded, on an essentially non-flickering monitor. [A1493]

"Adaptive elevational scan processor statement of government interest"

A signal processing system applies space-time adaptive processing ("STAP") to an airborne surveillance Doppler radar comprised of a single-channel, electronically scanned antenna. The STAP substantially improves signal-to-interference-plus-noise ratio ("SINR") by synthetically creating angular degrees of freedom, thereby improving the detection of weak targets. [A1494]

"Dual transmitter visual display system"

A cost-effective wideband radar system capable of locating objects, such as reinforcing steel rods, pipes, and air bubbles, objects located behind or within a volume of, e.g., concrete, soil, wood, or air. A sequence of wideband radar pulses are emitted without a carrier from each of two transmit antennas. The system includes a receiver that detects reflected pulse energy (echoes) that result when transmitted pulses encounter a change in material (e.g., an air to metal change or concrete to metal change) . These amplitudes of the echoes are visually displayed along with the length of the transmit/echo path for each transmitter. The lengths of the displayed transmit/echo paths are compared to determine whether the system is centered over an object located within or behind a volume, the system being centered over the object when the transmit/echo paths for each transmitter/receiver combination are of equal length. [A1495]

"Continuous wave radar altimeter"

A continuous wave radar altimeter comprises a pulsed power control (4) , operable when the signal-to-noise ratio of the received signal is likely to be too low, to pulse the transmitted power so that the power varies between a non-zero base level and a higher level. The receiver channel (13, 14) is switched off during each transmitted pulse. [A1496]

"Subchirp processing method"

A method of performing the computer-intensive initial steps of the range migration algorithm, or RMA, produces radar imagery of higher quality than the current polar format (PF) processing approach, while operating faster and more efficiently than the standard RMA. The new method is advantageous when the synthetic aperture length required to achieve azimuth resolution is significantly larger than the azimuth extent of the processed scene. The method subdivides the signal history into a plurality of non-overlapping subapertures, adds a low bandwidth azimuth chirp across each subaperture and applies a fast Fourier transform separately to each subaperture. The results are coherently combined, after which the remaining steps of the conventional RMA may be completed with minor modifications to the subsequent two-dimensional phase compensation. The invention is applicable to spotlight, stripmap and scan-mode SAR image formation, and the separate, subaperture Fourier transformations may be performed simultaneously. [A1497]

"Swept range gate radar system for detection of nearby objects"

A cost-effective ultra-wideband radar system capable of locating nearby buried objects such as reinforcing steel rods, pipes, and other objects buried in concrete, soil, behind walls, or in the air. A sequence of ultra-wideband radar pulses e.g. at a plurality of frequencies in a range of about 2 MHz to about 10 GHz are emitted without a carrier and the system detects deflected pulse energy caused by the transmitted pulse whenever encountering a change in the medium i.e. an air to metal change or concrete to metal change. This reflected energy is detected and visually displayed. The range gate delay of the receiver is continuously varied, thus changing the distance from the unit to where the reflected energy would be potentially detected from the target. By continuously sweeping the "depth" of the scan, the operator need only move the unit in two dimensions across the surface to detect objects buried or hidden at varying depths interior to or behind the surface. The range gate system includes a multipoint background subtraction, corrected gain with distance, linear range gate time correction and a dielectric constant correction for a calibrated distance display. [A1498]

"Adaptive ground collision avoidance system"

A ground collision avoidance system that exhibits improved accuracy and performance by integrating with all other aircraft systems including guidance systems, navigation systems, digital terrain elevation databases, mission computers, and radar altimeters. The ground collision avoidance system fully utilizes active onboard sensors in combination with the knowledge of terrain and obstacle data contained in databases. Furthermore, the ground collision avoidance system provides a multiple processing path to determine numerous predicted flight paths based on a number of reasonable assumptions regarding the aircraft flight during a predetermined amount of time. By using predictive flight path schemes a realistic estimate of the predicted flight path envelope can be determined and then this information can be used in conjunction with accurate terrain elevation databases to determine whether a ground collision condition exists. On the basis of these calculations, appropriate warnings can be provided to the air crew as well as suggested maneuvers to avoid ground collision. [A1499]

"Calibration for pilot warning system"

A calibration system for a pilot warning system includes first and second calibration antennas spaced apart on an aircraft. The first and second calibration antennas receive the same pulsed RF signal, suitable delayed so that, after emission from the calibration antennas, the pulsed signal is received at times at antennas of the pilot warning system appropriate to indicate that a simulated target is within or outside (up or down) an elevation angular band of interest. Adjustment of relative timing is made by inducing relative transmission delays of the pulsed signal on its way to the two antennas. In one embodiment, different cable lengths produce the desired delays. [A1500]

"Method and apparatus for remote measurement of terrestrial biomass"

Method and apparatus for remote measurement of terrestrial biomass contained in vegetative elements, such as large tree boles or trunks present in an area of interest. The method includes providing an airborne radar system, overflying the area of interest while directing radar energy having a frequency of under 400 MHz, and preferably between 80 and 120 MHz, toward the area of interest, using the radar system to collect backscatter data from the radar energy as a function of incidence angle and frequency, and using an inversion algorithm to determine a magnitude of the biomass from the backscatter data for each radar resolution cell. A biomass map is generated showing the magnitude of the biomass of the vegetative elements as a function of location on the map by using each resolution cell as a unique location thereon. [A1501]

"Method for the calibration of the positioning errors of a radar and the drift in ground speed of an inertial unit on board an aircraft"

A method of calibration includes obtaining an estimation of the ground speed of an aircraft by an inertial unit V.sub.inertial and by a radar V.sub.radar in at least two different flight orientations and in using these estimations to determine the drift in speed B and a rotation matrix R corresponding to positioning errors of the radar with respect to inertial unit on the basis of the matrix relationship: applied for each of the flight orientations. The ground speed and ground speed drift vectors are expressed by their x, y and z components in a referential system related to the aircraft, and the matrix of rotation R being defined on the basis of the angles of positioning error in terms of yaw .phi., attitude .theta. and roll .psi. by the relationship: ##EQU1## [A1502]

"Apparatus and method for mitigating multipath"

An apparatus and method for discriminating between false images created by multipath and an aircraft of interest in an air traffic control environment by maintaining a three-dimensional database in the area of interest of the air traffic control environment, the three-dimensional database including a position of a radar radiation source, three-dimensional positions, orientations, and sizes of fixed reflectors and three-dimensional positions, orientations, and sizes of non-fixed reflectors, receiving return radar radiation from an unknown object, classifying the unknown object as an aircraft of interest if the return radiation from the unknown object correlates with previous returns, and classifying the unknown object by searching for a plurality of candidate reflectors and if a sum of the distances between the plurality of candidate reflectors is approximately equal to a distance between the unknown object and the radar radiation source, classifying the unknown object as a false image created by multipath. [A1503]

"Holographic transmission beam director"

The present invention applies to the art of wind sensing using lidar, and in particular to the art of detecting the speed of objects such as air-borne particles and molecules in the atmosphere in order to determine the speed and direction of the wind which is carrying them. The present invention is a beam director for directing a beam transmitted from a lidar at objects to produce backscattered light and for directing the backscattered light into a lidar receiver. The preferred embodiment of the director comprises a rotatable holographic optical element for directing the transmitted beam in various directions, and then through the same rotatable holographic optical element direct backscattered light from various directions into a receiver. In one alternative embodiment of the director, a prism is disposed in the director for directing the transmitted beam. The lidar having the beam director is moved in a vehicle such as a satellite, so that wind characteristics such as wind speed and direction at a number of altitudes and over a large area can be measured. [A1504]

"Method of inferring sensor attitude through multi-feature tracking"

A method for inferring precise sensor attitude information in a tracking sensor system begins with storing at a first time a reference image in a memory associated with tracking sensor. Next, the method includes sensing it a second time second image. The sensed image comprises a plurality of sensed feature locations. The method further includes determining the position of the tracking sensor at the second time relative to its position at the first time and then forming a correlation between the sensed feature locations and the predetermined feature locations as a function of the relative position. The method results in an estimation of a tracking sensor pose that is calculated as a function of the correlation. Because the method is primarily computational, implementation requires no new hardware in a tracking sensor system other than that which may be required to provide additional computational capacity. [A1505]

"Precision height measuring device"

An apparatus for measuring the height and cross-track offset of a surface location from a moving platform is defined. First and second antennas positioned on an underside of the platform are directed downwardly toward the surface. A transmitter associated with one of the antennas transmits a signal toward the surface. A first coherent detector associated with the first antenna detects a received signal corresponding to the transmitted signal as reflected by the surface and generates in-phase and quadrature components of the detected signal relative to the transmitted signal. A second coherent detector associated with the second antenna detects a received signal corresponding to the transmitted signal as reflected by the surface and generates a second set of in-phase and quadrature components of the detected signal relative to the transmitted signal. An analog to digital (A/D) converter converts the in-phase and quadrature components into digital information stored in a memory. A digital signal processor processing the digital information stored in the memory determines the height and cross-track offset of the surface location. [A1506]

"Aviation pilot collision alert"

A collision alert system employs binaural acoustic effects to direct the attention of a person in a desired direction. In one embodiment, the angular location of a possible collision risk is detected to energize one of a plurality of acoustic generators spaced angularly apart about the cockpit of an aircraft. The Pilot utilizes normal delay and acoustic modification of high frequencies to determine the direction to look for the target. In another embodiment, the pilot wears headphones which inhibit normal binaural direction location. The delay and acoustic modification are simulated before being fed to left and right headphones. In a wired system, the headphone signals are produced off the headphones. The head angular position of the pilot is compensated so that, as the pilot's head is turned toward the simulated target position, the delay and acoustic modification are adjusted to compensate for the actual head position. In a further embodiment, the target angle is communicated to the headphone-wearing pilot using an optical radiation emitter. A plurality of receiving devices on the headphone determines the angular location of the pilot's head relative to the target angle. In a further embodiment, an optical radiation emitter is modulated to indicate the target location. [A1507]

"Ultra-wideband swept range gate radar system with variable transmitter delay"

A cost-effective ultra-wideband band radar system capable of locating nearby buried objects such as reinforcing steel rods, pipes, and other objects buried in concrete, soil, behind walls, or in the air. A sequence of ultra-wideband band radar pulses are emitted without a carrier and the system detects deflected pulse energy caused by the transmitted pulse whenever encountering a change in the medium i.e. an air to metal change or concrete to metal change. This reflected energy is detected and visually displayed. The range gate delay of the transmitter is continuously varied, thus changing the distance from the unit to where the reflected energy would be potentially detected from the target. The receiver is driven by a fixed delay. By continuously sweeping the "depth" of the scan, the operator need only move the unit in two dimensions across the surface to detect objects buried or hidden at varying depths interior to or behind the surface. [A1508]

"Subaperture high-order autofocus using reverse phase"

A high-order synthetic aperture radar (SAR) autofocusing method decomposes phase error into basis function components, one order at a time. Image patches are partitioned into a plurality of subapertures in accordance with positive- and negative-going slope of the basis function at each order. A positive mask is applied to each subaperture within which the basis function is increasing in slope, whereas a negative mask is applied to each subaperture within which the basis function is decreasing in slope. The results are then correlated to obtain a focused image, with the principle of map-drift preferably being used to compute phase-amplitude weights. The method may be uniformly applied, enabling the steps to be performed at a plurality of increasingly higher orders without performance degradation. [A1509]

"Method for improving SAR system sensitivity in the presence of RF interference"

The sensitivity of a synthetic aperture radar (SAR) system employing stretch processing is improved in the presence of radio-frequency interference (RFI) . The sequence of data processing operations initially uses a high number of bits to digitize radar echoes plus RFI, then uses floating-point arithmetic to perform range deskewing to "compress" RFI tones, followed by threshholding and nulling the primary RFI contributors, and finally re-quantizes the resulting radar signal to a lower number of bits and appropriately allocating these bits over the range of signal levels. [A1510]

"Radar with a wide instantaneous angular field and a high instantaneous angular resolution in particular for a missile homing head"

This radar with a wide instantaneous angular field and a high instantaneous angular resolution, in particular for a missile homing head, includes essentially: a transmitting antenna with a relatively wide radiation pattern, transmitting a quasi-continuous wave, a receiving antenna including a plurality of radiating elements, means for formation of beams associated with said receiving antenna, to achieve a linear combination of the signals from the various radiating elements of said receiving antenna, in order to obtain a group of simultaneous reception beams allowing the instantaneous scanning of the airspace covered by said transmitting antenna. [A1511]

"System and method for determining a position of an object using output from a radar system"

An inertial navigation system (INS) and a monopulse radar system are mounted on a body. The inertial navigation system outputs at least a velocity of the body. Either a synthetic aperture radar (SAR) map or doppler beam sharpening (DBS) map is created using the outputs of the monopulse radar system. The monopulse radar system outputs at least a summation output, an azimuth difference and an elevation difference associated with an object detected in either the SAR or DBS map. The position processor of the system and method of the present invention, however, only inputs the summation output and one of the azimuth difference and election difference. The position processor determines the other of the azimuth difference and the elevation difference by converting the velocity output by the INS into a doppler angle .theta. (the angle between the velocity, a vector, and a line connecting the object and the body) and determining either the azimuth difference or the elevation difference from the doppler angle .theta.. In this manner, the present invention reduces the number of channels between the monopulse radar system and the position processor. This results in a weight, hardware, and cost savings without a corresponding reduction in performance. [A1512]

"Multirate multiresolution target tracking"

A multiresolution, multirate approach for detecting and following targets. The resolution of data obtained from a target scanning region is reduced spatially and temporally in order to provide to a tracker a reduced amount of data to calculate. Balances of computer processing resources with long-range detection and multiple target tracking are provided. Computer processing resources can be allocated to other systems while still maintaining an accurate tracking function and alternatively, the tracking function can receive a high level of computer processing resources and track at a finer resolution. An ability to recover raw data points from the spatially and temporally reduced values is also provided. [A1513]

"Combined air surveillance and precision approach radar system"

A radar system which time shares the use of a common radar head to perform functions associated with Air Surveillance Radar (ASR) and Precision Approach Radar (PAR) systems, i.e., for respectively displaying information to an air traffic controller useful for tracking an aircraft's approach to an airport and then guiding said aircraft along a preferred glideslope approach to a runway. In accordance with a significant feature of a preferred embodiment, a common radar head is comprised of an azimuth antenna capable of using radar beams to scan, e.g., electronically, a subsidiary scan arc, i.e., less than .+-.90.degree., mounted on a rotational scan apparatus that directs said radar beams within a principal scan arc, a full circle (360.degree.) , by continuously rotating, e.g., mechanically, said azimuth antenna at an essentially constant rate. By periodically advancing, preferably electronically, the emission direction of the rotating azimuth antenna, time periods are allocated that can be used to individually permit both ASR and PAR emissions to occur at one or more common rotational positions. [A1514]

"Thunder cloud observation system"

In the thunder cloud observation system of the present invention, the vertical direction accumulated water content (VIL) is calculated by the VIL arithmetic operation unit from echo strength data obtained by the climate radar, the echo peak temperature is obtained by the echo peak temperature arithmetic operation unit with reference to altitude-temperature comparison data on the basis of high atmospheric climate data, the precipitation area is determined by the area determination unit from the VIL data, and the thunder cloud area generated within the precipitation area is identified from the echo peak temperature data. The thunder cloud area determined by the area determination unit is subjected to the correlation processes in terms of distance and overlapping area by the identification/tracking process unit, thus performing the identification/tracking, and the results of the processes of the area judgment unit and the identification/tracking process unit are displayed in the image display unit. Therefore, even a thunder cloud area regionally generated within a cloud expanding at a relative low altitude can be identified, and the area thereof can be detected and tracked. [A1515]

"Microwave energy implemented aircraft landing system"

A microwave radio frequency landing system includes an aircraft borne transmitter/receiver (transceiver) and a ground unit. The ground unit comprises a dielectric material lens and a transponder module array. The transceiver transmits pulsed interrogation signals to the ground unit. The dielectric material lens focuses the pulsed signals onto the transponder module array. The transponder modules illuminated by the pulsed signals transmit continuous wave return signals to the aircraft. Each continuous wave return signal comprises four tones, which are used by the aircraft to determine azimuth and glide slope of the aircraft, carried on a microwave carrier. In each transponder module which receives the pulsed signals from the aircraft transceiver, the microwave carrier is phase inverted for the duration of each pulse of the pulsed signals. The phase inversions on the microwave carrier are used by the aircraft to determine the range, velocity and acceleration of the aircraft with respect to the ground unit. [A1516]

"Data link and method"

This is a Mode S radio frequency transmission system with coordinated use of a rotating directional antenna and omnidirectional antennas. A software-implemented prefilter both processes messages destined for aircraft equipped with Mode S datalink capable transponders, and prevents any uplink message transmission to a transponder from coinciding with the once-per-scan surveillance interrogation from the rotating antenna as well as any datalink interrogations specified for transmission through the rotating antenna. [A1517]

"Apparatus for directing a mobile craft to a rendevous with another mobile craft"

Tracking means for establishing a line-of-sight between a control point to which the second craft is being guided and tracking the line-of-sight to follow the second craft and deriving a signal .sub.a representing the rate of rotation of the line-of-sight about the control point, monitoring means for deriving a signal representing the displacement e of the first craft from the line-of-sight, a signal representing the range R.sub.m between the first craft and the control point, and a signal representing the rate of change R.sub.m of the range R.sub.m, presetting means for providing a signal representing a positive quantity k, and a computer for deriving signals representing .sub.c, .sub.c, and k to satisfy the equation ##EQU1## and minimize the difference -.sub.a, k being initially set equal to k.sub.1 , control means for deriving from the representations provided by the computer a signal representing f (e) +R.sub.m .sub.c +2R.sub.m .sub.c wherein f (e) is a function of e, and guidance means for causing the first craft to develop an acceleration transverse to the said line-of-sight, of a magnitude determined by the control signal. [A1518]

"Method for iterative disk masking and automatic error repair for phase unwrapping"

Disclosed is a new alternative method for the phase unwrapping of the interferogram of two SAR (Synthetic Aperture Radar) images of the same area. This new method uses an iterative approach to the phase unwrapping problem by applying local circular or elliptical masks centered on the phase residues. A phase unwrapping error is detected automatically during the unwrapping process by comparing each unwrapped value with neighboring unwrapped values. This new method for phase unwrapping significantly improves the quality of unwrapped phase maps. This will allow extraction of quantitative information such as height and deformation from interferometric SAR measurements. This is significant for the routine application of SAR interferometry in fields like digital elevation mapping and large scale deformation mapping. [A1519]

"Improved height above target (hat) measurement algorithm"

A method for measuring the height of an aircraft above a target. An aircraft or platform is provided with a synthetic array radar (SAR) system that is used to designate a target. The aircraft performs a constant g vertical maneuver followed by a second constant g vertical maneuver whose incremental acceleration is equal in magnitude to the first maneuver and has opposite sign. The maneuvers are out-of-plane relative to a plane containing the velocity vector of the aircraft and the target. The maneuvers correspond to a push-over maneuver followed by a pull-up maneuver. SAR map data is collected during the maneuver that includes the designated target. Quadratic phase errors contained in the collected SAR map data are measured. The height of the target relative to the ground plane of focus of the SAR system is computed using the quadratic phase errors. [A1520]

"Automatic horizontal and vertical scanning radar with terrain display"

A weather radar and terrain map display system for aircraft with the terrain elevation and weather information displayed in an easy to read and quickly comprehendible presentation. The system includes an antenna for transmitting and receiving radar signals, a digitizer for digitizing the reflected radar signals, a means for storing the signals and calculating the latitude and longitude coordinates of the features from which the reflected radar signals were reflected, and for storing terrain elevation data. Flight modes are programmable to rapidly change a size of an alert region appropriate for the current flight mode. A display simultaneously shows a plan view image and vertical views of contoured terrain elevation data and the weather conditions found by the radar. The terrain and weather displays 15 are superimposed over one another to enable quick and efficient location of critical terrain and weather conditions. The system can also calculate the latitude and longitude coordinates of the radar echoes without antenna stabilization. [A1521]

"Weapon system employing a transponder bomb and guidance method thereof"

A launch aircraft launches a bomb at a target and uses a radar to transmit a predefined waveform at the bomb and target. The bomb incorporates a transponder that frequency shifts the transmitted waveform and illuminates the target with a shifted waveform having a null at the center of its beam pattern. The initially transmitted waveform and frequency shifted waveform are reflected from the target and are received by the radar. The received signals are processed to generate a correction signal that is a function of the offset between the null of the frequency shifted waveform and the target location. The correction signal is transmitted to the bomb and is processed therein to correct the flight path of the bomb toward the target. [A1522]

"Dynamically compensated linear regulator for pulsed transmitters"

A system to alter the voltage supplied to the linear regulator of a pulsed transmitter in accordance with the temperature of the regulator, the minimum voltage required for a transmission and the specific aircraft installation requirements so as to reduce problems of heat dissipation in the regulator. [A1523]

"Method and device for locating and identifying objects by means of an encoded transponder"

A method and device for locating and identifying objects uses an encoding transponder in combination with the use of an SAR device carried in aircraft and spacecraft. Signals transmitted by the SAR device are received by the transponder are provided with an additional dominant signal structure and subsequently retransmitted back to the SAR device. Once the modulated code sequence is known, a signal correlation can be carried out between the signals output by the transponder and the signal reflected from the environment. [A1524]

"Apparatus for and method of controlling and calibrating the phase of a coherent signal"

The apparatus for and method of generating a coherent signal whose amplit, frequency and phase can be accurately controlled. A first and second signal are synthesized digitally in response to separate frequency and phase input data. The second synthesized signal is heterodyned with a coherent oscillator signal. This heterodyned signal, in turn, is heterodyned with the first synthesized signal to produce a coherent signal generator output. The amplitude of the generator output signal may be varied in accordance with attenuation input data. A phase modulator provides phase shift key modulation of the output signal in accordance with a phase control signal. In addition, a switch gates the output of the final mixer under control of a switch control circuit which determines the pulse width and timing of the signal generator output. [A1525]

"Microwave recess distance and air-path clearance sensor"

A machine having protruding elements 26 and an adjacent abradable seal 18, which move relative to each other, an air-path clearance G between the seal 18 and the elements 26 and an element distance D2 between the sensor 10 and the elements 26, is provided with a sensor 10 which is recessed within the seal 18 by a recess distance D. A clearance/thickness circuit 14 provides transmitted and reflected microwave signals 30,32 along a coaxial cable 12 having a characteristic impedance, to the sensor 10, which has an impedance substantially matched to the characteristic impedance of the cable 12. The sensor 10 provides the reflected signal 32 which is indicative of the recess distance D when the elements 26 are not in front of the sensor 10 and is indicative of the blade distance D2 between the sensor 10 and the elements 26 when the elements 26 are in front of the sensor 10. The circuit 14 receives the reflected signal 32 and provides electrical signals indicative of the recess distance D and/or the air-path clearance G. Alternatively, the circuit 14 may provide only the recess distance D. The sensor 10 provides such measurements whether or not the machine is operating. [A1526]

"Method of reducing ambiguities in synthetic aperture radar, and radar implementing the method"

A method of defocusing range ambiguities in a pulse radar, in particular of the SAR type, the method comprising the following steps: radar pulses are spread on transmission by using a plurality of "chirp" rules for varying the frequency of the transmitted wave as a function of time, during transmission of successive pulses, chirp rules are alternated between chirps that rise and chirps that fall in the frequency/time plane of the pulse, received echoes are compressed by matched filtering using a correlation operation between the received echo signal and the chirp rule that was applied at the time of transmission of the pulse that gave rise to said echo signal, said method being characterized in that said plurality of rules for varying the frequency of the transmitted wave as a function of time comprise a number M of said rules, with M being an integer greater than or equal to 3. [A1527]

"Method for azimuth scaling of SAR data and highly accurate processor for two-dimensional processing of scanSAR data"

In a method for azimuth scaling of SAR data without interpolation, raw SAR data in azimuth are multiplied with a phase function H.sub.5 (f.sub.a ,r.sub.o) , where f.sub.a denotes the azimuth frequency and r.sub.o denotes the range to a target point, and where a desired scaling factor is entered into the phase function. An azimuth modulation of the SAR data is subsequently adapted with the phase function H.sub.5 (f.sub.a,r.sub.o) to that of a reference range, in a manner so that the azimuth modulation no longer depends on the range. In a last step of the process, a quadratic phase modulation is performed in the azimuth so that, in order to attain an azimuth processing with a very high phase accuracy, the azimuth frequency modulation becomes exactly linear. [A1528]

"Coherent detection architecture for remote calibration of coherent systems"

An architecture for remote calibration of coherent systems uses coherent reference and calibration signals that contain the relative amplitude and phase information desired in the calibration process. Circuitry extracts the relevant amplitude and phase information needed for the calibration while compensating for non-synchronized clocks and the effects of Doppler shifts due to relative motion of the transmitting and receiver platforms. The coherent detection architectures can be used effectively with any scheme designed to determine the relative amplitudes and phases of the signals emitted from the different elements of the phased array. These architectures are particularly applicable to coherent encoding calibration procedures that enhance the effective SNR by using coherent transmission of orthogonal transform encoded signals from N elements of the phased array. In an example calibration architecture, coherent elemental signals are encoded using controlled switching of the delay phase control circuits themselves to effectively generate a perfect orthogonal transform encoding of the signal vectors, even though the control circuits may be imperfect, no additional encoding hardware is required. The switching is dictated by matrix elements of an N xN invertible binary matrix, with the most preferred embodiment being an orthogonal binary matrix, i.e., a Hadamard matrix. The coherent signals are decoded with the inverse of the same binary matrix used in the control circuit encoding. [A1529]

"Guided missile calibration method"

A method for calibrating the radar system includes the steps of: replacing stored statistically generated "average" error correction coefficients with error correction coefficients personal to a missile under test. More particularly, stored in the missile's memory are: (a) first personalized error correction coefficients generated in response to test signals produced internal to the missile and injected into a monopulse arithmetic unit for the missile's receiver/processor, and (b) a second set of personalized error coefficients generated in response to test signals external to the missile and injected through the missile's antenna to the receiver/processor. The missile includes a radio frequency (R.F.) energy test signal generator for performing a test during the missile's flight to determine "in-flight" personalized error correction coefficients. The test is performed in-flight by injecting the R.F. energy test signal generated internal to the missile during the missile's flight into the monopulse arithmetic unit for the receiver/processor. The receiver/processor: (a) compares the first set of error correction coefficients with the "in-flight" error coefficients and adjusts the second set of error correction coefficients in accordance with such comparison, and, (b) if R.F. energy external to the missile is less than a predetermined threshold level, uses the adjusted second set of coefficients during the missile's flight to produce boresight error signals, otherwise, the receiver/processor uses unadjusted first set of error correction coefficients. [A1530]

"Stealth aircraft identification system"

The invention is an identification friend or foe system for an aircraft providing identification information when illuminated by an incident radar signal. In detail, the system includes at least a portion of the aircraft's surface incorporating magnetic material for absorption of at portion of the incident radar signal with the remainder reflected and scattered back in the direction of the incident radar signal. A electromagnetic coil assembly) is positioned behind the aircraft skin and is used to impress a biasing field on a portion of the aircraft's surface incorporating the magnetic material such that the biasing field modulates the reflected and scattered signal. A system is coupled to the coil assembly to modulate the biasing field such that the reflected and scattered signal from the portion of the aircraft's surface incorporating the magnetic material is modulated with an encoded signal incorporating the identification information. [A1531]

"Method and apparatus for accomplishing extended range TCAS"

A Traffic Alert and Collision Avoidance System (TCAS) antenna is mounted on a selected forward portion of an aircraft thereby extending the effective forward range of the TCAS. The antenna and ground plane are tilted relative to conventional TCAS antennas thereby aligning a peak of the antenna's radiation pattern along the aircraft's level line of flight. The resulting increased gain directed forward of the aircraft increases the forward range of the TCAS for both receiving and transmitting TCAS signals. The invention is also useful to extend the range of other aircraft systems including transponders. Alternate embodiments include tilting a conventional TCAS antenna mounted on a middle portion of the aircraft. [A1532]

"Synthetic aperture radar and target image production method"

A synthetic aperture radar apparatus which analyzes Doppler frequency displacements arising from a range direction motion component of a target and motion components of a flying body to produce a motion target image wherein only azimuth direction motion components of the target are converted into Doppler components. An SAR apparatus wherein SAR reproduction processing is performed based on target information obtained from a reflected wave received from a target and flying information of a flying body includes a recording and reproduction unit for recording the target information and reproducing the data in a designated range, and a moving target processor for analyzing Doppler frequency displacements arising from a range direction motion component of the target and motion components of the flying body from the reproduced data and producing a moving target image wherein only azimuth direction motion components of the target are converted into Doppler components. [A1533]

"Model-based feature tracking system"

Methods and apparatus providing model-based feature tracking for location assessment of a sensor platform, or tracking of a feature are disclosed wherein a series of predictive models are developed to predict a location of features in subsequently acquired sensor data. Feature location data acquired by a sensor in a previous platform position assessment is used to build a model corresponding to anticipated feature locations in data acquired for a present platform position assessment. [A1534]

"N-best feasible hypotheses multitarget tracking system for space-based early warning systems"

An N-best feasible hypotheses multitarget tracking system for accurately detecting and tracking large numbers of closely spaced objects in a dense target environment in real time. The multitarget tracking system includes a two-dimensional focal-plane multitarget tracker for performing accurate single-sensor target track assembly of individual target data by directly generating N-best feasible hypotheses, a target typer for performing target typing and providing an initial estimate of each target's launch parameters, a launch parameter estimator for generating a target launch state vector and state error covariance matrix for each target from the assembled target track data, an optimal target data associator for performing multisensor state-to-state association of the target launch states, an optimal target data combiner for performing multisensor state-to-state fusion of the target launch states, a target state initializer for initializing an inertial target state vector and state error covariance matrix, and a target state estimator for recursively updating the inertial target track state vector and state error covariance matrix for each target. [A1535]

"Method for locating moving objects"

The method of the invention is mixed and uses, in the forward link, the measurement of the phase of tones modulating a carrier and, in the backward link, a spectrum spread by pseudonoise code, which makes it possible to date the reception of the message. Application to the location of miscellaneous moving objects (land, sea, air, etc.) . [A1536]

"Method of and apparatus for detecting living bodies"

An apparatus detects living bodies, in particular human living bodies, by ectromagnetic signals. The apparatus has a receiver device for electromagnetic signals that includes a device for obtaining frequency components that are characteristic in respect to living bodies, out of the magnetic signals. The receiver device includes a direct demodulator. [A1537]

"Radar detection of accelerating airborne targets"

Radar detection of accelerating airborne targets in accordance with the present invention utilizing a sequence of velocity, acceleration matched filters. This system includes a transmitter generating a signal oscillating at a predetermined frequency controlled by modulator such that the transmitter repeatedly outputs short duration pulses. The output pulse frequency is passed to an antenna that radiates the energy into free space. Reflected electromagnetic wave energy is received by the antenna to produce a radar return signal that is processed to a receiver that includes a radio frequency amplifier having an output that is mixed with a local oscillator signal an applied to an IF amplifier. An output of the IF amplifier is mixed with the output of an IF oscillator where the mixed signal passes through a low pass filter to a pulse compression network. An output of the pulse compression network is input to a matched filter processor array having multiple outputs applied to an adaptive threshold detector. Outputs from the adaptive threshold detector are applied to a display for creating human intelligent information. [A1538]

"Process and amplitude or phase monopulse radar device for locating flying objects"

The process and the corresponding phase or amplitude-single pulse radar device are used to locate a first and possibly a second target (TT1, TT2) detected by the radar beam from the direction x1, y1, x2, y2. The extended single-pulse aerial of the radar device has at least three partial aerials for a first measuring axis x (e.g. azimuth) which are arranged in such a way, have such directional characteristics and the signals of which are combined together and weighted in such a way that two mutually linearly independent, purely real or purely imaginary aerial functions which are independent of target displacements perpendicular to the first measuring axis are formed. The function course of these aerial functions F1 (x) and F2 (x) is measured for the individual case and the functional values dependent upon the target displacement x are stored in the storage unit (MEM) . Measurements are found for the targets of the position x1 and x2 detected by the radar beam according to the aerial functions F1 and F2. [A1539]

"Continuous wave radar altimeter"

A continuous wave radar altimeter comprises a memory (24, 26) , means for storing in the memory in digital form an array of return signals representative of the variation of reflected amplitude with path length, means (27) , for addressing the memory for identifying a peak return representative of the highest objects on the terrain, means (28) responsive to the array for determining the signal-to-noise ratio thereof, and means (29) responsive to the height at which the said peak return occurs and to the signal-to-noise ratio to determine a "center of area" height representative of the lowest surface on the terrain. The altimeter thus provides not only the peak level, representing for example the tops of trees and buildings, but also the ground level. [A1540]

"Device for motion error compensation for a radar with synthetic aperture based on rotating antennas (ROSAR) for helicopters"

The present invention pertains to a device for motion compensation for a radar with synthetic aperture based on rotating antennas (ROSAR) for helicopters, with which the flight guidance of the helicopter is made possible according to a radar image on a ROSAR basis, because this device substantially improves the quality of this radar image. [A1541]

"Light beam range finder"

A "laser tape measure" for measuring distance which includes a transmitter such as a laser diode which transmits a sequence of electromagnetic pulses in response to a transmit timing signal. A receiver samples reflections from objects within the field of the sequence of visible electromagnetic pulses with controlled timing, in response to a receive timing signal. The receiver generates a sample signal in response to the samples which indicates distance to the object causing the reflections. The timing circuit supplies the transmit timing signal to the transmitter and supplies the receive timing signal to the receiver. The receive timing signal causes the receiver to sample the reflection such that the time between transmission of pulses in the sequence in sampling by the receiver sweeps over a range of delays. The transmit timing signal causes the transmitter to transmit the sequence of electromagnetic pulses at a pulse repetition rate, and the received timing signal sweeps over the range of delays in a sweep cycle such that reflections are sampled at the pulse repetition rate and with different delays in the range of delays, such that the sample signal represents received reflections in equivalent time. The receiver according to one aspect of the invention includes an avalanche photodiode and a sampling gate coupled to the photodiode which is responsive to the received timing signal. The transmitter includes a laser diode which supplies a sequence of visible electromagnetic pulses. A bright spot projected on to the target clearly indicates the point that is being measured, and the user can read the range to that point with precision of better than 0.1%. [A1542]

"IFF system including a low radar cross-section synthetic aperture radar (SAR)"

An IFF system including an interferometric ultra-high resolution synthetic aperture (SAR) radar located on an aircraft and a respective transponder located on one or more ground targets which may be, for example, ground vehicles. Each transponder is responsive to RF pulses transmitted from the radar and includes means for generating an identification code which then modulates the radar return with a coded signal indicative of the target's identity. Upon receiving the signal from the transponder, the radar processes the signals in an interferometric moving target focusing (IMTF) mode and a high resolution SAR processing mode to provide signals indicative of both moving and fixed targets with ID data superimposed thereon. Target ID extraction apparatus also having the same identification code applied thereto is included in the radar signal processor and extracts the target ID by a correlation technique which is then displayed along with the radar image of the target in question. [A1543]

"Miss distance indicator data processing and recording apparatus"

A miss distance indicator data processing and recording apparatus compris an antenna which receives an RF missile telemetry signal from a missile attempting to intercept a target and a translated RF missile telemetry signal from an AN/DRQ-4 miss distance indicator which is on board the target. A first telemetry receiver filters, amplifies and down converts the RF missile telemetry signal to a first predetection carrier signal, and a second telemetry receiver filters, amplifies and down converts the translated RF missile telemetry signal to a second predetection carrier signal. The first and second predetection carrier signals are then supplied to an analog magnetic tape recorder which records the signals. The first and second predetection carrier signals are also supplied to a double balanced mixer which is connected to a frequency analyzer. The double balanced mixer generates a difference frequency signal which includes doppler shift and frequency offset and then supplies the difference frequency signal to the frequency analyzer. Time data is also supplied to the frequency analyzer by a time code source. The frequency analyzer displays a plot of frequency versus time which is used to accurately determine miss distance which is the distance the missile misses the target. [A1544]

"Method and apparatus for enhanced resolution of range estimates in echo location for detection and imaging systems"

A method and apparatus for enhancing resolution of range estimates in all echo location systems and, specifically, such systems as Radar, Sonar, and Synthetic Aperture Radar (SAR) , for example. The invention utilizes high order signal processing to "sharpen" or contract the main lobe of the processing system ambiguity function and suppress its side lobes, for a given transmission pulse bandwidth. The method and apparatus may be implemented in the frequency domain or time domain. Enhanced resolution is achieved by using a filter (MSC filter) , according to this invention, in the echo location data processing system so that the received echo data is processed by the MSC filter to produce a signal that exhibits enhanced range resolution. The MSC filter output, H (.omega.) , which is specific to the transmitted pulse waveform, is the ratio of a high-order manipulation of the transmitted signal with its modified spectral profile. [A1545]

"Tactical ballistic missle early warning radar and defence system"

The volume of space, in range, azimuth and elevation, over which a conventional Tactical Ballistic Missile (TBM) early warning radar is required to search for incoming missiles is very large. This placed very heavy demands on the radar designer, resulting in large, very high power, low mobility radars, with subsequent vulnerability to ARMs and other defence suppression systems. This invention proposes an alternative approach to a TBM early earning radar which considerably reduces both the design and vulnerability problem, and permits effective TBM early warning radars to be constructed using current technology. This is achieved by moving the radar (1) beyond the front edge of the defended area (2) . The increased elevation scan requirements are more than compensated for by a range-adaptive scanning technique which reduces the volume search time by more than 50% compared with a more conventional arrangement. [A1546]

"Ultra-wideband horn antenna with abrupt radiator"

An ultra-wideband horn antenna transmits and receives impulse waveforms for short-range radars and impulse time-of flight systems. The antenna reduces or eliminates various sources of close-in radar clutter, including pulse dispersion and ringing, sidelobe clutter, and feedline coupling into the antenna. Dispersion is minimized with an abrupt launch point radiator element, sidelobe and feedline coupling are minimized by recessing the radiator into a metallic horn. Low frequency cut-off associated with a horn is extended by configuring the radiator drive impedance to approach a short circuit at low frequencies. A tapered feed plate connects at one end to a feedline, and at the other end to a launcher plate which is mounted to an inside wall of the horn. The launcher plate and feed plate join at an abrupt edge which forms the single launch point of the antenna. [A1547]

"Image synthesis using time sequential holography"

A method and apparatus for producing an image of a target area, by: at an observation location spaced from the target area, transmitting a beam of electromagnetic radiation toward the target area, and receiving reflections of the radiation from the target area, providing a representation of the magnitude and direction of the distance between points on the target area which produce reflections that travel in phase to the observation location, varying the spatial relation between the observation location and the target area and/or the given radiation frequency, in order to establish a plurality of different observation states which succeed one another in time, each state being associated with a distinct combination of magnitude and direction of the distance between points on the target area which produce reflections that travel in phase to the observation location, producing two coherent radiation beams, directing the two beams onto a receiving plane provided with an array of radiation receiving cells and storing output signals from each receiving cell, and controlling the two beams, for each observation state in succession, such that the two collimated beams have: beam axes which are inclined relative to one another by an angle corresponding in magnitude and direction to the magnitude and direction representations, a phase difference corresponding to the phase difference between the transmitted and received radiation, and intensities such that the product of the intensities of the two beams corresponds to the intensity product of the transmitted and received radiation. [A1548]

"Adaptive post-doppler sequential beam processor"

A signal processing system applies space-time adaptive processing ("STAP") to an airborne surveillance Doppler radar comprised of a single-channel, rotating antenna. The STAP substantially improves signal-to-interference-plus-noise ratio ("SINR") , thereby improving the detection of weak targets. [A1549]

"Display apparatus for flight control"

A display apparatus for flight control comprises a digital scan converter which converts ASDE video signal into a radar display by a television scan video, a CPU portion which receives a radar target position via LAN and generates a computer graphic display by adding an operation information from operation panel, a picture synthesizing portion which superposes computer graphic display from CPU portion on a radar display, and CRTs which display a picture synthesized at synthesizing portion. ASDE radar signal is converted to television scan video signal via the digital scan converter. The computer graphic display is generated by adding an operation information to the target information such as an airplane at CPU portion. A radar display and a computer graphic display are synthesized at the picture synthesizing portion. Thereby various information necessary for flight control is displayed on CRT. [A1550]

"Reduction of radar antenna area"

The traditional minimum antenna area limit for synthetic aperture radar (SAR) , imposed by ambiguity considerations, is eliminated by using a transmitter format providing distinguishable sub-pulses. Signal formats which are feasible for implementing such sub-pulses include frequency-division (i.e., a distinct frequency band is used for each sub-pulse) , and code-division (i.e., sub-pulses occupying the same frequency band are grouped in distinguishable combinations) . The nominal pulse period is divided into N sub-pulses, and the sub-pulse group is transmitted with the nominal pulse repetition frequency (f.sub.p) . The range ambiguities are determined by the repetition rate of the sub-pulse group (f.sub.p) and the azimuth ambiguities are determined by the repetition rate of the sub-pulses (N.f.sub.p) . The antenna is capable of sampling a Doppler bandwidth that is a factor of N times the traditional value and the antenna area can be reduced by a factor N from the limiting value presently used in SAR antenna design. A reduction in antenna length by a factor of N, for example, can be obtained at the expense of a signal-to-noise decrease of N and an increase in signal bandwidth by the same factor. Alternatively, the same antenna length reduction of N and an increase in signal-to-noise by a factor N can be obtained using the original bandwidth if the resolution is degraded by N. [A1551]

"Air control supporting system"

A user interface apparatus for an electronic operation strip control system for supporting control services by presenting electronic operation strips used in airport control to a plurality of controllers who carry out airport terminal radar control services and entering control services previously distributed and associated with each other, including an information display device and an instruction input device provided for each controller. Operation strip control information items necessary for respective distributed control services are obtained and inputted into an information processing section, where the items are edited and processed in correspondence with the distributed control services and in accordance with contents of instructions from an instruction input device. Thereafter, the processed operation strip control information items are displayed on an information display device of a corresponding control seat, in accordance with instructions from the instruction input device, and simultaneously, operation strip control information items of related control services including operation strip control information items of the other control services are displayed on the same screen. It is therefore possible to reduce loads to controllers, to supply instructions more accurately and rapidly, and to enable visual communication between pilots and controllers. [A1552]

"Image synthesis using time sequential holography"

A method and apparatus for producing an image of a target area, by: at an observation location spaced from the target area, transmitting a beam of electromagnetic radiation toward the target area, and receiving reflections of the radiation from the target area, providing a representation of the magnitude and direction of the distance between points on the target area which produce reflections that travel in phase to the observation location, varying the spatial relation between the observation location and the target area and/or the given radiation frequency, in order to establish a plurality of different observation states which succeed one another in time, each state being associated with a distinct combination of magnitude and direction of the distance between points on the target area which produce reflections that travel in phase to the observation location, producing two coherent radiation beams, directing the two beams onto a receiving plane provided with an array of radiation receiving cells and storing output signals from each receiving cell, and controlling the two beams, for each observation state in succession, such that the two collimated beams have: beam axes which are inclined relative to one another by an angle corresponding in magnitude and direction to the magnitude and direction representations, a phase difference corresponding to the phase difference between the transmitted and received radiation, and intensities such that the product of the intensities of the two beams corresponds to the intensity product of the transmitted and received radiation. [A1553]

"Delay compensated doppler radar altimeter"

A delay compensated Doppler radar altimeter which eliminates the relative delay curvature associated with the energy reflected by a scatterer located in the along-track direction of an aerial platform for which a most accurate estimation of scatterer elevation is desired. By Doppler shifting each return, the range indicated for each scatterer over its illumination history is equal to the minimum range x.sub.h experienced when the relative velocity between the aerial radar and the ground is effectively zero. Compensating each signal so that its entire along-track history can be used for elevation estimation leads to an advantage of more than 10 dB in gain improvement over existing systems, and less degradation from surface topography. [A1554]

"Aircraft landing/taxiing system using lack of reflected radar signals to determine landing/taxiing area"

A system for displaying a landing/taxiing area as an aircraft approaches/taxis that landing/taxiing area. The system includes means on the landing/taxiing area that absorbs radar signals. The remainder of the landing/taxiing area reflects radar signals, and the system includes processors on board the aircraft or in the control tower for translating the signals and the lack of signals into a graphic representation of the landing/taxiing area. The representation changes as the orientation and position of the aircraft changes with respect to the landing/taxiing area. The system can include an autopilot control, head-up displays and memory systems. The system permits surface control by the tower. [A1555]

"Ranging systems"

A continuous wave ranging system comprises a modulator for modulating an r.f. carrier signal in accordance with a pseudo random code, a transmitting antenna for radiating the signal towards a target, a receiving antenna and receiver for detecting the signal reflected from the target, a correlator for correlating the detected signal with the transmitted code with a selected phase shift corresponding to the current range gate to be tested, whereby the range of the target from the system may be determined, and filtering means for filtering from the output of the correlator those range gate amplitudes which vary with a frequency less than a predetermined value. [A1556]

"Target detection method"

A target detection method collects spatial data relating to a target at an instant in time. This data is converted to an appropriate coordinate system, such as Cartesian coordinates. A centroid of the target is determined. Predictions of the centroid are made at subsequent time intervals. The predicted centroids are averaged with the current determined centroids. When the closest centroid position of the target is determined, an indication is provided for detonating the warhead of a projectile. [A1557]

"Remote alignment system"

An arrangement for coordinating positional and angle information made on separate relatively moving platforms, such as aircraft, having independent coordinate systems, uses measurements of a common reference made on both platforms. The measurements are transmitted to a common location. Measurements made at a first time are processed to determine two of three coordinate transformation angles. After a period of time, a second set of measurements is used to determine the third coordinate transformation angle. In a particular embodiment of the invention, the direction of motion of one of the platforms is controlled to be orthogonal to a coordinate axis of the other platform. When the coordinate transformation is determined, it can be used to coordinate or align navigation instruments, weapons, or the like. In one embodiment of the invention, a missile is directed toward a target, in a situation in which the target is viewed from the missile and another moving vehicle. [A1558]

"Survival radio interrogator"

Survival radio interrogator (1) transmits upon request a message including an identification of survival radio (3) . Upon receiving and processing this message, survival radio (3) determines its position from the Global Positioning System and transmits a message back to the search aircraft (2) with the survival radio interrogator (1) . The processor (10) of the survival radio interrogator 1 determines a range and bearing of the survival radio (3) and processes data from the survival radio 3 which data includes identification, position and messaging information for display on the LCD display 14. All message transmissions are conducted via the aircraft's (2) radio/intercom system (30) . [A1559]

"Atmospheric correction method for interferometric synthetic array radar systems operating at long range"

A method of computing and correcting phase errors due to atmospheric turbulence in a dual-antenna multiple-pass synthetic array radar (SAR) interferometer system. The method improves topographic mapping accuracy at very long ranges. The method computes an atmospheric correction from the residual phase difference between a two-pass interferometer output (containing atmospheric phase errors) and a dual-antenna single-pass interferometer output (for which atmospheric phase errors cancel because the two channels are collected simultaneously) . The residual phase measured in a single resolution element is then filtered by averaging over an area of many resolution elements, typically on the order of several thousand resolution elements. This exploits the long correlation distance of the atmospheric phase errors to reconstruct the dominant low-frequency part of the error spectrum. In addition, unwrapping the phase of the output of the complex Wiener filter produces an atmospheric turbulence measurement map. [A1560]

"Aircraft wake vortex hazard warning apparatus"

An apparatus for monitoring the position of objects in a space including a target supervisor, a location supervisor, and a hazard monitoring supervisor. The apparatus can detect and respond to a potential wake-vortex hazard condition. The tracking supervisor receives target data from a sensor, characterizes and tracks selected objects, and provides target outputs having features respective of the selected objects. The location supervisor characterizes and displays features in the space, and provides a location output having the aforementioned features. The hazard monitoring supervisor detects and responds to potential hazard conditions, and provides a notice of such conditions, responsive to the target outputs and the location output. A data logger selectively retains the target outputs, the location output, or both. The position monitoring apparatus has six modes: full operation, non-airport-surveillance-radar, isolation, set-up, adaptation, and simulation. The target supervisor receives data from an airborne surveillance radar, a secondary surveillance radar, a global-positioning-system-based sensor, a ground-based sensor, or an auxiliary sensor. [A1561]

"Software/hardware digital signal processing (DSP) altimeter"

A radar altimeter system uses a microprocessor-based subsystem to process radar signals in software. The subsystem includes a track loop and a verify loop for digital signal processing of the radar signals. The track loop generates a gate pulse and integrates a radar return signal over the time window defined by the gate pulse in order to determine the leading edge of the return pulse. The verify loop positions the gate pulse for maximum overlap with the return pulse and integrates the return pulse over the gate pulse to determine the maximum signal strength of the radar return signal. [A1562]

"Low-cost radio altimeter"

A relatively low-cost FMCW radio altimeter includes a voltage-controlled oscillator based upon a GaAs FET. The oscillator produces, for example, a 4.3 GHz microwave signal that is modulated with a triangular wave having a pin-selectable modulation frequency. The modulated signal is amplified by a buffer amplifier, as well as a power amplifier, and connected to an RF output terminal by way of a plurality of microstrips. Reflected signals are received at an RF input and are coupled to a mixer by way of a low-noise amplifier. The modulation signal is also applied to the mixer by way of a microstrip coupling device to produce an audio output signal whose frequency is proportional to the altitude above ground. The gains of all of the amplifiers are selected to eliminate the need for hand-tuning of the microstrips and to enable the use of a glass/epoxy circuit board. The output of the radio altimeter is an audio signal whose frequency is proportional to the height above ground, which enables direct digital conversion by way of a frequency-to-binary converter. [A1563]

"Aircraft landing determination apparatus and method"

An aircraft landing determination apparatus and method for determining landing status of an aircraft by tracking arriving aircrafts and providing a unique runway assignment therefor. The aircraft landing determination apparatus includes a target processor, a track administrator, and a track reporter. The target processor culls multiple target tracks from a target data transmission provided by a target sensor. The track administrator receives the target tracks, selects at least one arrival track therefrom, and allocates a unique runway assignment to each arrival track. The track reporter receives the arrival track and runway assignment, prepares a track report thereabout, and transmits the track report to a position monitoring apparatus. The method according to the present invention tracks aircrafts approaching a predefined space and can include correlation of selected targets to tracks, thereby confirming track candidate status, and drop zone tracking of the arriving track candidate through at least a portion of a drop zone. [A1564]

"Multi-mode radar system having real-time ultra high resolution synthetic aperture radar (SAR) capability"

One meter and one foot resolution is achieved in a multi-mode SAR radar system in real time by wide bandwidth RF signal generation, precision motion compensation, polar reformatting, autofocusing and high dynamic range image processing. An exciter/receiver of this system includes means for providing wideband RF waveform generation and down-conversion, while a programmable digital signal processor includes improvements in software for implementing the functions of motion compensation including the presuming of data, polar reformatting, autofocusing and image processing. [A1565]

"Nonhomogeneity detection method and apparatus for improved adaptive signal processing"

Apparatus and method for improving detection of targets in a radar system that employs adaptive filtering. A nonhomogeneity detector eliminates nonhomogeneous signals from the population of signals received. An adaptive filter weight controller estimates covariance matrices from only homogenous signals. Thus the apparatus and method improves the probability of detecting the presence or absence of a target at the same time that it decreases the probability of a false alarm by improving the performance of an adaptive filter. Though developed for airborne radar, the apparatus and method may be applied to the processing of any image. [A1566]

"Radar system method using virtual interferometry"

The virtual interferometer is an improved method for generating multiple ultaneous transmit beams as effected by a phased array radar. The technique is particularly suited to a solid state active radar array having a transmit/receive (T/R) module that is located at each radiating element. Potential applications to radar systems include environments such as air traffic control in which wide area surveillance with high search rates may be required. With multiple simultaneous beam generation coupled with parallel receiver beamformers and processors, such a radar system could support large volume searches while preserving the narrow beam characteristics by using the full aperture for generation of each of the multiple beams. The multiple simultaneous beams are generated by applying a particular phase shift at each radiating element, with no requirement for amplitude modulation. To form the multiple simultaneous beams on transmit, the antenna is logically divided into a series of equal segments, with a quadratic or near-quadratic phase profile applied to each of the logical antenna segments. The curvature of the phase function determines the angular extent covered by the series of beams being generated. This phase function has the effect of focusing the radiation at a specific distance either in front of or behind the phased array antenna, depending on the sign of the curvature. Each of the logical antenna segments interferes coherently with the others, resulting in a constructive/destructive interference pattern in the far-field of the antenna. [A1567]

"Method for determining terrain following and terrain avoidance trajectories"

A method that enables an aircraft to determine an optimal terrain following, terrain avoidance, or threat avoidance trajectory over terrain, thereby reducing its exposure and increasing its survivability. A grid of discrete terrain points corresponding to the terrain above which the aircraft is to fly is formed. Each point has a cost that is function of predetermined criteria. A cost is assigned to each of the points that is representative of the cost to get to the point based upon the predetermined criteria. A terminal point is selected that is a point that must be flown through at the end of the trajectory over the terrain, or in order to clear an obstacle in the flight path of the aircraft. A series of paths is computed through the terrain points to a selected terminal point, taking into account the aircraft's maneuvering capability and current attitude. A total cost at the terminal point is computed for each path, and the total cost for a particular path is the sum of costs at the terminal point plus the respective costs of all terrain points along the path. The path that has the least total cost to arrive at the selected terminal point is selected. The aircraft is then guided along a trajectory defined by the selected path. The present method not only generates trajectories lower than those generated by current procedures, but also identifies regions where natural terrain masking provides cover without requiring extremely low flight, thus reducing the stress on both aircraft and pilot. [A1568]

"Adaptive DPCA subsystem"

An ADPCA subsystem includes a weight processor for weighting the delta channel signal according to the results of an adaptive algorithm to which the output of a DPCA vector combiner is input. An AMTI vector combiner is connected to the output of the DPCA vector combiner to form the filter output. The delta channel signal is time delayed and samples of the delta channel signal are collected by the processor together with a sum channel sample and a residue sample, in order to apply the proper weights to the undelayed and delayed delta channel samples. The output of the ADPCA weight processor therefore provides an optimum correction signal to the vector combiner. [A1569]

"Aircraft N-number control system"

An aircraft N-number control system includes a receiver for receiving aircraft identification information signals representing alphanumeric characters corresponding to an aircraft. A microprocessor operating in accordance with stored programming instructions processes the received aircraft identification information signals into alphanumeric codes, determines whether there is a substantial similarity between the alphanumeric codes representing two aircraft and generates an output signal representing the alphanumeric codes only if there is no substantial similarity. The alphanumeric codes representing the aircraft are displayed on a air traffic controller's radar screen in response to the output signal. [A1570]

"Projectile motion parameter determination device using successive approximation and high measurement angle speed sensor"

The invention relates to an apparatus and method for determining parameters of motion regarding a struck projectile. The invention has particular application to determining the launch parameters of a golf ball struck by a golf club. A Doppler microwave speed sensor measures the apparent speed of a struck golf ball, which is the true speed of the ball subtended onto a radial from the sensor to the ball. The speed sensor is positioned a substantial lateral distance from a straight aim line, and the sensor's microwave beam is wide. As a result of this deployment, and in contrast to the typical usage of microwave speed sensors, the apparent speed measured by the sensor differs significantly from the true speed of the ball. The measured apparent speed results from a complicated interaction of initial ball speed, loft angle, and aim angle. A computer connected to the sensor acquires measured apparent speed data into an array. Within the computer, a trajectory prediction algorithm is capable of predicting an array of apparent speeds which would result from a given set of launch conditions. An error function is capable of ascertaining how well predicted apparent speeds match actual acquired speeds. A search algorithm uses the trajectory prediction algorithm and the error function to try a succession of progressively better guesses of launch parameters. Those launch parameters, comprised of initial ball speed, loft angle, and aim angle, which best account for the acquired apparent speed data are reported by the computer as the actual launch parameters. An impact detection device is configured to detect the impact of club on ball within a window of time in which such impact is plausible. The computer will not report launch parameters if a comparison using the error function indicates that the acquired data was likely the result of interference from an extraneous golf ball. [A1571]

"Doppler video signal conditioning circuit"

A doppler video signal conditioning circuit comprising first, second and rd buffers which respectively receive a voltage controlled oscillator signal, a second intermediate frequency signal and a second local oscillator signal from a missile' radar receiver. The buffered voltage controlled oscillator, second intermediate frequency and second local oscillator signals are then supplied to a doppler processing circuit. The doppler processing circuit processes these signals, providing at its output a reconstructed doppler video signal which includes a marker which is 20 kHz above the frequency the missile's radar is tracking. The doppler processing circuit provides the reconstructed doppler video signal to an analog-to-digital converter. The analog-to-digital converter digitizes the reconstructed doppler video signal before supplying the digitized signal to a frame controller. The frame controller assembles the digital data of the reconstructed doppler video signal into a plurality of telemetry frames with each frame having 1024 eight bit words. The eight bit words of each telemetry frame are then supplied to a parallel to serial shift register which converts each word from a parallel format to a serial format. The frame controller also generates timing signals and control signals for the analog-to-digital converter and the serial to parallel shift register. [A1572]

"Location and velocity measurement system using atomic clocks in moving objects and receivers"

A coherent signal generated at a precise frequency determined by an atomic clock is transmitted by a moveable object. A receiver station compares the frequency of the coherent signal received from the moving object with a second coherent signal generated at the same precise frequency by an atomic clock in the receiver to determine the radial component of the velocity of the moveable object relative to the receiver as a function of the doppler shift of the transmitted signal. Low cost, low power, miniature atomic clocks with an accuracy of 10.sup.-11 make possible accurate measurements of velocities of only centimeters per second. Such velocity measurement can be used to enhance radar tracking in air traffic control and collision avoidance systems. These velocity measurements can also be used to resolve tracking ambiguities in precision location systems, such as prisoner, geriatric and airport ground control systems, where three or more receiver stations each having an atomic clock measure time of flight of the transmitted coherent signal to triangulate moving object position. [A1573]

"Missile fuzing system"

A fuzing system adapted for use by a guided missile to generate a detonation signal for a warhead carried by the missile. The missile has a seeker/tracker to track, and direct the missile towards, a target. The seeker/tracker has: a seeker, gimballed with respect to the body of the missile, for producing a signal representative of the angular deviation between the target and the missile, and, a ranging system for producing a signal representative of a range between the target and the missile. The fuzing system, in response to the range signals, produces a time-to-go signal, t.sub.go, where t.sub.go, related to the range between the missile and the target divided by the rate of change in such range. The seeker produced signal represents the line of sight angle between the missile and the target and wherein the processor, in response to the range signal and the line of sight angle signal produces a miss distance signal representative of a predicted distance, normal to the line of sight, at the time the remaining before the missile intercepts the target. A fragment velocity signal is produced representative of the velocity of fragments of the warhead divided by the predicted warhead miss distance. [A1574]

"Apparatus and method for encoding and decoding data on tactical air navigation and distance measuring equipment signals"

A method and apparatus for encoding and decoding data on navigation signal pulse pairs utilizes pulse position modulation (PPM) . The pulse interval between a first pulse and a second pulse of the pulse pair is varied depending on whether the logic value of the data to be encoded is a logic "0" or a logic "1". A tri-graph encoding process converts the raw input data into encoded input data. Each input data bit is encoded into three bits with each bit having the same logical value as the input data bit. The encoded input data is then encoded on the navigation signal using a pulse position modulation (PPM) technique. A decoder recovers the encoded data and provides an error correction process for high data integrity that corrects certain bit errors that may occur during the transmission and reception of the data on the navigation signal. The error correction process detects and corrects errors such as a missing bit, an extra bit or a bit error. [A1575]

"Super spatially variant apodization (Super - SVA)"

In systems wherein signal compression is performed using matched filters or transforms, as in the case of radar, multiple extrapolations are used to resolve beyond the limits of defraction. In one example, development of the method begins with a complex, uniformly weighted SAR or inverse SAR signal represented by a rectangle function. After performing an FFT, adaptive sidelobe reduction is carried out followed by an inverse weighting and truncation, after which the original signal is used to replace the center portion of the extrapolated signal. The signal is again transformed and sidelobe reduced, and inverse weighting and truncation are again performed, followed by the original data replacement step. The extrapolation procedure may be repeated end times, extrapolating each time by a factor K for a total extrapolation factor of K=k.sup.n. [A1576]

"Process for generating wind profiler data free of fixed ground clutter contamination"

This invention discloses a process for generating wind profiler data which is free of fixed ground clutter contamination. The fixed ground clutter contamination is removed based upon the different decorrelation times of noise, clear air signals, and clutter. A nonlinear regression is used estimate the clutter content of the radar return which is then subtracted from the time series. This process is capable of removing broadband clutter from the desired clear air signal even though both may occupy the same Doppler frequency. [A1577]

"Synthetic aperture radar simulation"

In a simulated synthetic aperture radar SAR, a terrain elevation model is provided. A phase component of the simulated SAR data is computed by determining a distance between incremental terrain points and a simulated SAR platform modulo the wavelength. The amplitude component is computed in the following manner. The terrain elevation model is rotated about a vertical axis to present terrain strips extending perpendicular to the assumed direction of travel of the SAR platform. Points distributed along the terrain strips are projected into an illumination plane perpendicular to the assumed SAR signal and into an image plane perpendicular to the illumination plane. Brightness values and areas in shadow from the simulated SAR signal are determined by the projection into the illumination plane and brightness values are accumulated into an accumulation register corresponding to incremental pixel areas of the image plane by interpolating the brightness of illumination values in accordance with the incremental pixel areas of the image plane. [A1578]

"Control target surveillance system"

A control target surveillance system capable of acquiring positional data of a control target in a control zone at high precision with fewer communications lines in a short period of time. A D. GPS ground station obtains differential data with respect to positional data based on a GPS signal from a GPS satellite, and sends this data to a control target to compensate the positional data obtained from the GPS signal. A surveillance cycle is time-divided by the number of SSR codes, individual time slots are associated with the SSR codes, and each control target is allowed. [A1579]

"Multi-pass and multi-channel interferometric synthetic aperture radars"

A method of providing accurate elevation data from three or more complex SAR images. A SAR vehicle is operated to produce a number of SAR images at different grazing angles. The present method provides precise elevation maps derived from the SAR images. In a multiple channel variant of the present invention, more than two antennas collect SAR data from various grazing angles, increasing sensitivity while resolving the ambiguity problem in a mathematically optimum manner. A multiple pass variant of the present invention collects data from more than two passes, and from various grazing angles (interferometric "baselines") . The multiple pass approach and associated processing preserves the high sensitivity of the long-baseline available from dual pass IFSAR while resolving the ambiguity problem in a mathematically optimum manner. Accuracy and ambiguity resolution are improved with each additional pass or channel. The method processes raw SAR data to produce a plurality of complex images therefrom. The complex images are processed to produce a plurality of linear phase matched complex images and predetermined processing parameters. The plurality of linear phase matched complex images are then processed to produce a elevation map. The plurality of linear phase matched complex images are produced by matching noise power contained in each of the complex images to normalize the images to compensate for differences in gain of the systems from scan to scan, matching linear phase values of each of the complex images to correct for phase differences by estimating phase matching parameters for each of the complex images, estimating a phase-difference scale factor for each of the complex images, and ordering each of the complex images in terms of increasing phase difference scale factors. The linear phase values of each of the complex images are matched by computing a pairwise interferogram for adjacent complex images, summing sample-pair products of the interferogram to estimate the linear phase thereof, and computing the phase of the summed sample-pair products. The elevation map is computed by computing an initial elevation map using conventional IFSAR techniques applied to a pair of complex images, estimating additive phase correction values for each of the linear phase matched complex images, and estimating elevation values by maximizing the magnitude of the complex weighted sum of M complex images or complex interferograms, where the weights include the phase attributable to the estimated elevation to produce the elevation map. [A1580]

"Three-dimensional underground imaging radar system"

An ultra-wide band ground penetrating radar (GPR) system providing non-invasive detection and three-dimensional mapping of underground objects and voids. The performance of this radar provides improved underground object detection, location and identification over existing radars through the use of a novel interrupted, frequency modulated, continuous wave (FMCW) signal waveform. A synthetic aperture radar (SAR) technique known as spotlight mode focused (SAR) operation is used to collect data for the underground area of interest, by circumscribing this area with a radar beam provided on an airborne or ground based vehicle. Near-Brewster angle illumination of the ground is used to reduce losses. [A1581]

"Airport surface traffic control system"

An airport surface traffic system is provided which detects targets moving on an airport surface and automatically adds ID codes thereby reduces the controlling duties of an air traffic controller and elevates safety of an aviation control. An airport surface traffic system comprises airport surface monitoring radars which detects targets moving on an airport surface, ASDE target detector which detects targets by an output signal of the airport surface monitoring radars, a second monitoring radar which receives response signals from airplanes and from an airport monitoring radar which controls airport, ASR/SSR target detector which detects targets, ID code addition apparatus which adds an ID code to targets based on a signal from FDP which stores flight schedule data of airplanes and a multi-function display which displays targets. [A1582]

"Device for the detection and location of objects on the ground"

The device for the detection and location of objects on the ground in a delimited zone comprises (i) a radar transmitter/receiver provided with at least one antenna generating a radiating beam displaced parallel to itself over a path that is substantially transverse with respect to its direction round a stationary position relative to the ground, and (ii) synthetic aperture radar processing means processing the output signal of the radar receiver relating to the return of said beam over said zone in accordance with the antenna movement, so as to detect and locate the objects on the ground in the said delimited zone. [A1583]

"Radar system for transmitting and receiving radar signals via a common aerial"

The radar system comprises a transmitter unit and a receiving unit for radar signals, a trigger unit for guiding the radar signals from the transmitter unit and an aerial unit for transmitting the radar signals from the transmitting unit and for receiving reflected video signals. The transmitter unit and receiving unit each comprise at least two separate transmitters and receivers. All of the transmitters and receivers are triggered off by a common trigger which is arranged to trigger each individual transmitter mutually in series during a sequence period so that the transmitters produce signals with mutually distinct frequencies/characteristics. The individual receivers are matched to the respective transmitters to be able to present the frequencies/characteristics of video signals in approximately the entire sequence. [A1584]

"Time-of-flight radio location system"

A bi-static radar configuration measures the direct time-of-flight of a transmitted RF pulse and is capable of measuring this time-of-flight with a jitter on the order of about one pico-second, or about 0.01 inch of free space distance for an electromagnetic pulse over a range of about one to ten feet. A transmitter transmits a sequence of electromagnetic pulses in response to a transmit timing signal, and a receiver samples the sequence of electromagnetic pulses with controlled timing in response to a receive timing signal, and generates a sample signal in response to the samples. A timing circuit supplies the transmit timing signal to the transmitter and supplies the receive timing signal to the receiver. The receive timing signal causes the receiver to sample the sequence of electromagnetic pulses such that the time between transmission of pulses in the sequence and sampling by the receiver sweeps over a range of delays. The receive timing signal sweeps over the range of delays in a sweep cycle such that pulses in the sequence are sampled at the pulse repetition rate, and with different delays in the range of delays to produce a sample signal representing magnitude of a received pulse in equivalent time. Automatic gain control circuitry in the receiver controls the magnitude of the equivalent time sample signal. A signal processor analyzes the sample signal to indicate the time-of-flight of the electromagnetic pulses in the sequence. The sample signal in equivalent time is passed through an envelope detection circuit, formed of an absolute value circuit followed by a low pass filter, to convert the sample signal to a unipolar signal to eliminate effects of antenna misorientation. [A1585]

"Aircraft landing aid device"

The disclosure is an aircraft landing aid device that includes at least a database containing signatures and positions of reference objects, a sensor picking up signatures of reference objects, means of navigation used to fix the approximate position of the aircraft, means of correlation connected to said means of navigation, sensor and database, that define the vertical and horizontal bearings of the objects picked up by said sensor, and means of fixing the exact position of the aircraft, connected to said means of navigation, sensor and database. It is applicable in particular to airliners, enabling landing in all weather conditions. [A1586]

"Methods for compressing and decompressing raw digital SAR data and devices for executing them"

In a method for compressing raw digital SAR data input data are first coded with fewer bits by means of an adaptive block quantization (BAQ) and subsequently vectors are formed from the block-quantized data. The vectors are coded by a special mapping table in order to achieve an effective data reduction. In a method for decompressing digital data, vectors are generated from the coded data by means of a code book table, from which scalar values are formed. After de-standardization of the scalar values, decoded data are obtained in that the scalar values are multiplied for the de-standardization by the standard deviation of each block already calculated during coding. [A1587]

"Interferometric SAR processor for elevation"

An interferometric Synthetic Aperture Radar (SAR) system having a special-purpose processor to integrate motion compensation, interferogram coregistration, and a spectral shifting for optimal interferogram correlation together to achieve efficient, accurate, and robust three-dimensional imaging. A simple radar mapping coordinate system is implemented in the present invention to enhance the overall image processing and in particular to improve the accuracy and efficiency. The present invention substantially improves the fidelity and efficiency of phase unwrapping by incorporating phase-bootstrapping process, a correlation filter, and other processes. Absolute phase determination is implemented without known ground references by two proposed techniques employing cross-correlation of sub-patches to generate a number of estimates within a patch and weighting correlation processes. [A1588]

"Unambiguous range-doppler processing method and system"

Range-Doppler ambiguity is eliminated from an ultra-wideband radar system by transmitting an ultra-wideband chirped pulse towards a moving target, and mixing it with the doppler-shifted chirped pulse which is received as a target echo return signal. Multioctave radar tracing systems can potentiality track stealth aircraft without ambiguity since pulses containing many frequencies can defeat narrow-band radar absorbing material coatings. The unambiguous range-doppler signal processing method mixes the chirped pulse to yield an instantaneous Doppler frequency (which indicates target velocity) and a rate of change in the instantaneous Doppler frequency (which indicates target acceleration) . [A1589]

"System for detecting and viewing aircraft-hazardous incidents that may be encountered by aircraft landing or taking-off"

A system and method for detecting and viewing aircraft hazardous incidents such as flying aircraft and meteorological phenomena which includes microbursts, thunderstorms, tornadoes, and the wake turbulence of aircraft. The aircraft hazardous incidents are positionally and horizontally displayed to the pilot on a display, that is located in the aircraft cockpit, in relation to the flight path of the aircraft. The timely displaying of any of the aircraft hazardous incidents permits the pilot to take evasive action to avoid a potentially dangerous incident. [A1590]

"High resolution autonomous precision approach and landing system"

An aircraft including an approach and landing system, including a navigation unit for providing navigation information, a weather radar unit for providing radar information, a processor which receives navigation information from the navigation unit and information from the weather radar unit, the processor unit providing an output representing information concerning the aircraft in accordance with the provided navigation information and radar information, a memory for storing information representing a scene, the processor unit correlating the stored scene information with the output representing information concerning the aircraft to provide a mapped scene, a display unit for displaying the output of said processor and the mapped scene, and a steppable frequency oscillator for providing a signal which is stepped in frequency to the weather radar unit, thereby providing an increased range resolution. [A1591]

"Method of inferring sensor attitude through multi-feature tracking"

A method for inferring precise sensor attitude information in a tracking sensor system begins with storing at a first time a reference image in a memory associated with tracking sensor. Next, the method includes sensing at a second time a second image. The sensed image comprises a plurality of sensed feature locations. The method further includes determining the position of the tracking sensor at the second time relative to its position at the first time and then forming a correlation between the sensed feature locations and the predetermined feature locations as a function of the relative position. The method results in an estimation of a tracking sensor pose that is calculated as a function of the correlation. Because the method is primarily computational, implementation requires no new hardware in a tracking sensor system other than that which may be required to provide additional computational capacity. [A1592]

"System for minimizing automobile collision damage"

A system for minimizing automobile collision damage using radiant energy detectors and externally deployed air bags for aiding in damage reduction of automobile collisions. This system includes radiant energy detectors, such as radars, with transmitters and receivers, a computer, and energy absorbing inflation devices, air bags. Optionally, the system may be adapted to provide warnings and control vehicle functions, such as braking and disengaging the drive train. A dashboard link allows the computer to determine speed, steering and other conditions of the automobile, while the radiant energy detectors provide the computer with information of the object (e.g., another vehicle, pedestrian, or inanimate item) of imminent collision. The computer, using the information provided will determine at what time a ensuing collision will occur, and establish a minimal allowable time window to deploy the inflation device. The inflation device or air bag provides an energy absorbing and diverting buffer between the automobile and the object of imminent collision. The computer uses minimal allowable time window to deploy the air bag automatically, allowing the control of the automobile to remain with the driver such that necessary evasive measures can be taken. Once the imminent collision reaches the minimal allowable time window, the computer initiates a control signal deploying the external air bag. Once deployed, the external air bag reduces the amount of physical damage to the automobile, resulting in less injury, and repair costs. [A1593]

"Integrated RF system with segmented frequency conversion"

An integrated RF avionics system having a common IF interface for diverse functions, such as radar, electronic waveform (EW) and communications/navigation/identification (CNI) . The interface uses a segmented band of IF frequencies which are subdivided into two or more individual band segments separated by a guard band segment. The lower frequency band segment comprises a narrow band segment which is assigned to radar functions while the other or upper band segment comprises a wideband segment assigned to other functions such as EW and CNI functions. The guard band is not used for signal transmission, but is left unused to permit bandpass filters to reject signals in the adjacent unwanted segment, thus achieving frequency separation across the IF band while allowing the use of common hardware. The total IF range is sufficiently wide that radar, EW and CNI signals can be separated from each other with practical filters while being routed through a common IF switch network. Signals from various types of antennas are routed through an RF switch network to a bank of frequency converters for converting the RF signals to an IF frequency within the IF band. [A1594]

"Method and device for preventing collisions with the ground for an aircraft"

A mass memory stores a data base representing at least a substantial part of the terrestrial globe, in accordance with a grid configuration on several levels, said grid configuration being in particular more precise in the vicinity of an airport. Status indications are received representing the position of the aircraft with two horizontal components, and the altitude, and the velocity and acceleration vectors of the aircraft, as well as control indications coming from the flight deck. In accordance with the horizontal components of the position of the aircraft, a temporary local map is transferred into a fast access memory, on the basis of which map, an altitude envelope of the terrain is established in the zone where the aircraft is travelling. Anticollision processing make it possible to establish an alarm if the relation between a protection field and the altitude envelope meets a first condition which is defined at least partly by the control indications. The device has application as an aid for aerial navigation. [A1595]

"Automatic range reducing gating system"

A target detecting device having a plurality of gate circuits for detecting he presence of sea return signals and reducing the effective target detecting range to a range less than the range to the sea surface which permits the detecting of true target signals. [A1596]

"Process for monitoring ship traffic at sea while recognizing oil spills and potential ship collisions"

The invention provides a system and a method for detection of oil spills and icebergs at sea and for aiding the navigation of ship traffic to avoid collisions between ships and icebergs. A constellation of polar orbiting satellites is used to determine the position of icebergs and oil spills within an observation area, and this information is transmitted to a data processing center which also receives information concerning the position of ships within the observation area. The data processing center uses this information to evaluate the likelihood of collisions between ship and icebergs and sends warning signals to the ships, alerting them to the danger. The data processing center also correlates the position of ships and oil spills to determine the likely cause of the latter. [A1597]

"Ballistic projectile trajectory determining system"

A computer controlled system determines the three-dimensional trajectory of a ballistic projectile. To initialize the system, predictions of state parameters for a ballistic projectile are received at an estimator. The estimator uses the predictions of the state parameters to estimate first trajectory characteristics of the ballistic projectile. A single stationary monocular sensor then observes the actual first trajectory characteristics of the ballistic projectile. A comparator generates an error value related to the predicted state parameters by comparing the estimated first trajectory characteristics of the ballistic projectile with the observed first trajectory characteristics of the ballistic projectile. If the error value is equal to or greater than a selected limit, the predictions of the state parameters are adjusted. New estimates for the trajectory characteristics of the ballistic projectile are made and are then compared with actual observed trajectory characteristics. This process is repeated until the error value is less than the selected limit. Once the error value is less than the selected limit, a calculator calculates trajectory characteristics such a the origin and destination of the ballistic projectile. [A1598]

"Dynamic inertial coordinate system maneuver detector and processing method"

A maneuver detector and processing method for use in target trackers employed in weapon guidance systems, and the like, that employs multidimensional measurements and a set of inertial coordinate systems. The maneuver detector and processing method are implemented as follows. Time-delayed target position and velocity estimates of the target are maintained in a history file. These estimates are continuously updated, in that they are transformed 24 into intermediate north, east, down (NED) range Cartesian coordinate systems by correcting for aircraft motion. for each measurement time, the histories are used to predict the position and velocity of the target in an "observation-relative" inertial coordinate system aligned with the line-of-sight to the target. The error between the prediction and observation is calculated and used with the measurement accuracies to calculate a maneuver probability. [A1599]

"Airport surface monitoring and runway incursion warning system"

An airport runway incursion warning system for monitoring air and ground traffic at an airport. The system is optimally used with an aircraft that has an electronic tag or interrogation system that stores identification information regarding the aircraft, and an RF transponder for receiving interrogation signals and for transmitting the identification information in response thereto. A radar system comprises a plurality of radar sensor units disposed at predetermined installation sites adjacent to a runway. Each radar sensor unit typically has an interface processor and telemetry electronics for communication, although hard-wired communication paths may be used. An RF/telemetry interface is provided for communicating with the radar sensor units when the interface processor and telemetry electronics are used. The RF/telemetry interface is also used to transmit the interrogation signals to the aircraft and receive the identification information therefrom. A central processing unit is coupled to the radar sensor units for receiving and integrating radar data produced by each the radar sensor units to produce a map of the runway that identifies authorization objects and aircraft that do not constitute intrusion threats, and intruding objects that do constitute intrusion threats to the runway. The central processing unit is optionally coupled to the RF/telemetry interface for transmitting signals to and from the aircraft, and in this case, the central processing unit processes identification information received from the aircraft to integrate the identification information into to generate a displayed image. An operator display is coupled to the central processing unit for displaying the map and identification information generated thereby for use by an operator. [A1600]

"Combined ground and satellite system for global aircraft surveillance guidance and navigation"

The present invention provides a combined ground and satellite system for global aircraft surveillance, navigation, landing guidance and collision avoidance which comprises a satellite subsystem consisting of both a satellite constellation and associated ground stations, and a ground subsystem consisting of a network of ground stations, together with an airborne subsystem comprised of a transponder unit located in each of the aircraft using the system. A high speed two-way data link is provided between each of the subsystems using spread spectrum technology to permit overlaying and operation of the system in an existing band of narrow channels with minimum mutual interference. The system of the invention is reliable because of the redundant subsystems, and is not subject to failure. Also, the system provides for computations to be made on the ground, rather than in the aircraft, thereby reducing the size and complexity of the airborne equipment. The system also achieves a high degree of precision, as compared with the prior art systems. The system also provides air/ground data communication. [A1601]

"Method of image generation by means of two-dimensional data processing in connection with a radar with synthetic aperture"

In connection with a method for image generation by means of two-dimensional data processing, received SAR data are multiplied by a phase correction (H.sub.mc) for a reference range (r.sub.ref) for the insertion of a motion compensation and for processing at a high drift angle, and an additional cubic phase term is inserted for compensating a range migration. The entire range migration is then eliminated by means of an additional linear frequency displacement, subsequently the SAR data are transformed back into the "range-Doppler" domain. A remaining phase error, created by a "chirp scaling" correction, is corrected, the SAR data are transformed back into the time domain and a phase correction as a function of the range is performed by multiplication for the exact motion compensation in the time domain. The one-dimensional reference function is performed in the frequency domain for azimuth compression, by means of which two-dimensional SAR data are obtained. [A1602]

"Decentralized tracking and routing system wherein packages are associated with active tags"

In a freight tracking and routing system, each individual package is provided with a tag physically attached thereto. The tag includes a radio or infrared transceiver, and a microprocessor. At important nodes at geographical locations within the distribution system, location transceivers broadcast signals representative of their locations. The microprocessor, in response to receiving a desired destination signal, emits a signal commanding external equipment to take the package so that it remains at the desired location. The tags are also capable of being electronically queried, or alternately can emit distress signals when they do not reach a particular location at a particular time. [A1603]

"Device for protecting SSR transponders against unintended triggering on an airport with very limited muting activity in vertical direction"

A device is provided for interrogating airborne SSR transponders at an airport, in which in certain regions which are made non-active, P1 pulses are transmitted followed, with the correct timing, by P2 pulses which have the same or a larger amplitude than the P1 pulses. As a consequence, SSR transponders in these regions are blocked or muted, and this blocking or muting is repeated, whereas in one or a few selected regions, normal interrogating signals are transmitted. Spreading of transmitted pulses to higher levels above ground is countered by keeping the energy of the pulses low and the vertical gain of transmitter antennas small. [A1604]

"Secondary radar digital monopulse receiving apparatus and method"

A secondary radar uses monopulse reception techniques to improve the estimate of the aircraft position and to improve the reliability of the reply decoding process. Digital signal processing techniques are utilized to replace the analog circuit used in the prior implementations. The secondary radar implements monopulse processing using a half angle phase method wherein the sum and difference signals are encoded in a complete phasor. The detection of the signal and extraction of the azimuth angle data is implemented using a digital receiver concept. The complex phasor is sampled at an intermediate frequency, down converted to baseband and detected. The azimuth angle is computed using arithmetic methods implemented by digital signal processing circuitry. [A1605]

"Onboard aircraft flight path optimization system"

An onboard aircraft flight optimization system that includes an onboard performance management computer, a control display unit, an infrared probe, a temperature probe, a weather radar, an inertial navigation system, and comparing apparatus. The control display unit inputs a position remote from an aircraft into the performance management computer. The infrared probe determines temperature at the position remote from the aircraft and generates a remote temperature signal received by the performance management computer. The temperature probe determines temperature at the aircraft and generates a local temperature signal received by the performance management computer. The weather radar determines wind at the position remote from the aircraft and generates a remote wind signal received by the performance management computer. The inertial navigation system determines wind at the aircraft and generates a local wind signal received by the performance management computer. And, the comparing apparatus is disposed in the performance management computer and compares the remote wind signal with the local wind signal and compares the remote temperature signal with the local temperature signal so as to determine the position remote from the aircraft where the remote wind signal is less than the local wind signal so that an altitude can be achieved that has less head wind and is therefore more economically efficient. [A1606]

"Miss distance vector scoring system"

A miss distance scoring system comprising four antennas which are configu to provide for an optimal radiation pattern of pulsed radio frequency energy to determine a missile's miss distance and miss direction from a target. Reflected pulses from a missile are received by each of the four antennas and then supplied by a radio frequency switch to a scalar scoring system which provides an analog video signal to four analog switches. The four analog switches are also connected to a controller which provides control signals to the switches to separately activate each switch. The activated analog switch then samples and holds the analog video signal with the sample being provided to an associated bandpass filter of the switch which is one of four bandpass filters. The sampled portions of the analog video signal are provided to a multiplexer and then passed sequentially through the multiplexer. The resulting doppler video signal is supplied to an analog to digital converter which converts this signal to an equivalent doppler digital signal. The equivalent doppler digital signal is next supplied to a pulse code modulation encoder which encodes the signal into a serial bit stream and provides a frame sync to the serial bit stream for transmission to a ground station by a transmitter and its associated antenna. [A1607]

"All weather visual system for helicopters"

The invention relates to an all weather visual system that combines information from a ROSAR type radar sensor with navigation and flight information to provide artificial vision for the pilot. The radar utilizes the movements of rotating arms fixedly mounted on the rotor head of a helicopter. for this purpose, a turnstile is used as the central carrier structure, which is protected by an aerodynamically shaped body against atmospheric forces. The radar transmitter and radar receiver are located on the rotor head and in the tips of the rotating arms, respectively. [A1608]

"Inverse synthetic array radar system and method"

An inverse synthetic array radar (ISAR) system provides for improving the resolution of an ISAR image by providing compensation for non-uniformity in the magnitude of the angular velocity of a rotating target as the target rotates to generate the synthetic-aperture-angle, and enables use of a larger synthetic-aperture angle, without compromising ISAR image quality with respect to smear. The preferred embodiment records sampled data signals to generate a collected-data matrix indexed in each of two dimensions on the basis of uniform increments of time, and performs data processing to produce a translated data matrix indexed in a dimension on the basis of uniform increments of synthetic-aperture angle. Further processing of the translated data matrix produces data in a buffer for controlling a display device for the ISAR image. [A1609]

"Method of generating visual representation of terrain height from SAR data employing multigrid analysis"

In a method of recovering data representing terrain height from a synthetic aperture radar system the phase data is unwrapped by a Gauss-Seidel relaxation technique applied to a least squares differential equation in a multigrid algorithm. In the multigrid algorithm the problem represented by the least squares equation is transferred to successively coarser grids to more quickly remove the low frequency components of error. The resulting interim solutions determined on the coarser grids are then transferred successively back to the finer grids to converge on the finest grid of the grid array. [A1610]

"Imaging synthetic aperture radar"

A linear-FM SAR imaging radar method and apparatus to produce a real-time image by first arranging the returned signals into a plurality of subaperture arrays, the columns of each subaperture array having samples of dechirped baseband pulses, and further including a processing of each subaperture array to obtain coarse-resolution in azimuth, then fine-resolution in range, and lastly, to combine the processed subapertures to obtain the final fine-resolution in azimuth. Greater efficiency is achieved because both the transmitted signal and a local oscillator signal mixed with the returned signal can be varied on a pulse-to-pulse basis as a function of radar motion. Moreover, a novel circuit can adjust the sampling location and the A/D sample rate of the combined dechirped baseband signal which greatly reduces processing time and hardware. The processing steps include implementing a window function, stabilizing either a central reference point and/or all other points of a subaperture with respect to doppler frequency and/or range as a function of radar motion, sorting and compressing the signals using a standard fourier transforms. The stabilization of each processing part is accomplished with vector multiplication using waveforms generated as a function of radar motion wherein these waveforms may be synthesized in integrated circuits. Stabilization of range migration as a function of doppler frequency by simple vector multiplication is a particularly useful feature of the invention, as is stabilization of azimuth migration by correcting for spatially varying phase errors prior to the application of an autofocus process. [A1611]

"Air traffic advisory system bearing estimation receiver"

In an air traffic advisory system for determining the bearing of an intruder aircraft relative to a protected aircraft, the preferred apparatus determines a corrected bearing to compensate for bearing errors caused by intruder signal reflections. More particularly, the preferred apparatus uses a hybrid combiner to produce a sum, delta one and delta two signals, and determines the phase relationship between the sum signal and each of the delta signals, the two phase relationships being subject to at least partially offsetting errors due to intruder signal reflections. The apparatus determines an uncorrected intruder bearing from each phase relationship and then averages the uncorrected bearings to produce a corrected intruder bearing. [A1612]

"Method of independently controlling a guided flying body bearing a warhead and arrangement for implementing the method"

A method for the independent control of a guidable flying body that is provided with a warhead and to an arrangement for implementing the method. The method resides in that the flying body flies on a curved flight path during its flight approach phase and, on the curved flight path, the ratio S/C between the signals S reflected by the ground target and the clutter C of the ground, on the average, is kept constant or at least approximately constant. The path vector of the flying body during the subsequent target approach phase is oriented in the direction of the ground. The arrangement is configured in such a that an antenna array constructed of transmitting and receiving antennas is configured as a rigid component group that is fixed to the flying body and is switched to act on a transmit/receive unit, or a transmit/receive unit composed of light source (s) and detectors and operating on an optical basis is configured as a rigid component group that is connected with the flying body and the detectors are switched to act on an evaluation unit. [A1613]

"Secondary surveillance radar interrogation system using dual frequencies"

A communication system is provided for identifying the position of aircraft in a surveillance area. The communication system includes a dual-frequency interrogator which produces two signals at different frequencies. These signals are transmitted over a narrow beam, scanning antenna, the antenna being located within the surveillance area. A transponder is provided on the aircraft with an auxiliary antenna assembly tuned to a frequency equivalent to the difference between the dual frequencies. The transponder produces a signal containing aircraft identification information. A processing unit is co-located on the aircraft with the transponder to receive the two signals transmitted by the interrogator and produce a signal equivalent to the difference between those signals. The difference signal produced by the processing unit is coupled with the transponder and is used to identify the position of aircraft on the ground. A stationary antenna and receiver are tuned to the frequency of the transponder response and receive the transponder response. The stationary receiver transmits information to a position-estimating computer regarding the time of arrival of the aircraft signal. The position-estimating computer also receives information from the interrogator regarding the time of interrogation and the position of the antenna at the interrogation time. The position-estimating computer processes this information to identify the position of the aircraft on the airport surface. [A1614]

"Method and apparatus for finding aircraft position by integrating accelerations less time averages"

A method and apparatus for short-range position determination of aircraft, used for preventing errors in radar mapping from position inaccuracies, finds velocity in the x-direction (flight direction) by integrating accelerometer outputs. The accelerometer values are averaged over a time interval and then the average is subtracted from the instantaneous signal value, this difference, called adjusted acceleration, is integrated over time to yield a velocity. In turn, this velocity is time-averaged and the time average is subtracted from the instantaneous velocity. The resulting adjustment velocity is subtracted from the output of aircraft speedometer, and the difference is used to generate estimates of the average aircraft speed and acceleration by the method of least squares. These estimates are used to create a speed correction term for correcting the flight speed. The same process is used for positions in the y-direction and z-direction (vertical) , except that an additional integration, time-average, and subtraction are involved for each. [A1615]

"RF signal train generator and interferoceivers"

New apparatus comprise a optical fiber based RF signal train generator for storing transient RF pulses and regenerating the identical replicas for analysis. The apparatus further comprise RF receivers to process one stored pulse with a reference to other stored pulse. The present invention drastically increases our abilities to investigate acoustical, electromagnetic, and optical transient phenomena. [A1616]

"Short range radio locator system"

A radio location system comprises a wireless transmitter that outputs two megahertz period bursts of two gigahertz radar carrier signals. A receiver system determines the position of the transmitter by the relative arrival of the radar bursts at several component receivers set up to have a favorable geometry and each one having a known location. One receiver provides a synchronizing gating pulse to itself and all the other receivers to sample the ether for the radar pulse. The rate of the synchronizing gating pulse is slightly offset from the rate of the radar bursts themselves, so that each sample collects one finely-detailed piece of information about the time-of-flight of the radar pulse to each receiver each pulse period. Thousands of sequential pulse periods provide corresponding thousand of pieces of information about the time-of-flight of the radar pulse to each receiver, in expanded, not real time. Therefore the signal processing can be done with relatively low-frequency, inexpensive components. A conventional microcomputer is then used to find the position of the transmitter by geometric triangulation based on the relative time-of-flight information. [A1617]

"Range gated strip proximity sensor"

A range gated strip proximity sensor uses one set of sensor electronics and a distributed antenna or strip which extends along the perimeter to be sensed. A micro-power RF transmitter is coupled to the first end of the strip and transmits a sequence of RF pulses on the strip to produce a sensor field along the strip. A receiver is coupled to the second end of the strip, and generates a field reference signal in response to the sequence of pulse on the line combined with received electromagnetic energy from reflections in the field. The sensor signals comprise pulses of radio frequency signals having a duration of less than 10 nanoseconds, and a pulse repetition rate on the order of 1 to 10 MegaHertz or less. The duration of the radio frequency pulses is adjusted to control the range of the sensor. An RF detector feeds a filter capacitor in response to received pulses on the strip line to produce a field reference signal representing the average amplitude of the received pulses. When a received pulse is mixed with a received echo, the mixing causes a fluctuation in the amplitude of the field reference signal, providing a range-limited Doppler type signature of a field disturbance. [A1618]

"Manual probe acquisition system"

A probe acquisition and display system is disclosed featuring one simple trol for acquiring, tracking, and instantaneously locking for a missile control radar. The system provides for fast initial target acquisition and re-acquisition in the presence of intentional or unintentional interference. A dual trace oscilloscope display is provided with radar tracking (range) gate and a probe is used to touch a target on the display by a radar operator. [A1619]

"Apparatus and method for frequency space modeling"

This is a computer-implemented model for the frequency space utilized by the Mode Select Beacon System (the Mode S system) for air traffic surveillance and control. The model simulates the operation of interrogators, transponders, and receivers, and calculates the probability of interference between transponder reply signals using a sliding window. [A1620]

"Mutiple-clock controlled spatial light modulator"

A SAR radar has an optical processor which uses an electrical-signal-to-light modulator. The modulator includes a tapped delay line which may be either analog or digital, and the signals tapped from the delay line are applied to an array of temporary storage elements, which in the case of analog signals may be a capacitive sample-and-hold, or for digital signals may include storage registers. In order to improve the signal-to-noise ratio (SNR) by comparison with a processor using an acoustic modulator, the signals tapped from the delay line are sampled at a display sampling rate, which is very low by comparison with the signal sampling rate or the highest frequency of interest, and the sampled signals are held until the next following display rate pulse. The signals held in the temporary storage elements are applied to the modulator elements, so that the optical pattern remains fixed for relatively long periods of time during which the optical processing can integrate photons for improved SNR. [A1621]

"Horizontal miss distance filter system for suppressing false resolution alerts"

A horizontal miss distance filter system (220) is provided for inhibiting resolution alert messages from an air traffic alert and collision avoidance system (210) to a pilot's display (230) . The horizontal miss distance filter employs a parabolic range tracker (10) to derive a range acceleration estimate (11) utilized to discriminate intruder aircraft (110) having non-zero horizontal miss distances. The horizontal miss distance calculated from the range data provided by the parabolic range tracker is compared with a bearing based horizontal miss distance provided by a bearing based tracker (22) . The smaller of the two calculated horizontal miss distances defines a projected horizontal miss distance which is compared with a threshold value. Any resolution alert for intruder aircraft whose projected horizontal miss distance is greater than the threshold will be inhibited unless it is determined that the encounter involves a maneuver of one of the aircraft. As many as five maneuver detectors (50, 52, 56, 58 and 64) may be employed to assess whether the encounter involves a maneuver. If any of the maneuver detectors establish the occurrence of a maneuver, then a resolution alert provided from the TCAS system (210) will not be inhibited. [A1622]

"Airport integrated hazard response apparatus"

An apparatus for monitoring the position of multiple objects in a space including a target supervisor, a location supervisor, and a hazard monitoring supervisor. The tracking supervisor receives target data from a sensor, characterizes and tracks selected objects, and provides a target output having multiple features respective of the selected objects. The location supervisor characterizes and displays multiple features in the space, and provides a location output having the aforementioned features therein. The hazard monitoring supervisor detects and responds to a predetermined hazard condition, and provides a detectable notice of such hazard condition, responsive to the target output and the location output. A data logger for selectively retains the target output, the location output, or both. The position monitoring apparatus has six modes: full operation, non-airport-surveillance-radar, isolation, set-up, adaptation, and simulation. An integrator mode is included wherein the target supervisor receives data from a surface detection radar, an airborne surveillance radar, a secondary surveillance radar, a global positioning-system based sensor, a ground-based sensor, or an auxiliary sensor. [A1623]

"Airspace management system and method"

An airspace management system and method includes an alternate quick look mode display option which allows a user to designate a specific geographic region for display in a specified area on a display screen. Within this specified area, which can encompass a portion or all of the display screen, radar plot data is displayed for at least one aircraft for which input radar information is received. Symbols can be assigned to aircraft to differentiate friend and enemy aircraft, colors can be assigned to differentiate friend and enemy aircraft and plots, and radar-measured height information can optionally be displayed. In this quick look mode, near real-time positions for all aircraft within the quick look mode window are displayed, since selection of the quick look mode window bypasses normal time-consuming tracking information processing. Thus, a controller can view only essential plot and identification data in an aerial combat situation or to control an aircraft on a landing approach for example, with other portions of the display screen other than the quick look mode window, remaining unaffected. This airspace management system and method thereby combines the most useful attribute of an automated system, namely the automatic tracking of all aircraft, with the most useful attribute of a manual system, namely the near real time display of aircraft locations. [A1624]

"Antenna arrangement and aircraft collision avoidance system"

An antenna arrangement on a host aircraft for generating power signals related to a direction from which a transponder reply signal is received from a threat aircraft. The arrangement includes first and second monopole antenna elements arranged along a first axis of the host aircraft, third and fourth monopole antenna elements arranged along a second axis of the host aircraft, with the second axis being orthogonal to the first axis, a first quadrature combiner coupled to the first and second monopole antenna elements for generating first and second signals from the received reply signal, and a second quadrature combiner coupled to the third and fourth monopole antenna elements for generating third and fourth signals from the received reply signal. The respective power levels of the first, second, third and fourth signals are related to the direction from which the reply signal is received from the threat aircraft. [A1625]

"Measurement of topography using polarimetric synthetic aperture radar (SAR)"

The polarimetric technique of measuring azimuth direction terrain slopes utilizes a polarimetric synthetic aperture radar (SAR) to provide a direct measure of terrain azimuthal slopes and a derived estimate of terrain elevation. Utilizing this measure of the azimuthal slopes and estimated terrain elevations, a one-dimensional terrain slope map over a wide area may be produced without any prior knowledge of the terrain. Utilizing the method of steepest descent (or gradients) the polarimetric orientation of the peak (maximum) of the signature is determined for each image pixel. The terrain elevations are derived by integrating the slopes in the azimuthal direction and may be further refined so as to obtain absolute, rather than relative, elevation values by independently knowing at least one elevation "tie-point" along each slope profile being integrated. These orientations are proportional to terrain slope in the azimuthal direction. Processing of all the image pixels allows a complete two-dimensional topography elevation map of the terrain slopes can then be constructed from sets of elevation profiles spaced throughout the range direction. [A1626]

"Transponder system and method"

A system and method for determining the range between a receiver of a radio frequency signal and a transmitter of the signal includes transmission of a ranging signal having a grossly timed trigger followed by a chirp waveform. In response to receipt of the leading edge of the grossly timed trigger, the receiver of the ranging signal generates a first reference chirp at about the same time as the expected time of receipt of the chirp waveform, and thereafter compares the two chirps to provide a time correction signal (it being known that when two identical chirp signals, one time delayed from the other, are mixed, the resulting signal will have a frequency proportional to the amount of delay between the two chirp signals.) The time correction signal is used to correct the timing of an outgoing corrected chirp that is to be used to determine range between the transmitter and receiver based on a time of arrival. The corrected signal is received at the transmitter and compared to a further reference chirp that is generated at a known time. The comparison of the received signal to the reference provides a signal related to a time difference between receipt of the corrected signal and the further reference chirp in order to determine a range between the transmitter and the receiver. [A1627]

"Method of designing transmission power in synthetic aperture radar"

In a method of designing the transmission power of a synthetic aperture radar installed on a flight object such as an artificial satellite, the transmission power is designed such that, in applying radar equation P.sub.r =P.sub.t .multidot..sigma..multidot.A.sub.p.sup.2 / (4.pi..lambda..sup.2 R.sup.4) [P.sub.t : transmission power (W) , .sigma.: radar scattering cross section (m.sup.2) , A.sub.p : antenna area (m.sup.2) , R: distance to the object to be observed (m) , .lambda.: wavelength of radio wave (m)] for setting transmission power P.sub.r so as to satisfy the conditions required for the radar, the radar scattering cross section .sigma. is set to .sigma.=.sigma..sup.0 .multidot.S.sup.2 .multidot.4.pi./ .lambda..sup.2 [.sigma..sup.0 : scattering coefficient, S: area of irradiated domain (m.sup.2)]. [A1628]

"Separating coherent radio-frequency interference from synthetic aperture data"

The data is processed using a quadratic phase removal process to remove quadratic phase variations contained in the interference to compress the interference to its narrowest extent in a range frequency dimension. Partial motion compensation may be optionally employed using the partial motion compensation process to remove incidental Doppler modulation of the interference caused by motion of the radar during data collection, and to center the Doppler spectrum of radar and interference signals at a convenient frequency. The data is processed using an azimuth Fourier transform to compress the interference to its narrowest extent in an azimuth dimension to localize the interference into peaks while leaving the desired radar signals dispersed throughout the data in one or both dimensions. Optionally, another set of interference data, collected and interleaved with the radar video data and delayed a short time with respect to it, may be compressed in range frequency using a similar quadratic phase removal process and partially motion compensated to remove effects of undesired aircraft motion using a partial motion compensation process and compressed in azimuth using an azimuth FFT. The 2-D compressed interference data is then subtracted from the 2-D compressed radar video data by a subtraction process. The data is processed using a thresholding process to find interference peaks in the data. The found peaks are attenuated by attenuating azimuth cells and range cells. The data is processed using a second azimuth Fourier transform to restore the data to its original format. The data is then processed to produce an image for display. This is achieved by processing the data using a final motion compensation process to provide reference point tracking to remove the phase change imparted by the intentional motion of the aircraft during data collection, polar resampling the motion compensated data, weighting and two-dimensional Fourier transforming the polar resampled data, and autofocusing 25 the data to produce the image for display. [A1629]

"Synthetic aperture radar clutter reduction system"

A method, and corresponding apparatus, for deriving clutter-reduced images of the ocean surface in synthetic aperture radar (SAR) systems. An estimate of ocean surface parameters is first made and subsequently updated iteratively, to provide a reliable model of a selected patch of the ocean as it existed when a series of conventional spotlight mode SAR images were obtained. Based on the estimated ocean model, and on models of ocean wave behavior, of radar scattering behavior, and of the SAR acquisition system, predicted SAR images can be generated, and compared with the measured SAR images, and clutter-reduced images can be produced as a result. In addition to the clutter-reduced images, the method and apparatus of the invention produce an accurate estimate of ocean surface data, and can be used in a reliable approach for detecting hard targets on the ocean.

[A1630]

"Swept range gate radar system for detection of nearby objects"

A cost-effective ultra-wideband radar system capable of locating nearby buried objects such as reinforcing steel rods, pipes, and other objects buried in concrete, soil, behind walls, or in the air. A sequence of ultra-wideband radar pulses are emitted without a carrier and the system detects deflected pulse energy caused by the transmitted pulse whenever encountering a change in the medium i.e. an air to metal change or concrete to metal change. This reflected energy is detected and visually displayed. The range gate delay is continuously varied, thus changing the distance from the unit to where the reflected energy would be potentially detected from the target. By continuously sweeping the "depth" of the scan, the operator need only move the unit in two dimensions across the surface to detect objects buried or hidden at varying depths interior to or behind the surface. The range gate system includes a multipoint background subtraction, corrected gain with distance, linear range gate time correction and a dielectric constant correction for a calibrated distance display. [A1631]

"Swept range gate short range radar system"

A cost-effective ultra-wideband band radar system capable of locating nearby buried objects such as reinforcing steel rods, pipes, and other objects buried in concrete, soil, behind walls, or in the air. A sequence of ultra-wideband band radar pulses are emitted without a carrier and the system detects deflected pulse energy caused by the transmitted pulse whenever encountering a change in the medium i.e. an air to metal change or concrete to metal change. This reflected energy is detected and visually displayed. The range gate delay is continuously varied, thus changing the distance from the unit to where the reflected energy would be potentially detected from the target. By continuously sweeping the "depth" of the scan, the operator need only move the unit in two dimensions across the surface to detect objects buried or hidden at varying depths interior to or behind the surface. The range gate system includes a multipoint background subtraction, corrected gain with distance, linear range gate time correction and a dielectric constant correction for a calibrated distance display. [A1632]

"Apparatus and method for windshear data processing"

The present invention improves upon conventional windshear data processing techniques in three mutually exclusive aspects. First, the present invention provides an improved method and system for detecting microburst downdraft candidates. The improvement lies in its capability of detecting multiple candidates in range. Because of the added capability to detect multiple candidates in range, the present invention also provides an improved method and system for azimuthal association of the multiple candidates in range to define an accurate locus of headwind and tailwind pairs. Second, the present invention provides an improvement in that it utilizes a non-circularly symmetric spatial model to compute the vertical component of a total hazard factor. Third, the present invention provides an improvement in the accurate detection of small radii microbursts by correcting bias present in the data from which the small radii microbursts may be detected. [A1633]

"Method for the detection, localization and velocity determination of moving targets from raw radar data from a coherent, single- or multi-channel image system carried along in a vehicle"

In a method for the detection, localization and velocity determination of moving targets from raw radar data from a coherent, single- or multi-channel image system (SAR) , for representing the surface of the earth with different backscatter ratios, chronologically successive azimuth spectra are continuously formed during a defined period of time and a frequency shift of the backscatter ratio portion is obtained by determining the position of the maximum of the correlations between respectively two azimuth spectra formed chronologically directly in succession. Then the frequency shifts of the entire raw radar data set are evaluated for producing a frequency shift map. By searching for values deviating from the nominal Doppler rate in the Doppler rate map, a respective moving target is detected and the center of an image of the detected moving target is formed from this. By neglecting its radial acceleration, the tangential velocity of the moving target is determined by means of a Doppler rate taken from the Doppler rate map, and finally the radial velocity of the moving target is determined from the ratio of a length of the moving target in the range direction on the Doppler rate map and the duration of a scanning time by the antenna. [A1634]

"Near field RCS test facility and testing method"

A method for determining the far field radar signature of relatively large and complex objects, like a fighter aircraft, and the facility to provide the data for the method. The method includes reflecting different frequencies of near field radar energy off of an object while translating the object in a radial direction with respect to the radar so the resulting radar return includes a moving signal representative of the radar return of the object and a stationary return representative of environmental clutter. The environmental clutter and R 4 amplitude variations caused by signal strength variations due to the different overall reflection distances during translation are removed from the radar signal. Multipath reflections may also be removed. The resultant signal is transformed from a spherical wave to a cylindrical wave so that for objects having a major dimension that is presented to the radar with respect to a much smaller minor dimension at right angles thereto, the radar signature as determined by the method is almost identical to that obtainable at a far field radar range. In addition, the facility includes an electromagnetically shielded building, object translating devices with position feedback, object rotators, and a computer to perform the transformations. [A1635]

"Method and system for the detection and measurement of air phenomena and transmitter and receiver for use in the system"

A system and method for the detection and measurement of atmospheric air movement irregularities such as wind velocity vector, clear air turbulence, aircraft induced vorteces and turbulence, by means of electromagnetic waves. An air volume (10) under investigation is illuminated by a transmitter (1, 1A, 1B) with a beam of coherent electromagnetic energy (1E) , and a resulting wave field (2E) is received and subsequently coherently demodulated and processed in process means to derive information on the existence of the said atmospheric irregularities and furthermore to give specific measurements of related parameters. At least one receiver (2, 2A, 2B) for said resulting wave field (2E) , which is due to scattering in said air volume (10) , is positioned at a bistatic location having a selected distance (2R) from said transmitter (1, 1A, 1B) . Said electromagnetic energy (1E) is transmitted at microwave frequencies in a concentrated beam. Transmitter and receiver antennas (1A, 1B, 2A, 2B) , respectively, are directed so as to cover said air volume (10) with a scattering angle (.THETA.) chosen to have such a (low) value that scattering from atmospheric irregularities in said air volume (10) has a higher power than noise sources in the system. [A1636]

"Transponder squawk calibration"

An altimeter system for aircraft employs an aneroid, dash mounted altimeter having a needle coupled to an encoder. The encoder provides a signal indicating that the needle points to a certain altitude. A solid state transducer senses outside pressure and supplies a signal to a signal processor, which instructs a transponder to transmit an ICAA coded altitude signal. When the signal from the encoder is provided to the signal processor, it compares the altitude from the needle position with the altitude that is squawked. If the error exceeds a value stored in the signal processor, a fault is indicated to the pilot and squawked. If the error is within the stored value, an offset is computed from that value and is summed with the needle altitude and the sum is squawked. The squawked altitude is the value between the altimeter reading and the altitude indicated by the transducer. [A1637]

"Electric power receiving circuit and responder for automatic vehicle identification system including the same"

A first responder for transmitting an identification signal in response to a microwave interrogation signal comprises an electric power receiving circuit for receiving the interrogation signal to produce a dc power, having a microstrip line antenna having a trapezoid shape whose upside has a width from 1/2 to 1/4 of a wavelength, and a rectifying circuit. The rectifying circuit may be modified. A second responder comprises an electric power receiving circuit having a microstrip line antenna from the received microwave signal, a power supplying circuit for supplying a dc power in the vertical and horizontal positions of the responder against a polarizing plane of the microwave signal, an identification signal generation circuit for transmitting an identification signal through the antenna with given polarization plane by detecting the responder attitude. A third responder receives a microwave signal circularly polarized or polarized in vertical and horizontal directions and transmits the identification signal in either of vertical or horizontal directions according to the received microwave intensity in both directions. [A1638]

"Airport surface aircraft locator"

A system for identifying the location of an aircraft on the surface of an airport includes a plurality of low power FM transmitters located along the boundaries of runway and taxiways. Each transmitter provides an FM signal having a common carrier frequency and each FM signal is encoded with unique information indicative of the position of the transmitter on the airport surface. Aircraft and other vehicles containing a conventional FM receiver "capture" only the strongest signal and process the "captured" signal to determine which transmitter was the source of the signal and hence where the aircraft is on the airport surface. [A1639]

"Electronic surveillance system"

An electronic surveillance system for detecting unauthorized persons within a building. The system comprising a microwave transmitting/receiving device which transmits a microwave signal into the area under surveillance and receives microwave signals reflected from the area. The microwave signal having frequencies corresponding to the life functions of any living beings present in the area. The transmitting/receiving device comprising a signal conditioning device, a memory device, and a comparator unit. The signal conditioning device adjusts the amplitude and phase of a portion of the outgoing microwave signal and adds it to the incoming microwave signal, eliminating the carrier wave. The resultant actual signal is transmitted to the comparator unit which also receives a signal from the memory device comprising characteristic frequencies representing authorized occupants. If the results of the comparison are above a predetermined threshold, an alarm is generated. [A1640]

"Guidance seeker for small spinning projectiles"

A guidance seeker for a spinning projectile defined by its angular momentum vector, comprises a lens system or a millimeter-wave antenna for receiving radiation derived from a target and forming an image of the target. The lens system has a reticle having a pattern of concentric circles nutating about the projectile angular momentum vector such that the received radiation is modulated by the target image as the image moves across the concentric circles. The millimeter-wave antenna generates concentric lobes nutating about the projectile angular momentum vector such that the received radiation is modulated by the target image as the image moves across the concentric lobes. A detector is coupled to the lens system or the antenna for receiving the modulated radiation. The detector is adapted to generate an output in response to the received modulated radiation. A circuit is provided to process the output from the detector to determine the deviation of the target image from the axis of the concentric circles or lobes. [A1641]

"Processing for mode S signals suffering multipath distortion"

A communication system for receiving aircraft reply squits (transmissions) normally used in a radar beacon system for surveilling aircraft in a given geographic area. The communication system includes a plurality of omnidirectional receivers, each receiver having a function of omnidirectionally receiving the aircraft squits and developing therefrom two types of information strings, namely a data string, indicative of a message in the aircraft squit, and a corresponding confidence string indicative of the reliability of the developed data string. A data communication link transmits the data and confidence strings between the plurality of omnidirectional receivers and the master data processor. The master data processor processes the data strings and corresponding confidence strings developed by each of the plurality of omnidirectional receivers by performing a bit-by-bit comparison of the received data strings and corresponding confidence strings, so as to develop by the comparison a corrected data string which minimizes the use of data bits from the data strings received over the data communication link that are indicated by the corresponding confidence strings as having a low reliability. [A1642]

"Self telemetry fuze transmitter"

A self telemetry system for use on missiles that utilizes the existing on board fuze transmitter as a telemetry transmitter. [A1643]

"In flight doppler weather radar wind shear detection system"

An airborne doppler radar wind shear detection system has a volumetric scanning pattern for providing atmospheric measurement data for individual resolution cells that are formed into a 3-D grid of atmospheric data samples. Volumetric feature extraction modules identify and group resolution cells having particular features into air masses of interest. A spatial feature association and filtering module combines the air masses of interest into a 3-D representation of atmospheric conditions and filters out ground clutter. A contextual matching and temporal tracking module compares the 3-D representation to known wind shear models and compares successive 3-D representations to one another to aid in identifying hazardous wind shear conditions in the aircraft flight path. [A1644]

"Airport surface safety logic"

An airport safety logic system includes a target state machine, a prediction engine, light-control logic, and alert logic. The target state machine receives a plurality of tracks, each of which includes information about an airport target object including a track number, position, velocity, acceleration, and a measure of the size of the airport target object. The target state machine also determines, for each track, a state of the airport target object at an airport including whether the object is stopped, taxi-ing, arriving, landing, aborting a landing, departing, or aborting a departure. The prediction engine utilizes, for each track, at least the position and the velocity of the object to predict a variety of things. The predictions include a maximum and a minimum distance the airport target object could travel in a period of time, and a maximum distance path and a minimum distance path the object could follow in that time period. The prediction engine also determines, if the state of the object is "arriving," whether the airport target object can land on a particular runway of the airport. The light-control logic controls runway-status lights of the airport based on the predictions and determinations made by the prediction logic. The alert logic determines if two or more objects are at risk of colliding based on the predictions and determinations made be the prediction logic, and then generates visual and audible alerts in an airport control tower of the airport if risk of collision exists. [A1645]

"Turnout protection for aircraft tractor"

An aircraft extending along a longitudinal aircraft axis and having a nose wheel pivotal about an upright wheel axis can be maneuvered by a tractor extending along a longitudinal tractor axis and adapted to engage the nose wheel of the aircraft. The tractor and aircraft axes can extend at an angle to each other that should not exceed a predetermined maximum turnout angle. A turnout protection system has structure on the aircraft that is directed generally perpendicular of the aircraft axis and that is only directed toward the tractor when the aircraft and tractor axes extend generally at the maximum turnout angle relative to each other. At least one electronic sensor on the tractor directed toward the aircraft detects the structure when the aircraft and tractor axes extend generally at the maximum turnout angle relative to each other. A controller on the tractor takes action, e.g. emits an alarm or takes over the tractor steering and/or braking, when the electronic sensor detects that the aircraft and tractor axes extend generally at the maximum turnout angle relative to each other. [A1646]

"Method of evaluating the image quality of a synthetic aperture radar"

An active reflector including an antenna, a frequency converter, and a delay circuit is placed at a location within an area to be detected by a synthetic aperture radar. The active reflector receives an incoming radio wave emitted by the synthetic aperture radar and changes its frequency or delay time. The resultant radio wave is transmitted as a reflected radio wave toward the synthetic aperture radar. As a result, the position of the active reflector image displayed on the screen of the synthetic aperture radar is shifted. The ambiguity is quantitatively detected from the pixel value at the original display position at which the active reflector image was displayed before it was shifted, thereby evaluating the image quality of the synthetic aperture radar. [A1647]

"Time-of-flight radio location system"

A bi-static radar configuration measures the direct time-of-flight of a transmitted RF pulse and is capable of measuring this time-of-flight with a jitter on the order of about one pico-second, or about 0.01 inch of free space distance for an electromagnetic pulse over a range of about one to ten feet. A transmitter transmits a sequence of electromagnetic pulses in response to a transmit timing signal, and a receiver samples the sequence of electromagnetic pulses with controlled timing in response to a receive timing signal, and generates a sample signal in response to the samples. A timing circuit supplies the transmit timing signal to the transmitter and supplies the receive timing signal to the receiver. The receive timing signal causes the receiver to sample the sequence of electromagnetic pulses such that the time between transmission of pulses in the sequence and sampling by the receiver sweeps over a range of delays. The receive timing signal sweeps over the range of delays in a sweep cycle such that pulses in the sequence are sampled at the pulse repetition rate, and with different delays in the range of delays to produce a sample signal representing magnitude of a received pulse in equivalent time. Automatic gain control circuitry in the receiver controls the magnitude of the equivalent time sample signal. A signal processor analyzes the sample signal to indicate the time-of-flight of the electromagnetic pulses in the sequence. [A1648]

"Pilot warning system"

This invention relates to a system to alert an aircraft pilot of the presence and general location of other aircraft that might constitute a collision threat to the pilot's aircraft. A first and second antenna on the upper paid lower surfaces of the aircraft each operate in first and second modes characterized by respective first and second directivity conditions. The first and second antennas directly receive pulse signals from a source in order to determine the relative time of arrivals and thus the relative altitude of the source to the aircraft. Analysis means compares amplitudes of responses in the first and second modes to provide an angle indicating signal without having to generate radio signals other than those already being generated by equipment in the other aircraft in response to ground ATC interrogation. [A1649]

"Frequency range gate closure"

A frequency range gate closure circuit for use in synthetic aperture radars that incorporate a digital waveform generator or direct digital synthesizer that improves the mapping resolution of the radars. Range gate closure motion compensation is more accurately implemented using the present circuit. The digital waveform generator or direct digital synthesizer is clocked by a system clock, and processes control words corresponding to a desired slope of the stretch frequency modulation of transmitted radar signals, to generate frequency modulated pulse output signals. The range gate closure circuit includes a digital data accumulator for receiving an increment value and a pulse repetition frequency value of the radar. Logic circuitry is coupled to an output of the digital data accumulator and is coupled to receive a digital modulo threshold signal and output the increment value when it is less than the digital modulo threshold signal every pulse repetition interval. The difference between the digital modulo threshold signal and the increment value is coupled to the digital data accumulator to reset it when the increment value is less than the digital modulo threshold signal. A coarse time delay counter is coupled to the logic circuitry for counting desired coarse time delays needed by the circuit. The frequency range gate closure circuit decrements a frequency offset of a local oscillator frequency sweep by the increment value every pulse repetition interval until the frequency offset is less than the digital modulo threshold signal so that the frequency offset is equal to the expected Doppler frequency error. [A1650]

"Detection system"

A detection system will detect targets against a fixed background if the target is of a type emitting a gaseous plume. The detection system directs electromagnetic energy, preferably radio frequency signals, toward the fixed background in an area of suspected target activity. The detection system has a receiver which detects reflected electromagnetic energy from the fixed background. The system will identify anomalous variations in range. The variations occur as a result of refraction of the electromagnetic energy wave passing through the gaseous exhaust stream. This indicates a probable target which is creating exhaust plume. [A1651]

"Beam position indicator for directional radar"

A radar display having particular utility in search and rescue radar systems, employs a computer receiving inputs indicative of aircraft altitude, radar beam tilt angle and radar beam bandwidths to provide signals to the display indicative of where the radar beam intersects the surface under investigation. [A1652]

"Method of classifying and identifying an object using Doppler radar"

The invention relates to a method of classifying and identifying an object, for example satellites, aircraft, land vehicles and ships with a Doppler radar system in which a video signal is generated by means of coherent signal processing and tracking data including, position and changes in position, are determined from the video signal for the object. The method includes representing the object as an inverse synthetic radar aperture image and then selecting a reference object with the aid of the tracking data and the rotational axis of the object. A representation of the reference object is rotated into a position that corresponds to the spatial rotational axis of the object and then superimposed over the inverse synthetic aperture radar image of the object. Identification of the object is effected by comparing the representation of the rotated reference object with the inverse synthetic aperture radar image. [A1653]

"Ground surveillance radar device, especially for airport use"

The surveillance radar device comprises, in combination, a fixed antenna for providing electronic scanning of space in bearing in the horizontal plane, a transmit source and microwave frequency transmit/receive means with a circulator, a transmit channel, a receive channel and means for subdividing the receive channel into a sum signal and at least one difference signal. A first and a second receiver element with frequency change respectively receive the sum and difference signals, and provide numerically coded outputs. Processing means process numerical signals from the first and second receiver elements for the radar detection of objects in the zone under surveillance. [A1654]

"Stabilizing method of synthetic aperture radar and position determining method thereof"

A stabilizing method of a synthetic aperture radar and a position determining method by the radar. At least three repeaters are arranged in mutually different positions on the ground or the sea and a radio frequency signal having a predetermined frequency is transmitted from the radar mounted on a radar platform such as an aircraft to the repeaters. Each repeater frequency-modulates and amplifies the received signal to return the signal to the radar. The radar receives the signal returned from each repeater. The radar calculates a distance between the radar platform and each repeater on the basis of a time required for the transmitting and the receiving and phase information of the received signal. When the position of each repeater is known, by using the positions of the repeaters and the calculated distances, the position of the radar platform can be calculated. On the basis of the obtained position of the radar platform, a reference signal for phase compensation is generated. The radar eliminates a phase variation of a reflected wave received from an object to be acquired by multiplying the reflected wave by the reference signal for phase compensation. [A1655]

"Collison avoidance communication system and method"

In a collision avoidance communication system and method, equipped aircraft (12) and ground control stations (18) which represent nodes of an RF communication network (22) . A radar system (16) determines locations of equipped aircraft (12) and unequipped aircraft (14) within an airspace (10) . The ground control station (18) couples to the radar system (16) and the network (22) to receive location data for the aircraft (12, 14) . These location data are merged in an object list (142) . The ground control station (18) displays objects from the object list (142) , broadcasts surrogate location data (84) for unequipped aircraft (14) over the network (22) , and broadcasts control data (100, 116) describing weather conditions, geographic features, and the like, over the network (22) . Equipped aircraft 12 receive aircraft location data (84) and control data (100, 116) from the network (22) . Each equipped aircraft (12) determines its own location. The equipped aircraft (12) include a display (62) which shows the locations and orientations of nearby aircraft (12, 14) and of geographic features, and the equipped aircraft (12) broadcast their own locations over the network (22) . [A1656]

"ASR system for microburst detection"

A high gain antenna that produces a pencil beam along the ground and a lower gain antenna that produces a beam extending above the pencil beam are coupled to a source of r.f. pulses so that the amplitude of the r.f. pulses applied to the high gain antenna is less than the amplitude of the r.f. pulses applied to the lower gain antenna during airplane detection and the full amplitude of the r.f. pulses during a pulse segment is applied to the high gain antenna during wind pattern detection. [A1657]

"Sensor arrangement, especially for a landmine"

A sensor arrangement for an active member, especially such as a landmine which is deployed against ground and airborne target objects, including a waking or proximity sensor which is responsive to the approach of a target object. A high degree in the precision of direction-finding, in addition to target classification, can be achieved by means of a larger passive bearing or direction-finding base, such as can be set up through the positioning of at least three microphones about the mine or at a certain distance from the mine. Hereby, such a passive acoustic direction-finding or bearing base evidences the advantage in contrast with essentially the active high-frequency direction-finding, in that the mine cannot be located from the target object and thus is able to remain in constant operation upon the activation of a waking or proximity sensor without any danger of the mine having its presence betrayed. for a remote distance resolution for a multiple target-recognition, there must be evaluated a larger passive measurement base, as a result of which this evaluation, for instance, is then operatively associated with the active sensor (radar) . [A1658]

"Airborne SAR system for determining the topography of a terrain"

In an airborne SAR system for determining the topography of a terrain, two complete, correlated SAR images with different amplitude modulation in the cross-track direction are obtained and recorded by switching of two antenna patterns which can be generated by means of a monopulse antenna. The desired terrain information is extracted from the amplitude relationship of the two SAR images. It is furthermore possible to extract the terrain information from polarimetric SAR data via crosstalk parameters. [A1659]

"Compression network displaced phase center electronic correlator"

A synthetic array processing system which simultaneously develops a plurality of parallel synthetic beams, each beam being spaced in time along a flight path and having different effective phase centers. Means are provided for storing and reading out a plurality of doppler history signals from each of a plurality of range positions and in one embodiment of the subject invention the read out sweep lengths are programmed as a function of the square root of range to allow use of a constant slope focusing oscillator. The center frequency of the doppler histories are offset as a predetermined function of range and applied through a focusing mixer to a time compression filter circuit. A plurality of compressed pulses provided at the output terminal of the compression filter circuit, each represent a doppler history of a point reflector and a synthetic beam and these signals are applied to a display which may be controlled as a function of the square root of range. [A1660]

"Method and device for preventing collisions with the ground for an aircraft"

A mass memory stores a data base representing at least a substantial part of the terrestrial globe, in accordance with a grid configuration on several levels, said grid configuration being in particular more precise in the vicinity of an airport. Status indications are received representing the position of the aircraft with two horizontal components, and the altitude, and the velocity and acceleration vectors of the aircraft, as well as control indications coming from the flight deck. In accordance with the horizontal components of the position of the aircraft, a temporary local map is transferred into a fast access memory, on the basis of which map, an altitude envelope of the terrain is established in the zone where the aircraft is travelling. Anticollision processing make it possible to establish an alarm if the relation between a protection field and the altitude envelope meets a first condition which is defined at least partly by the control indications. The device has application as an aid for aerial navigation. [A1661]

"Airborne weather radar system with icing detection capabiliy"

A weather radar system with icing detection capability is disclosed. Increased radar system sensitivity is combined with aircraft outside air temperature to determine super-cooled liquid water content which leads to icing. The radar system can operate in a rainfall mode only, an icing mode only, or in both modes. Display modes include plan position indicator and range height indicator configurations. [A1662]

"Multi-scale adaptive filter for interferometric SAR data"

Apparatus including a multi-scale adaptive filter for smoothing interferometric SAR (IFSAR) data in areas of low signal-to-noise ratio (SNR) and/or coherence while preserving resolution in areas of high SNR/coherence. The multi-scale adaptive filter uses simple combinations of multiple linear filters applied to a complex interferogram. The multi-scale adaptive filter is computationally efficient and lends itself to parallel implementation. A pyramid architecture comprising a plurality of cascaded stages is employed which reduces the computational load and memory required for implementation of the processing algorithm. The multi-scale adaptive filter implements a processing algorithm that may be applied to standard IFSAR data. Its input is a complex interferogram (the conjugate product of two complex images) and its output is a filtered interferogram (A) which is passed to an information extraction processor, that extracts a terrain elevation map, for example. The adaptive filter incorporates linear filters at two or more scales (i.e. filter impulse response widths) whose outputs are combined in a data-dependent manner. The combination rules result in an output interferogram (A) that is filtered heavily in areas of low coherence and receives little or no filtering in areas of high coherence. The combination rules use a coherence measure that is a simple nonlinear function of the linear filter outputs themselves. [A1663]

"Signal processing apparatus for synthetic aperture radar"

A signal processing apparatus for use in SAR radar. The signal processing apparatus uses a new method of processing SAR images, primarily for wide band SAR. The new method is based on the numerical unfolding of differential equations along the flight path. The method makes motion compensation possible and can be used along a curved flight path and irrespective of the acceleration of the aircraft. Moreover, the method makes real time processing possible. [A1664]

"Radar transponder apparatus and signal processing technique"

An active, phase-coded, time-grating transponder and a synthetic-aperture radar (SAR) and signal processor means, in combination, allow the recognition and location of the transponder (tag) in the SAR image and allow communication of information messages from the transponder to the SAR. The SAR is an illuminating radar having special processing modifications in an image-formation processor to receive an echo from a remote transponder, after the transponder receives and retransmits the SAR illuminations, and to enhance the transponder's echo relative to surrounding ground clutter by recognizing special transponder modulations from phase-shifted from the transponder retransmissions. The remote radio-frequency tag also transmits information to the SAR through a single antenna that also serves to receive the SAR illuminations. Unique tag-modulation and SAR signal processing techniques, in combination, allow the detection and precise geographical location of the tag through the reduction of interfering signals from ground clutter, and allow communication of environmental and status information from said tag to be communicated to said SAR. [A1665]

"On-board navigation system for an aerial craft including a synthetic aperture sideways looking radar"

On-board navigation system for an aerial craft of the type including an SAR synthetic aperture sideways looking radar (12) . According to the invention, computing device (18) express the alignment deviation as a function of the estimation error vector .DELTA.U associated with the state vector U consisting of the components of the vectors P, V for the position and relative velocity of the vehicle, in the form of a noise-affected observation, a KALMAN-BUCY filter with gain matrix K computing the estimate of the vector of estimation errors. [A1666]

"Antenna stabilization error correction system for radar"

A radar utilizes an antenna stabilization error correction system to automatically estimate and correct attitude sensor errors in pitch, roll and elevation. The radar system includes an antenna, an antenna positioner, a transmitter receiver, a signal processor, an antenna controller and stabilization processor and the antenna stabilization error correction system. As part of the normal signal processor sub function, ground clutter signals are extracted from the received signals. These signals are the primary input to the antenna stabilization error correction system. Other inputs are received from the signal processor, antenna controller and stabilization processor and an external aircraft radio altimeter. The antenna stabilization error correction system processes the signals and estimates pitch, roll and elevation errors which are passed back to the antenna controller and stabilization processor. [A1667]

"Precision location of aircraft using ranging"

A millimeter wave radar is placed on an aircraft and several radar targets are placed near a runway. The targets are discrete objects, each having a relatively localized radar cross section, a unique signature or a unique range bin, and a position which is accurately known. Targets should be spread over the length of the runway. Radar corner reflectors and active or passive repeaters are preferred. The locations of the radar targets with respect to the runway can be transmitted to the aircraft, or they can be stored on board. On board memory requirements can be reduced by requiring all airports to select one of only a few standard target placement patterns, or even only one. Targets are inexpensive, as are radars whose only precision requirement is in range, and not in azimuth or elevation angles. Range to at least three targets in the radar's field of view is all that is required for an on-board computer to determine the aircraft's location. A radar-generated image of the runway perimeter may be provided to the pilot, preferably in a heads-up display, with hazards superimposed in their proper relative positions. The runway edges need provide no radar contrast at all. [A1668]

"Low cost radar altimeter with accuracy enhancement"

A low cost frequency modulated (FM) radar altimeter system with enhanced accuracy for continuously providing an altitude of a target, comprising a transmitter means for transmitting a carrier modulated output signal towards the target, a receiver means having an altitude output signal for receiving the carrier modulated output signal reflected from the target after a time delay, and for providing an open loop error correction means for correcting errors resulting from nonlinearities in the transmitter means and signal processing delay variations in the receiver means so that the altitude determined is accurate, a coupling means for directing a portion of the carrier modulated output signal to the receiver means, and searching means having a first output directed to the receiver means and a second output directed to the transmitter means and having a symmetrical search output signal with a slope, s.sub.s, and a fixed period for providing continuous and repeated sweeping from a low altitude to a high altitude, an upsweep, and then back down to the low altitude, a downsweep, so that the radar altimeter is in a constant searching mode, and for automatically altering a search rate of the radar altimeter with changes in the slope, s.sub.s, of the search output signal so that the sensitivity of the radar altimeter increases as the slope, s.sub.s, decreases. [A1669]

"Method and apparatus for associating target replies with target signatures"

Apparatus for associating target reply signals with target signatures, wherein each reply signal is received from a target transponder within a selectable time period, and further wherein each target signature comprises a first set of parameter values that identify a target position and movement relative to an interrogating aircraft, the apparatus including reply processor means for producing a target report for each reply signal, the target report having a second set of parameter values, and report processing means for: 1) comparing each target report with each target signature to identify which report/signature pairs are potential matches, each comparison between a target report and a target signature being based on comparisons of corresponding parameter values to produce a probability of match for each parameter comparison, and 2) identifying which report/signature matches are best based on comparison of each report/signature potential match with each other potential report/signature potential match including comparison of the parameters' probabilities of match. An improved method for compensating inaccurate bearing data is also provided. [A1670]

"Combined SAR monopulse and inverse monopulse weapon guidance"

A system and method that provides for all-weather precision guidance of conventional air-to-surface weapons. The system and method employs a coherent monopulse radar disposed on a launch platform and a noncoherent passive (receive only) radar disposed on the weapon. The synthetic aperture radar generates a synthetic aperture radar monopulse map of an area around the target. The radar is used designate the location of the target, and transmit a sequence of alternating sum and simultaneous azimuth and elevation difference patterns centered on the target. The weapon includes a guidance system and seeker that is responsive to guidance commands transmitted by the synthetic aperture radar. The guidance system and seeker receives reflections of the alternating sum and combined azimuth and elevation difference pattern from the target, and the sum pulse is used by the weapon to acquire and track the azimuth and elevation difference pattern null on the target to fly an optimum trajectory to the target. One method for guiding a weapon to a target comprises the following steps. A synthetic aperture radar is used to generate a SAR monopulse map of a target area and designate a target therein. The weapon is then launched toward the target. The radar is used to transmit an interleaved sum and simultaneous azimuth and elevation difference pattern guidance pulse train at the target. The reflected interleaved sum and simultaneous azimuth and elevation difference pattern is received from the target at a seeker and guidance system on the weapon. The sum pattern is used by the weapon to lock onto the converging null, and is used by the launch platform to provide closed loop tracking of the target during guidance illumination. After weapon null lock-on, steering commands are generated to cause the weapon to fly an optimum trajectory to the target. [A1671]

"Multiple remoted weapon alerting and cueing system"

A weapon alerting and cueing system including a weapon terminal responsive to radar track information for radar detected aircraft, a first weapon launcher operated by a first weapon operator, a first weapon pointing sensor for providing azimuth and elevation information about the first weapon launcher, a first cueing sight for providing visual pointing cues to the first weapon operator, a first weapon cueing processor responsive to the radar track information, the weapon terminal, and the first pointing sensor for controlling the first cueing sight such that the first cueing sight provides visual cues for cueing the first weapon launcher to a selected radar detected aircraft target, a second weapon launcher operated by a second weapon operator, a second weapon pointing sensor for providing azimuth and elevation information about the second weapon launcher, a second cueing sight for providing visual pointing cues to the second weapon operator, a second weapon processor responsive to the radar track information, the weapon terminal, and the second pointing sensor for controlling the second cueing sight such that the second cueing sight provides visual cues for cueing the second weapon launcher to a selected radar detected aircraft target, and a plurality of RF modems for interconnecting the weapon terminal, the first weapon processor, and the second weapon processor. [A1672]

"Calibration method and apparatus for receiving transponder reply signals"

Calibration apparatus for an antenna/receiver system having, in combination, means for receiving one or more electromagnetic data encoded signals from a transmitter and producing in response to each data signal two signals having a phase relationship, the receiving means comprising an antenna, signal processing means for using the phase relationship to determine information related to the data signals, and means for coupling a calibration signal into the antenna to produce two calibration signals having a known phase relationship, the signal processing means using the known phase relationship to compensate for phase errors when processing the data signals.

[A1673]

"Synthetic aperture radar for nonlinear trajectories using range relative doppler processing and invariant mapping"

Synthetic aperture radar imaging for nonlinear trajectories utilizing range relative doppler processing, invariant mapping of information from arbitrary shaped cells onto an X--Y coordinate system, and round trip signal delay which allows accurate synthesis of a reference signal for each range cell. A synthetic signal synthesizer produces the reference signal for synchronous demodulation in the radar. [A1674]

"Digital circuit for decoding encoded doppler data"

An electronics circuit receives a sub frame of encoded doppler data having roups One through N of data words with the first three words of Group N comprising a frame sync signal which is compared to a reference signal with a sync pulse being generated whenever the signals are identical. This sync pulse is supplied to three counters to load each counter with a predetermined count. The first counter counts the number of words in each Group, the second counter counts the number of Groups in a sub frame and the third counter indicates the location of Automatic Gain Control and Word Width data within the sub frame. Encoded within each group of a Sub Frame are one or more clusters of doppler words with a fourth counter indicating the location of these clusters of doppler words. A word decoder circuit in response to a gain signal and a word width data signal decodes each word of each group of the sub frame having doppler data to extract the doppler data. [A1675]

"Method and apparatus for multiple reply rejection when decoding transponder replay signals"

Apparatus for rejecting multipath reply signals received from a target transponder within a selectable time period, comprising: a top antenna and a bottom antenna to detect reply signals, means for determining an altitude code associated with each reply signal detected by the antennas respectively, means for determining a differential time of arrival (DTA) value for each reply signal detected by the antennas respectively, and processing means for: 1) producing, for each top antenna reply signal, a top antenna target report that includes the altitude code and DTA values, 2) producing for each bottom antenna reply signal, a bottom antenna target report that includes the altitude code and DTA data, and 3) comparing each top antenna report data with corresponding data from each bottom antenna report, and marking out each bottom antenna report that is a multipath reply based on such comparison. [A1676]

"Hyper-precision SAR interferometry using a dual-antenna multi-pass SAR system"

The present invention is an interferometric SAR system and processing method that combines multi-pass SAR interferometry with dual-antenna SAR interferometry to obtain elevation maps with accuracy unobtainable by either method alone. A single pass of the dual-antenna system provides coarse elevation maps. High accuracy maps are obtained through additional passes, with accuracy determined by the number of passes. The processing method combines the acquired data to provide a calibrated, high precision, low ambiguity elevation map, using approximate least-squares and maximum-likelihood processing methods. The present dual-antenna SAR interferometer collects two complex SAR images from slightly different elevation angles on a single pass using two antennas on the same platform. The present invention provides calibrated maps that have coarse precision but are nearly unambiguous because of the small interferometer baseline. The multi-pass method collects two or more complex images using multiple passes of a radar platform with each antenna. Alone, the multipass method provides much more precise, but ambiguous and uncalibrated, elevation maps. However, the present invention combines the dual-antenna and multi-pass techniques to provide unambiguous and highly precise maps. [A1677]

"Air traffic surveillance and communication system"

An air traffic surveillance and communication system for air traffic controllers, includes a plurality of ground based first radio transceivers located in specific geographic sectors, respectively, and having a first frequency channel for supporting party-line digital voice and a second frequency channel dedicated to supporting a digital data channel for down-linking dependent surveillance data and for both up-link and down-link data communications. The first and second frequency channels are paired such that each time a frequency change is commanded by the ground both the first and second frequency channels will be automatically tuned to a new air-ground frequency paid. The system also includes a plurality of aircraft based second digital radio transceivers, one located in each aircraft. Each second radio transceiver has corresponding first and second frequency channels and a navigational data source on each aircraft. The navigational data source incorporates triply redundant GPS receivers for producing highly accurate aircraft navigation data selected from aircraft latitude, longitude, altitude, speed, heading and glide data which is coupled to the respective aircraft transceiver for transmission on said second channel to at least one of the plurality of ground based first radio transceivers. Each ground based first radio transceiver has a communication controller for formatting up-link data and separating down-linked surveillance data and disseminating same to air traffic controllers in the sectors of said aircraft. In a preferred embodiment, in a TDMA format with digital radio transceiver operates with a 12.5 kHz spacing, differential QPSK signal modulation is used and each broadcast is by short transmission bursts having a guard band signal preamble and a management/user data field. [A1678]

"Method and apparatus for responding to an interrogation signal"

A transponder receives a stable reference frequency transmitted from an interrogator and compares the stable reference frequency to a local oscillator frequency that has short term stability. A comparison signal is provided to a synchronous oscillator for providing a locked signal that briefly locks onto the comparison signal and "remembers" its phase and frequency characteristics. The locked signal, which is inherently locked to the stable reference signal of the interrogator, is then combined with the short-term stable local oscillator frequency, and the combined signal is used in the up-converted reply back to the interrogator. [A1679]

"Radar device for obstacle warning"

The present invention pertains to a radar device with synthetic aperture based on rotating antennae (ROSAR principle) , preferably for helicopters, which operates in the millimeter-wave range and is used mainly as an obstacle radar, wherein the full synthetic aperture length can be reached already within very short distances due to the arrangement of the antennae on a turnstile. Exemplary embodiments, calculations and representations are shown and explained. [A1680]

"Vehicle location method and system"

A vehicle location system and method whereby the position coordinates of a vehicle are made available to other vehicles or to fixed locations by transmission of a data message containing position coordinates of the vehicle. The time slot in which the data message is transmitted is uniquely assigned to each transmitting vehicle as a function of its position in a grid segment with respect to a reference waypoint assigned to that grid segment. Position information in latitude and longitude is provided to each receiving vehicle, together with a precise timing signal, by the Global Positioning System (GPS) , or by the Global Orbiting Navigational Satellite System (GLONASS) , or by both systems. A synthetic latitude function and a synthetic longitude function provide a periodic mapping of a specific time period onto areas represented by grid segments charted on the global surface. These synthetic functions are initiated and controlled by the precise timing signal from the GPS or GLONASS systems. Each grid segment is assigned a reference waypoint at the northernmost and westernmost point of the grid segment. The vehicle's position in a grid segment with respect to the reference waypoint of that grid segment is determined mathematically. The vehicle's relative position in the grid segment is then correlated to the time mapping of the grid segment provided by the synthetic functions. The vehicle transmits its data message during the mapped time slot corresponding to its position within a grid segment. [A1681]

"Aircraft data communication employing existing voice channels"

A system for communicating data between an aircraft and ground unit over conventional amplitude modulated (AM) voice radio channels employs a data collection unit for collecting data desired to be transmitted, such as global positioning system (GPS) data, altitude, or aircraft identification information which is encoded by a data encoder. A gating means senses when the microphone of the AM transmitter is keyed, and passes the encoded data and the voice signals to the existing AM modulator of the AM voice transceiver. This results in a transmitted signal received by a receiving unit, such as a ground unit, which separates the received signal into an AM modulated voice signal and a AM data signal. The AM voice signal is demodulated by normal means into an audible signal, with the AM data signal being decoded by a data decoder into data. This data may be used to identify the aircraft symbol on a radar screen, identify the voice signal with a aircraft identification number, or flight number thereby reducing the amount of identification required. In alternative embodiments, avionics equipment may be added to the aircraft responsive to the data being sent from the ground unit, allowing collision avoidance capabilities. [A1682]

"System for locating a plurality of objects and obstructions and for detecting and determining the rolling status of moving objects, such as aircraft, ground vehicles, and the like"

In a system for locating a plurality of objects and obstructions and for detecting and determining the rolling status of moving objects, such as aircraft, ground vehicles, and the like, in the area of an airport, a short-range radar network is provided having at least three radar stations. Via simple stationary non-rotating transmitting antennas with coherent time-pulsed microwaves or other microwave signal forms, a large sector in the azimuth of about 90.degree. is illuminated, and the associated fixed receiving antennas, which have fixed subdivided sector characteristics, with one receiving channel per subsector, also receive signals from the other stations for bistatic measurements. The separation of the signals of individual stations is effected by selecting different frequencies, or alternatively, a time triggering of transmitted signals and receiver gates or by station-specific modulation codes. Illumination zones are chosen so there are no shadow zones caused by, e.g., buildings. [A1683]

"Terrain height radar"

A terrain height radar system and processing method comprising a high resolution synthetic aperture radar (SAR) mounted on an air vehicle and a SAR signal processor containing a signal processing algorithm or method for computing terrain height and radar backscatter power. The system contains motion sensing and navigation functions that also provide data to the signal processor to provide motion compensation. Signal processing algorithms in the method compensate for planar motion of the air vehicle for variations of terrain height in the field of view. The algorithms also compensate for nonplanar motion of the radar, and for scatterers in or very near to a reference plane in the field of view. The algorithms exploit defocusing due to displacement from the reference plane to estimate the terrain height above the reference plane. The algorithm is computationally efficient because the bulk of the radar signal processing is common to both the SAR function and the terrain height estimation function. The following processing method is implemented. The synthetic array radar is operated to produce out-of-plane motion and generating radar return signals derived therefrom. The radar return signals are processed to compensate for relative motion, generate ground plane polar format data, generate range compressed data, and generate autofocused data. Azimuth compressed data is generated by focusing uncompressed azimuth data for each of many discrete terrain height reference levels, compressing the focused data using a weighted FFT, temporarily recording the magnitude of each pixel, storing separate image magnitude values corresponding to each terrain height reference level for each pixel and outputting the largest of these magnitudes for each pixel as a radar cross section value of that pixel, and outputting the height reference level at which that maximum occurred as the height of that pixel. Interpolation may be used to refine the height estimate. The strong scatterer signal is then canceled by estimating the amplitude phase height and azimuth of the strong scatterer, using these parameters to determine a contribution in the uncompressed data set due to the strong scatterer, subtracting this contribution from the uncompressed data, and repeating the amplitude phase height and azimuth height estimating step to provide for for improved accuracy. [A1684]

"Alignment and beam spreading for ground radial airborne radar"

A method and apparatus for controlling a radar beam emitted by a radar sym. The invention produces improved high resolution ground mapping by aligning the antenna isogain or isonull lines with the ground radial lines. The antenna axis is rolled by an angle determined from the geometric principles of the unit vectors along the ground radial lines. A new azimuth pointing angle is then computed and implemented. A new azimuth beamshape, azimuth beamwidth and azimuth beam spoiling factor are also computed and implemented. [A1685]

"Airborne system for operation in conjunction with a marker beacon"

An airborne radio system upon receipt of mode and code radio signals from a arker beacon that it is seeking, queries the marker beacon as to its slant range and direction. Upon receipt of information on the slant range and direction the airborne system and/or its operator make a determination whether to initiate a radio signal that would activate a flare on the marker beacon. Upon actuation the flare is usable for visual and infrared homing. [A1686]

"SAR/GPS inertial method of range measurement"

A method that provides precise target location measurement using a synthetic aperture radar (SAR) system jointly with a global positioning inertial navigation system (GPS/INS) located on a moving aircraft. The SAR system provides a precise measurement of the round trip elapsed radar wave propagation time from the aircraft location to a selected pixel in a ground map that includes a portion of the target. The velocity of radar wave propagation is measured at the same time that the range time lapse to the designated SAR map pixel is measured. When combined with position and velocity information derived from the GPS/INS inertial navigation system, the radar wave propagation time is used to calculate the position of the target pixel in GPS/INS coordinates, thereby improving measurement accuracy. The method comprises flying an aircraft containing GPS/INS and SAR systems along a predetermined flight path. The relative position and velocity of the aircraft along the flight path is accurately measured using the the global positioning system. A first SAR map is generated. A target pixel in the first SAR map that corresponds to the target is then designated. A minimum of two additional SAR maps are generated and the target pixel in each of the additional SAR maps is designated. The position of the target pixel relative to GPS/INS coordinates and the velocity of radar wave propagation to the target using aircraft position data derived from the global positioning system are then simultaneously measured. Finally, a more accurate position for the target pixel is calculated using the computed value for the radar wave propagation velocity. [A1687]

"Synthetic aperture radar guidance system and method of operating same"

A synthetic aperture radar guidance system adapted for use in a guided missile is described wherein the frequency of the transmitted pulses changes with time with a chirp slope which varies with range. The time between pulses also changes as a function of range. The desired values of the chirp slope and the interpulse interval are computed for all values within a range of interest and stored. Furthermore, the operating parameters of the SAR are changed as the range changes. The time intervals and frequencies are selected to avoid interruption ambiguities and eclipsing. The phase and frequency of the synthesized signal are controlled to adjust for motion of a vehicle on which the SAR is mounted. The SAR is operated in several modes. In a search mode, the beam of transmitted pulses is steered across a mapping area to form a plurality of patches of the mapping area. The patches are combined into one map of the entire area. Each pixel of the map is compared with a target template until a match is provided. Then the SAR operates in track mode wherein a correlation process ensures the missile is steered toward the target area using a template provided using known feature data. [A1688]

"Semiautomatic jam-accept (SAJAC) decider for mode-4 of the IFF mark XII"

A semiautomatic jam-accept decider for use in an interrogator responsor installation in which an operator selects a particular range and azimuth of interest. The decider can make Accept decisions concerning IFF Mark XII Mode 4 reply targets in the presence of extraneous signals. Enemy spoofing or jamming of the Mode by transmitting on the reply frequency can also be detected and the position of the enemy aircraft can be determined. [A1689]

"Method and system for monitoring vehicles"

System for tracking a vehicle equipped with a transponder which emits a first reply signal containing data identifying the vehicle in response to a first interrogation signal and emits a second reply signal containing data specifying the altitude of the vehicle in response to a second interrogation signal, the system including: (a) a squitter transmitter located on the vehicle for interrogating the transponder with the first and the second interrogation signals which are separated in time by a predetermined time spacing interval, in response to which first and second interrogation signals, the transponder transmits the first and second reply signals, (b) a plurality of spaced apart ground receive stations, each of which includes a receiver and decoder for: (i) receiving and decoding data from the first and second reply signals, (ii) determining a time of arrival of the first and second reply signals and the predetermined time spacing interval, and (iii) determining an identity of the vehicle by combining data from the first reply signal with information derived from the predetermined time spacing interval, (c) a communications link for connecting the ground receive stations with one of the ground receive stations, and (d) a computer at the one of the ground receive stations for receiving information from the other ground receive stations over the communication link, the information including the identity and time of arrival data determined from the time of arrival of the first and second reply signals, and for calculating the position of the vehicle from the time of arrival data. [A1690]

"Synthetic aperture radar guidance system and method of operating same"

A synthetic aperture radar guidance system adapted for use in a guided missile is described wherein the frequency of the transmitted pulses changes with time with a chirp slope which varies with range. The time between pulses also changes as a function of range. The desired values of the chirp slope and the interpulse interval are computed for all values within a range of interest and stored. Furthermore, the operating parameters of the SAR are changed as the range changes. The time intervals and frequencies are selected to avoid interruption ambiguities and eclipsing. The phase and frequency of the synthesized signal are controlled to adjust for motion of a vehicle on which the SAR is mounted. The SAR is operated in several modes. In a search mode, the beam of transmitted pulses is steered across a mapping area to form a plurality of patches of the mapping area. The patches are combined into one map of the entire area. Each pixel of the map is compared with a target template until a match is provided. Then the SAR operates in track mode wherein a correlation process ensures the missile is steered toward the target area using a template provided using known feature data. [A1691]

"Method and apparatus for use of alphanumeric display as data entry scratchpad"

An aircraft control and display system having a multifunction display for configuring the vehicle flight parameters and control of mission equipment utilizes a dedicated alphanumeric display as a scratchpad memory for temporarily displaying IFF mode commands encoded in alphanumeric form and for changing an IFF transponder code, thereby obviating the use of the multifunction display and the need thereby for reprogramming the mission functions. Codes entered in the alphanumeric display are validated against codes stored in a master control processor unit, whereby a prompt is provided to the operator to reenter the code in the event of an error in entry or an invalid code. [A1692]

"Terrain clearance generator"

A terrain clearance signal generator particularly usable with ground proximity warning systems provides a signal representative of terrain clearance when the radio altimeter signal is unreliable, such as in the case of excessive pitch or roll, out of track or other conditions resulting in invalid readings. The system monitors such conditions and takes a sample of the last valid radio altitude reading prior to sensing an invalid condition and, upon sensing an invalid condition, updates the sample utilizing barometric altitude signals or integrated barometric altitude rate or inertially-derived Z-velocity signals. [A1693]

"Hit verification technique"

An interceptor's point of impact on a targeted missile is quickly revealed in the milliseconds preceeding and following the impact by illuminating the target with radar signals at a high pulse repetition rate and observing the reflected radar echoes on an A-scope display. The position within the returned radar echo of a double echo and related changing phenomenon indicates the point of impact. Failing intercept, the miss distance is computed from the relative slant ranges to the targeted missile, the interceptor, and the double echo. The type warhead killed is revealed by a spectrograph slaved to the radar's antenna. Various techniques assist with the interpretation of the displayed patterns, including subtraction of previously stored patterns and display of the difference, display of characteristic patterns of various known missiles and interceptors stored in "look up" tables, and neural networks. [A1694]

"Radio communication system including indication that communication link is established"

A networked radio communication system for transmitting a radio signal between a source transceiver and a plurality of destination transceivers. The source transceiver first transmits an interrogate signal that includes a synchronize code and an address code that is indicative of a particular destination transceiver. If the particular destination transceiver receives the interrogate signal, an acknowledge signal that includes the address of the destination transceiver that is transmitting the acknowledge signal is transmitted back to the source transceiver. The source transceiver compares the address included in the interrogate signal with the address included in the received acknowledge signal and determines if a communications link is established. If a communication link is established, a feedback signal is provided to the operator of a source transceiver indicating that the source transceiver is in communication with the particular destination transceiver. The feedback signal preferably includes a sidetone signal which allows an operator of the source transceiver to monitor signals transmitted from the source transceiver to the plurality of destination transceivers. [A1695]

"Apparatus and method for producing three-dimensional images"

An apparatus and method is capable of acquiring useful three-dimensional ar images from an aircraft which travels in a curvilinear path to generate only a sparsely filled synthetic array. A motion measurement unit outputs position measurements as the aircraft travels in the curvilinear path. The system includes a motion compensation and timing unit and a wave transmitter which outputs chirped radar signals. An antenna coupled to the wave generator sends the chirped radar signals to a region to be imaged and receives scattered chirped radar return signals from scatterers in the region. These scattered signals are coherently mixed to baseband and digitized before being input to a processor. The processor includes a range processing unit, a memory unit and an estimator. The range processor receives and Fourier transforms the digitized return signals to obtain range profiles. The estimator completes the image formation process by three-dimensional back projection of the range profiles. It also estimates the location and complex strengths of scatterers and uses these to generate a side lobe free image. [A1696]

"Aircraft traffic alert and collision avoidance device"

A proximity warning device for aircraft responds solely to transmissions from transponders. The host aircraft has a host transponder and a signal is generated therein and coupled to the device to indicate transmission of a host reply. Selective suppression is implemented based on presence of an SSR beam which is indicated by the signal. Suppression pulses have a fixed duration but randomly selected intervening durations. Data collection proceeds without regard for suppression or the presence of host replies. The shaping of data collection intervals free of interference from suppression provides for improved efficiency for later data decoding and processing. The signal is used to specially mark collected data generated by a host reply. The ability to discriminate between host and other replies allows completely new performance monitoring functions. In one case, the health of the receiver is deduced from the amplitude of host replies. In another case the effectiveness of suppression is noted by capturing host replies in the presence of a suppression pulse. [A1697]

"Radar fuze"

A method and apparatus for determining an altitude for a radar fuze. The method includes the steps of receiving a return signal and transmitting a transmitted signal. The return signal and the transmitted signal are mixed and a mixed signal representing an altitude is responsively generated therefrom. The mixed signal is amplified to generate an amplified signal. The amplified signal is filtered to generate a filtered signal which is envelope detected to provide a detected signal responsive to the filtered signal. The detected signal is integrated responsively to the detected signal. The integrated signal level is compared against a track threshold reference signal and a track/no-track comparator signal is provided responsively to the integrated signal level and the track threshold reference signal. System timing is controlled by generating a plurality of control signals responsive to the track/no-track comparator signal and proportional to an altitude. A modulation signal responsive to the plurality of control signals is provided wherein the modulation signal is representative of an altimeter range as determined by the plurality of control signals. The transmitted signal is generated responsively to the modulation signal. [A1698]

"Method and apparatus for detecting and decoding transponder reply signals"

Methods and apparatus for detecting and decoding transponder reply signals of the type having a plurality of associated time discrete pulses including two bracket pulses and a number of related data pulses that may have been transmitted at discrete data time intervals between the bracket pulses such that the signal content detected during the data time intervals corresponds to the reply signal data code, comprising receiver means for receiving the reply signals and producing in-phase (I) , quadrature (Q) phase and video (V) signals for each received pulse, means for detecting received pulses and storing the I/Q/V signals in a first memory, means for storing in a second memory pointer values that correspond to the temporal location of pulse I/Q/V signals in the first memory, means for identifying, based on time of arrival (TOA) values, pairs of potential bracket pulses wherein each pair marks the beginning and end of a reply code, and processor means for 1) determining an angle of arrival (AOA) value for each detected pulse based on each pulse's I and Q signals, 2) selecting a reference pulse for each potential bracket pair based on relative amplitudes of the bracket pair, and 3) identifying data pulses, associated with the reply signal and detected between occurrence of the bracket pulses, based on the reference pulse to provide the reply code. Such apparatus also provides for a determination of confidence factors relating to each detected pulse and each data value assigned to a data time interval of the reply code. Such apparatus further provides for pulse sharing, pulse claiming, reply code modification and false reply identification and deletion. [A1699]

"Portable aircraft RCS versus azimuth measurement apparatus"

Portable RCS versus azimuth measurement apparatus for an aircraft to be tested has a dolly attached to the aircraft at a location on a supporting surface. A nose wheel adapter mounted on the dolly temporarily replaces the nose wheel of the aircraft with a spare nose wheel. An electric motor on the dolly coupled to the spare nose wheel rotates the spare nose wheel. A beam structure has a first end removably affixable to the dolly and a spaced opposite second end extending under the axis of rotation of the aircraft and between the main landing wheels. A synchronizing gearbox, mounted on the second end of the beam structure at the axis of rotation of the aircraft, has an output shaft and senses rotation of the aircraft about the axis of rotation, sensed rotation of the aircraft being indicated by rotation of the output shaft. Rotation of the output shaft of the gearbox is restrained relative to the surface by an anchor. A radar computer signal is utilized to compare signals from the motor and the gearbox to produce an output command to the motor for rotating the spare nose wheel. This rotates the aircraft about its axis of rotation. The gearbox transmits signals indicating sensed rotation of provide data for RCS versus azimuth measurement. [A1700]

"Image synthesis using time sequential holography"

A method and apparatus for producing an image of a target area, by: at an observation location spaced from the target area, transmitting a beam of electromagnetic radiation toward the target area, and receiving reflections of the radiation from the target area, providing a representation of the magnitude and direction of the distance between points on the target area which produce reflections that travel in phase to the observation location, varying the spatial relation between the observation location and the target area and/or the given radiation frequency, in order to establish a plurality of different observation states which succeed one another in time, each state being associated with a distinct combination of magnitude and direction of the distance between points on the target area which produce reflections that travel in phase to the observation location, producing two coherent radiation beams, directing the two beams onto a receiving plane provided with an array of radiation receiving cells and storing output signals from each receiving cell, and controlling the two beams, for each observation state in succession, such that the two collimated beams have: beam axes which are inclined relative to one another by an angle corresponding in magnitude and direction to the magnitude and direction representations, a phase difference corresponding to the phase difference between the transmitted and received radiation, and intensities such that the product of the intensities of the two beams corresponds to the intensity product of the transmitted and received radiation. [A1701]

"Testing of airborne windshear radars"

A portable test system is arranged to enable testing of an aircraft-mounted radar system. Simulated radar returns are transmitted via a test antenna positioned a short distance from an aircraft parked on an airport surface. The varying amplitude of received radar pulses is analyzed as the test antenna is illuminated by the main beam and side lobes of the radar antenna pattern as the radar beam is scanned. By controlling the amplitude of the simulated radar returns in inverse relation to the amplitude of received radar pulses, simulated radar returns inserted off beam center line are interpreted by the radar system as received on the beam center line. Test system transmissions, which may incorporate windshear effect test data, are thus enabled to create simulated effects usable for testing radar system response to a variety of airborne conditions, such as windshear. Test methods are also described. [A1702]

"Resolution advisory display instrument for TCAS guidance"

An aircraft indicating system for displaying a resolution advisory signal from a Traffic Advisory and Collision Avoidance System provides an indicating pitch attitude symbol to the pilot engendering an instinctive response to avoid a collision. A driving circuit converts a TCAS signal in the form of a vertical speed command to a pitch command for energizing the indicating symbol by effecting a vertical displacement thereof in accordance with the guidance resolution advisory. The display signal is generated in accordance with the relationship: ##EQU1## where: .PHI.=aircraft roll attitude, limited to + or - 30.degree. .THETA..sub.CMD =commanded pitch attitude defining the upper and lower pitch limits of the resolution advisory symbology .THETA..sub.EXIST =current pitch angle V.sub.ZTCAS =TCAS vertical speed command V.sub.ZEXIST =current vertical speed V.sub.T =true airspeed K=conversion constant. [A1703]

"Multiple target doppler tracker"

The present invention is a Multiple Target Doppler Tracker which tracks a plurality of components, including debris and submunitions of a munition burst apart above the ground. A plurality of transmitters transmits constant frequency (CW) signals towards the burst event of the munition and a plurality of receivers receive the signals reflected from the components. The signals received by the receivers are processed into frequency spectra. The spectra are analyzed to determine the path of a selected number of components. Using the path information the selected components are tracked with tracking devices. [A1704]

"Unfocussed signal processing apparatus for a synthetic aperture radar having a rotating antenna"

In a rotating antenna synthetic aperture radar, a method and apparatus for unfocussed signal processing for the correlation of the received signals by means of the reference functions. In unfocussed signal processing, only the main portion of the receiving signal S.sub.E is used, in which the phase shift is smaller than or equal to 90.degree. for the go-and return-path of the signal. A simplified window function is used as a reference function whose width also corresponds to the main portion of the received signal. Preferably, the in-phase and quadrature component (I.sub.r, Q.sub.r) of the window function r are selected to be identical. [A1705]

"Signal processing for ultra-wideband impulse radar"

An ultra-wideband impulse radar system for use on an airborne platform includes circuitry for coherently integrating the signals to improve signal-to-noise ratio so as to enhance the detection capability of the system, and for motion compensation of the signals to correct for inadvertent modulations of received signals due to buffeting or vibration of the airborne platform which may otherwise corrupt the filtering and signal integration processes. The inclusion of velocity filters and coherent integration despite the lack of phase information in the signals is accomplished by exploiting the time-delay properties of the received impulse signals, in which the observable pulse repetition frequency of the received signals differs from the transmitted pulse repetition frequency by virtue of the relative velocity between signal reflecting elements and the radar platform. [A1706]

"Aircraft position monitoring system"

There is provided an aircraft position monitoring system for monitoring the position of aircraft in a ground station. An air-borne sub-system mounted in the aircraft acquires, automatically and periodically, monitor data including data on the aircraft position, ID and FOM. The acquired monitor data is transmitted to the ground station via a satellite communication line or a data communication line. In the ground station, the monitor data sent from the aircraft is sent to a monitoring device and a tracking processing unit. The resultant data is displayed on a display device. The tracking processing unit collates the input monitor data with track data in a track file prepared on the basis of flight schedule data of the aircraft, and determines presence/absence of correlation therebetween by referring to FOM data in the monitor data. On the basis of the determination result, the existing track file is updated or a new track file is prepared. Thus, the tracking processing of each aircraft is performed. The display device shows position and ID data relating to the aircraft, the tracking processing of which has been performed by the tracking processing unit, in a mode which can be easily recognized. [A1707]

"Synthetic aperture radar having rotating antennas"

A rotating antenna synthetic aperture radar apparatus having a module in the processor circuit in which are stored image definition values for reducing image errors. The module acts upon process circuits to subdivide the distance range illuminated by the antenna into individual distance intervals and to determine the reference functions in these distance intervals. [A1708]

"Helicopter recognition radar processor"

A radar processor is disclosed for processing the radar return samples from a Doppler radar receiver to discriminate helicopter targets from fixed-wing targets. The samples are passed through a helicopter filter which eliminates the target skin Doppler return, and passed the sidebands about the target skin return which are due to the helicopter rotor hub modulation. The coefficients of the helicopter filter are selected to maximize the signal-to-noise ratio. The radar processor requires only a few milliseconds on target for reliable detection and can, therefore, be easily implemented by scanning surveillance systems. [A1709]

"Airport surface surveillance system"

An airport surface traffic surveillance and automation system addresses a wide variety of airport surface conflict scenarios using a combination of runway-status lights, controller alerts, and enhanced controller displays. Runway-status lights, composed of runway-entrance lights and takeoff-hold lights, provide alerts directly to pilots and vehicle operators, to prevent runway incursions before they happen. Controller alerts are used to direct a controller's attention to existing conflicts between aircraft on or near the runways. Enhanced displays present symbology to describe aircraft position, size, direction and speed of motion, altitude, aircraft flight number, and equipment type. Aircraft on approach to runways are also depicted on the displays. The invention features an airport surveillance system, having a radar data interface for receiving radar data from a radar source at a first data rate and for outputting radar data at a second data rate less than the first data rate, and a radar target processor coupled to the radar data interface. The radar target processor includes a clutter rejecter for generating a clutter map of the clutter signals in the radar data, and for substantially removing the clutter signals from the radar data using the clutter map, a morphological processor to receive radar data from the clutter rejecter and for detecting from the radar data target objects using the morphology of the target object, a multipath processor to receive radar data from the morphological processor and for detecting and removing from the radar data false targets resulting from multipath radar reflections, and a target tracker to receive radar data from the multipath processor and for tracking the path of target objects on or near the airport surface. [A1710]

"Generation of wideband linear frequency modulation signals"

A low-frequency low bandwidth Linear Frequency Modulation (LFM) waveform, nominally a 1 MHz to 10 Mz swept frequency analog sinusoid or digital square wave, is produced by direct digital synthesis. This waveform is upconverted in frequency and expanded in bandwidth, nominally to microwave frequencies with bandwidths of nominally 160-360 MHz, in a multiplying offset phase locked loop. The phase locked loop also linearly frequency modulates a X-band carrier with the microwave frequency LFM waveform to produce an output signal suitable for Synthetic Aperture Radar. The phase locked loop induces low phase error, and may be closed around the radar transmitter to remove phase errors induced by that unit. [A1711]

"Method of correcting measurement errors caused by clock deviations in a secondary radar system"

Conventional secondary radar systems use mechanically rotating antennas to radiate a concentrated beam that rotates in a horizontal plane. Data exchange between ground stations and airborne transponders can only take place if the aircraft is struck by the antenna lobe. The distance from the aircraft to the ground station is determined from the signal transit time. Directional information is derived from the antenna position. The secondary radar system according to the invention uses an omnidirectional antenna, so that data can be exchanged between ground station and aircraft at any time. To determine the position of the aircraft, interrogation signals are transmitted by a single active ground station such that the reply signal from a transponder falls within the common system time frame of the ground station. The times of arrival of the reply signals at different ground stations are then directly proportional to the distances from the aircraft to these ground stations. Measurement errors caused by clock deviations are corrected by determining any deviation of the clocks of two ground stations from each other. To correct clock deviations, two interrogation/reply cycles are used in direct succession in opposite directions over a common transmission path. The two transmission periods will differ by twice the deviation of the clocks in the two ground stations. The measured deviation is used to correct the measured transit time values and/or to synchronize the clocks. Synchronization of several ground stations with a master station can be achieved by using successive interrogation/reply cycles between the master station and all other stations. [A1712]

"Directional warhead fuze"

A directional ordnance for a missile. The missile contains circuitry to determine the direction of a target relative to the missile and to selectively detonate directing charges to force the blast from the warhead towards the target. The circuitry for determining the direction of the target includes two transmit antennas, each transmitting a different pseudo noise sequence, and two receive antennas, each coupled to a receiver which can determine the level of each pseudo noise sequence at each receive antenna. The relative strengths of the different pseudo noise sequences tell the direction of the target relative to the transmit and receive antennas. [A1713]

"X-scan aircraft location systems"

Linear array antenna systems are used in X-scan aircraft location systems and methods able to avoid disabling azimuth error conditions caused by multipath reflections under roll and pitch conditions during aircraft carrier landing operations. Aircraft azimuth and elevation data is derived based upon time of incidence at an aircraft location of two transverse, diagonally oriented, scanned antenna beams. The aircraft location data is derived by comparing time of incidence data with data on known timing of scanning of the beams, which have diagonally-oriented fan beam patterns. A plurality of vertically oriented radiating elements are typically positioned along a line diagonal to the vertical to produce a diagonally oriented fan beam pattern. Beam scanning results from relative adjustment of signal portions supplied to the radiating elements. While beam scanning is nominally diagonal, the vertical radiation cut-off characteristics of the elements constrain vertical radiation and thereby enhance provision of a desired horizontally oriented approach window. A particular embodiment uses spaced feeds along a traveling-wave input waveguide, with coupling to radiating elements by interconnecting waveguide sections of successively longer length, to provide broad-band equalization of signal supply path lengths. [A1714]

"Method for simulating high resolution synthetic aperture radar imagery from high altitude photographs"

A simple and inexpensive method for using aerial or satellite photographs of an area of terrain to form images to be used in the simulation of a series of synthetic aperture radar (SAR) images of the terrain as would be observed by a down-looking SAR mounted on an aircraft over the terrain. Scanned and digitized photographic pixels are formed and converted into radar image pixels and combined into composite images as required for SAR simulation. Terrain elevation data are assembled, correlated with the radar image pixels and converted to elevation images. These images are stored on media accessible by aircraft simulators and correlated with simulated aircraft position and altitude data to form composite images with obscured terrain features for display as darkened areas closely duplicating actual SAR images when displayed in an aircraft simulator. [A1715]

"Low-level wind-shear alert system"

The apparatus of the present invention improved low-level wind shear alert system that provides an improved method of identifying the presence and locus of wind shear in a predefined area. This system enhances the operational effectiveness of the existing LLWAS system by mapping the two-dimensional wind velocity, measured at a number of locations, to a geographical indication of wind shear events. This system can also integrate data and processed information received from a plurality of sources, such as anemometers and Doppler radar systems, to produce low-level wind shear alerts of significantly improved accuracy over those of prior systems. In particular, the apparatus of the present invention makes use of the data and processed information produced by the existing Low-Level Wind Shear Alert System as well as that produced by the Terminal Doppler Weather Radar to precisely identify the locus and magnitude of low-level wind shear events within a predetermined area. This resultant geographical indication is displayed in color-graphic form to the air traffic control personnel and can also be transmitted via a telemetry link to aircraft in the vicinity of the airport for display therein. [A1716]

"Apparatus for the observation and indentification of helicopters"

Apparatus for the observation and identification of helicopters by means of an FM-CW radar apparatus provided with transmitter means (1) , antenna means (2) and receiver means (3) . Blade flashes caused by the rotor blades are digitized by A/D converter (4) and processed by Fourier analysis means (5) and processor (6) in order to determine the range from a helicopter to the radar apparatus and the rotor symmetry characteristics. These symmetry characteristics, together with the blade flash repetition frequency yield a substantially unambiguous indication of the helicopter type. [A1717]

"Auto-focusing correction for rotational acceleration effects on inverse synthetic aperture radar images"

Inverse synthetic aperture radar imaging systems that are used to image targets that undergo rotational accelerations are enhanced by signal processing techniques which provide correction factors to reduce the frequency-shift and frequency-stretch errors that occur due to such accelerations. A target scan is subdivided into a number of sub-apertures and a Fast Fourier Transfer (FFT) is performed on the data for each sub-aperture to provide associated frequency sub-images. The FFT is then subdivided in "sub-swaths" of amplitude versus frequency for a plurality of frequency bands. The change-of-frequency, or frequency shift, data between prominent scattering points of each sub-image are processed to provide a phase correction factor that incorporates range changes and translational acceleration distortions for additional scattering points other than the most prominent scattering point. A frequency-stretch correction factor that compensates for rotational acceleration distortion is also provided. [A1718]

"FM/CW sensor processor for target recognition"

A processor for an FM/CW sensor divides the sweep periods of the sensor into a number of subsweep intervals, measures the received power within a multiplicity of frequency windows during each of the subsweep intervals, and then performs a spectrum analysis of the power measurements in each frequency window to characterize the reflectors in the corresponding range bins of the FM/CW sensor footprint. [A1719]

"Random binary modulated sensor"

A random binary modulated sensor transmits a continuous wave r.f. signal ulated by a binary random bit pair code signal which is transmitted by an antenna. A return signal reflected from a target is received by the antenna. A receiver mixer modulates the return signal with the r.f. signal and a delay circuit delays the binary random bit pair code. A coorelator receives the modulated return signal and delayed binary random bit pair code for producing a doppler output signal. A separate r.f. path in which a portion of the modulated r.f. signal is variably attenuated and variably phase shifted is present to cancel noise signals generated by antenna mismatch in transmission. [A1720]

"Airborne metal detecting radar"

Method and arrangement for an airborne radar system particularly adapted to detect large metal targets that are concealed from the air by camouflage or natural foliage. The arrangement includes an antenna that transmits a continuous wave electromagnetic signal having a selectable frequency that preferably has a wave length generally twice the length of an anticipated target and which is carried by a flying vehicle. The frequency of the transmitted signal is chosen to provide maximum penetration of the camouflage or natural foliage and maximum re-radiation from a metal target. Receivers connected to an in-line receiving antenna and to a crossed receiving antenna carried by a flying vehicle detect the radiation that is reflected from the terrain and a target with the same polarization as that transmitted. The co-linear antenna and receiver respond to the reflected radiation while the cross-polarized antenna does not detect this reflected radiation. However, a metal object on the ground re-radiates cross polarized electromagnetic waves in proportion to their angular orientation and lateral distance to the transmitting antenna so that a metal target is detected by observing the output differences for the two receivers. [A1721]

"Method and system for sharpening impulse response in a synthetic aperture radar"

A synthetic aperture radar system performing two dimensional monopulse measurement of the return data. [A1722]

"Process for generating synthetic aperture radar interferograms"

A process for generating synthetic aperture radar interferograms comprises the following steps. First and a second radar images of a scene from a first and a second position spaced apart by a given baseline are generated. A first signal of said first image within a first radio frequency band of the spectrum is recorded. A second signal of said second image within a second radio frequency band of the spectrum having a frequency shift relatively to the first detecting band is recorded. The frequency shift being such that it ensures or maximizes correlation between the first and the second images. The first and second signals are combined for generating an interferogram of said scene. [A1723]

"Procedure for detection and localization of objects on relatively flat ground and a device for application of the procedure"

A detection and localization system mounted on an airborne vehicle, and which enables detection of objects having at least one face inclined relative to the surrounding flat horizontal ground and therefore presenting a contrast with this ground. A radar transceiver is connected to an antenna rotating around the airborne vehicle and has a low directivity in a pitch plane and a high directivity in a roll plane, associated with a generator of distance cells. Making use of mathematical relations, an on-board computer, knowing the altitude of the airborne vehicle and the roll angle of the emitted radar wave, localizes the inclined face which produces a much higher reflection of the emitted radar wave than the surrounding ground, to thereby detect the inclined face. [A1724]

"Correcting errors in crossfeed radar systems"

A method for correction errors in radar systems that operate using a crossfeed principle (CFR) , in which echo signals are directly received from flying objects, such as an aircraft. In particular, the present invention is used in connection with low-flying objects, in which radar signals are indirectly reflected from the surface of the earth to an antenna of the radar system. Correction terms are determined and weighted, using correction factors, so as to improve the capability of the crossfeed radar system to accurately determine the exact elevation of the flying object. The correction factors that are used to improve the accuracy of the radar system are based upon sea state numbers, or Beaufort numbers, which vary in relation to the shape and/or structure of the reflecting surface. [A1725]

"Synthetic aperture radar digital signal processor"

A digital signal processor optimized for synthetic aperture radar image formation provides two separate stages of arithmetic processing along independent in-phase and quadrature channels. The first stage accepts a first reference input and integrates a multiplier/accumulator for each channel, and the second stage accepts a second reference input and includes a multiplier and an adder for each channel. In addition to hardware to select and route data in accordance with a desired operation, a hold register is incorporated prior to input-selection logic to facilitate complex-by-complex multiplications of data derived from either input in the first stage. Hold registers are also included before the second-stage adders to permit a complex multiplication with magnitude weighting to occur during the zero-th stage of a fast Fourier transformation, effectively hiding the time to perform one FFT stage. A control section contains a microprogrammed control sequencer, an input/output controller, data address generators and two reference address generators, the data and address generators being implemented using digital differential analyzers, or DDAs, which may be combined to form second-order or groups of complex linear DDAs. Implemented as a single-chip C-MOS integrated circuit, the architecture comprises a complete SAR image-formation processing element, including all arithmetic, control and addressing functions. The circuit is entirely self-contained with the exception of an external memory required to store partial results and reference functions. [A1726]

"Displays and display systems"

An aircraft display system has a display unit comprising a matrix array of LED's mounted in the glareshield. Air traffic command signals received by a datalink processor produce a visual indication on the display unit which is visible to the pilot when looking through the window. A button on the display unit is pressed by the pilot to acknowledge receipt of instructions. Other important messages are displayed by the display unit at different times. Radar altimeter height is displayed in a color which changes when the aircraft descends below its flare height. When on the ground, the display unit displays alphanumerically the distance-to-go to the end of the runway, and simultaneously displays stripes that move horizontally to indicate deviation of the aircraft from the runway center line. [A1727]

"Time delay passive ranging technique"

A method of passive ranging and geolocation of multiple emitters by a single detection platform. Two independent emission sequences support formulation of two independent algebraic equations involving a triangular arrangement of platform and emitters. One sequence constitutes an interrogation signal by one emitter and a transponded or reflected signal from another. A second emission sequence constitutes the reversed order of emitters from those of the first emission sequence. The method utilizes the steps of measuring the time difference of arrival at the platform of signals having travelled the direct path and the transponded or reflected paths, and measuring the angles of arrival of received signals for each independent emission sequence. A series of steps computing ranges and angles based on prior measurements provide a set of desired ranges and angles identifying the relative positions of the emitters relative to the platform. The invention may be employed in bistatic or transponded mode depending on the kind of signal emissions that are to be exploited. In the bistatic mode, the energy from an emitter is reflected from the other emitter. In the transponder mode the emitters communicate in an interrogation-transpond format with signals with known and small internal time delays. In the transponder mode, both signals are direct path signals. [A1728]

"Method and apparatus for motion compensation of SAR images by means of an attitude and heading reference system"

For motion compensation of SAR images by means of an attitude and heading reference system a mean track angle (.psi..sub.T) flight is selected as desired flight direction, an acceleration (a.sub.x '' (t)) is turned through a drift angle (.psi..sub.D) in the direction of a desired flight path, the speed (v.sub.xo ' (t)) in the desired flight direction is calculated from a ground speed (v.sub.G (t)) , a variation of the relative speed (v.sub.x ' (t)) in the desired flight direction is calculated by an integration of the acceleration (a.sub.x (t)) , a relative change of the across heading horizontal position (P.sub.y (t)) is calculated by a double integration of the across heading horizontal acceleration (a.sub.y ' (t)) , and an actual slant range of the aircraft to an illuminated terrain strip (R.sub.i ' (t)) is calculated for each range gate in a manner known per se. [A1729]

"Synthetic aperture radar system"

A synthetic aperture radar system is mounted in a moving platform. The synthetic aperture radar system includes a multi-beam antenna having a plurality of reception beams different in direction from one another, the multi-beam antenna being adapted to receive radar echoes from objects. The width of each of the reception beams is selected such that the band width of a Doppler shift contained in the radar echo of a moving object is broader than that of a Doppler shift contained in the radar echo of a stationary object. The radar echo is pulse compressed to improve the range resolution before the frequency thereof is shifted such that the center frequency of the Doppler shift due to the velocity of the moving platform becomes zero. After the frequency shifting, the radar echo is filtered to separate the radar echoes of the moving and stationary objects from each other. The radar echoes of the moving and stationary objects are respectively subjected to Fourier transform with respect to the distance between the moving platform and the objects. The spectrum of the radar echo from the moving object is further shifted such that the center frequency of the Doppler shift due to the velocity of the object becomes zero. These reception, pulse compression, frequency shift and Fourier transform are executed for each reception beam. The spectrums in the radar echoes of the moving and stationary objects are respectively synthesized for all the reception beams. After the synthesization, the spectrums are respectively multiplied by a reference spectrum in the complex manner. The results of the multiplication are respectively inverse transformed from the spectrums. [A1730]

"Method of track merging in an aircraft tracking system"

A method of processing a plurality of tracks representative of one or more target aircraft in a vicinity of a surveillance aircraft, where each track is generated in response to target reply signals provided by the target aircraft in response to interrogation signals transmitted by the surveillance aircraft, includes eliminating a portion of the plurality of tracks which are duplicate tracks of the same target aircraft. The remaining tracks are maintained and updated in response to the target reply signals provided by the target aircraft. A threat level for each of the remaining tracks is determined and two or more of the remaining tracks which are possibly representative of a same target aircraft are merged resulting in a composite track. The composite track is output to a display device utilizing information from a particular remaining track of the composite track having the greatest threat level to the surveillance aircraft while continuing to maintain and update all the remaining tracks. [A1731]

"Multiple radar interference suppressor"

A multiple radar interference suppressor for use in a missile scoring system. The multiple radar interference suppressor phase locks the pulse repetition frequency of each drone (unmanned) aircraft to one other drone of the plurality of aircrafts. The phase of the pulse repetition frequency of each of the transmitting radars of the drones is slightly offset from one another. As a result, mutual interference among the drones transmitting radar signals and receiving radar signals of other drones is overcome. Lastly, the transmitted signals and received signals are encoded so that unwanted reflections and scattering from a target may be substantially eliminated or suppressed. [A1732]

"Method of altitude track initialization in an aircraft tracking system"

A method of processing a plurality of replies of target aircraft provided in response to interrogation signals from the surveillance aircraft during surveillance periods to determine whether an altitude track may be initialized for use in a traffic alert and collision avoidance system includes the step of selecting three replies, one from each of three consecutive surveillance periods. The replies have binary or coded altitude data of high or low confidence. The binary or coded altitude data of non-adjacent and adjacent replies of the selected replies are compared and an altitude difference value for each of the comparisons is generated. Further efforts to initialize a track are discarded if any of the altitude difference values are greater than first predetermined separated altitudes if and only if such compared non-adjacent and adjacent replies have binary or coded altitude data of high confidence. The binary or coded altitude data of the non-adjacent and adjacent replies are further compared whether or not the replies have binary data of low or high confidence to determine whether an altitude track may be initialized. The process applies if the altitude data is Gilham code, binary, or other encoded data with single bit errors. [A1733]

"Low-level wind-shear alert system"

The apparatus of the present invention improved low-level wind shear alert system that provides an improved method of identifying the presence and locus of wind shear in a predefined area. This system enhances the operational effectiveness of the existing LLWAS system by mapping the two-dimensional wind velocity, measured at a number of locations, to a geographical indication of wind shear events. This system can also integrate data and processed information received from a plurality of sources, such as anemometers and Doppler radar systems, to produce low-level wind shear alerts of significantly improved accuracy over those of prior systems. In particular, the apparatus of the present invention makes use of the data and processed information produced by the existing Low-Level Wind Shear Alert System as well as that produced by the Terminal Doppler Weather Radar to precisely identify the locus and magnitude of low-level wind shear events within a predetermined area. This resultant geographical indication is displayed in color-graphic form to the air traffic control personnel and can also be transmitted via a telemetry link to aircraft in the vicinity of the airport for display therein. [A1734]

"Vehicular display system"

A vehicular display includes a three-dimensional representation of a moving host vehicle fixed at a stationary point on the screen, and dynamic representations of objects located within a predetermined distance of the host vehicle in locations proportional and scaled to their respective distances and locations from the host. The display plots the trajectories of these objects and classifies them according to probability of collision, warning the user if collision is imminent. The display also includes a variety of navigational aids, including heading lines, compass indications, and various non-alphanumeric indicators. Both the hardware and software used in the system are of the type which may be provided on small civilian craft, in addition to replacing the more complex and less intuitive displays presently provided in such contexts as commercial aircraft, marine vehicles, and air traffic control systems. The display also may be adapted for use in outer space. [A1735]

"Airborne weather radar system with aircraft altitude and antenna tilt angle dependent sensitivity time control"

Sensitivity time control (STC) data for an airborne weather radar system is provided as a function of aircraft altitude and radar system antenna tilt angle to normalize radar return signals at high as well as low aircraft altitudes. In one form of the invention the STC data is used to adjust the gain of a signal applied to a radar system received by a system antenna and in another form of the invention the STC data is used to establish a desired threshold for said signal. [A1736]

"Windshear radar system with upper and lower elevation radar scans"

The present invention is an airborne radar system which scans the flight path of an aircraft with two radar scans, an upper elevation pointing above local level and a lower elevation scan pointing below the glide slope. The radar returns from the upper elevation scan are used to detect the core of the microburst. The core and a model of the windshear which uses the core are used to select angles and range cell candidates, in a lower elevation scan, for hazard detection processing. The candidates in the lower scan, which is pointing at the ground, are used to create a hazard map tested against a predetermined hazard threshold. A threshold violation results in a pilot alert. The hazard map includes a vertical factor determined through model coefficients in the radial outflow as a function of altitude. The invention applies the model to determine the total hazard factor along the glideslope using the vertical hazard of the model and altitude scaling of the horizontal hazard from the lower bar elevation to the glideslope of the aircraft. The present invention also includes a radar scan with two pulse repetition frequencies which allows the elimination of non-correlated returns. The system also includes post detection integration with a sliding azimuth window to enhance the signal to noise ratio. The system also combines velocities within a single range gate to produce a velocity representing the windspeed at that range. [A1737]

"Method of operating a dual mode tracking system"

A method of processing IR signals from a repetitively scanned array of photovoltaic cells is shown to consist of the steps of: (a) subtracting IR signals received on successive scans to produce response signals corresponding only to IR signals from moving or scintillating objects, (b) generating inhibiting signals for IR signals from the edges of wind-driven clouds or from scintillating objects, and (c) inhibiting those response signals that are from the edges of moving clouds or scintillating objects. [A1738]

"Method for resolving ambiguity in the determination of antenna angle of view and Doppler frequency in synthetic aperture radar"

In a method for resolving ambiguity in the determination of antenna angle of view and Doppler frequency in synthetic aperture radar (SAR) , by evaluating the dependence of the Doppler frequency on the transmitting frequency a skew of the two-dimensional Fourier power spectrum or the two-dimensional autocorrelation function of radar data is measured in that the radar data are subjected to a range Fourier transformation and for the individual range frequencies in a following Doppler centroid estimator a Doppler centroid determination is carried out in the azimuth direction. By this method the pulse repetition frequency ambiguities are eliminated without any demands having to be made on the data acquisition or a high image contrast, this method can therefore be applied to any region of the raw data matrix. Moreover, no azimuth compression is necessary. [A1739]

"High speed method for predicting radio-wave propagation"

Radio-wave propagation is rapidly predicted by a hybrid computational method that uses Ray Optics techniques to calculate radio field strength above a limiting radio-wave ray, Parabolic Equation techniques to calculate radio field strength below the limiting radio-wave ray and below a predetermined altitude, and a newly created Extended Optics method to compute radio field strength in an area of the atmosphere below the limiting radio-wave ray and above the predetermined altitude. Rays in the extended optics area are initialized from the elevation angle that rays traced through the parabolic equation area make with the predetermined altitude. Where reflected, direct or origin created rays do not exist within the parabolic equation area, the elevation angle for the ray that does exist at the furthest range (optical limit) is used to initiate ray tracing in the extended optics area for ranges beyond the optical limit. Where the refractive index varies along the predetermined altitude, adjustments to the elevation angle used to initialize rays within the extended optics area are made. Propagation factors, determined through the Parabolic Equation method, are assigned to the rays traced through the extended optics area based upon the propagation factors in existence at the predetermined altitude. Field strength or propagation loss within the extended optics area is calculated from an interpolation between propagation factor values assigned to the extended optics rays. [A1740]

"Stick figure radar tracking process"

A process for reducing the likelihood of runway incursions wherein the major components of an aircraft are individually tracked by radar instead of tracking only the overall image of the aircraft to more accurately predict possible runway incursions due to the rapid and accurate indication of any change in aircraft orientation during each sweep of the radar. [A1741]

"Optical RF stereo"

An optical RF stereo systems includes multiple remote vehicles, a processing center, and optical RF link systems for transmitting RF signals from remote vehicles to the processing center and for transmitting command and control signals from the processing center to remote vehicles. [A1742]

"Multiple target discrimination system"

A radar homing system in a guided missile for intercepting one of a group of targets, such as aircraft flying in formation. Offset circuitry places undesired Doppler target returns outside of the IF filter bandpass frequency of the system. The system is designed to take cognizance of the highest Doppler frequency derived from the targets. [A1743]

"Local oscillator frequency control means for semiactive missile guidance and control system"

A target tracking radar receiver for use in a semiactive tracking system wherein elevation angle data, azimuth angle data and Doppler frequency shift data are processed in a manner which enables narrow band filtering of target angle tracking data in the first intermediate frequency stage. The receiver is arranged to track, simultaneously, variations of target Doppler frequency and of transmitter frequency to permit the desired early narrow band filtering of the received angle data. [A1744]

"Beam summing apparatus for RCS measurements of large targets"

Systems and methods for measuring RCS patterns of large targets in a compact target range having limited size. The present invention utilizes a compact range whose sweet spot (corresponding to the imaged area of the target) is much smaller than the target size. Inverse synthetic array radar (ISAR) images of successive sections of the target are registered to form a composite image of the whole target. The image is then Fourier transformed to generate an RCS value of the full target. This procedure is repeated for successive measurement angles, an RCS versus .theta. plot is generated corresponding to the RCS pattern of the target. The multiple images may be generated by translating the target and computing RCS plots of the target by combining the multiple images produced during translation, or generating the the multiple images by moving feeds or using multiple feeds of the ISAR system. [A1745]

"Radar techniques for detection of particular targets"

A radar system is capable of detecting and classifying rotating targets such as rotating antennas. Particularly, unfriendly radar installations can be detected and classified by a synthetic aperture radar system, which may be carried by an aircraft. The radar reflection signal (echo) received by a synthetic aperture radar system and reflected from a rotating object will appear as a series of image points, or pulses, at the same range, but spaced apart by some apparent distance or frequency. By knowing the apparent distance (d) between adjacent image points, the range (R) to the target, the time of integration (T.sub.o) of the radar system, the velocity (V.sub.o) of the detecting aircraft, the angle (B.sub.o) to the target, and the wavelength of the aircraft's radar signal (.lambda.) , the rate of rotation (F) of the target may be determined from ##EQU1## where S is the azimuthal resolution expressed by ##EQU2## Furthermore, by knowing the azimuthal extent (W) of the apparent target (namely, the apparent width of the entire set of image points) , the width or diameter (L) of the target may be ascertained ##EQU3## Apparatus for classifying rotating targets is provided to permit on-board determination of the class of target detected. [A1746]

"Method of improved initial transmission of acquisition and tracking interrogations in an aircraft tracking system"

In an aircraft having an aircraft tracking system (ATS) , the aircraft being a monitoring aircraft, the monitoring aircraft interrogates target aircraft in the vicinity of the monitoring aircraft in order to determine potentially dangerous situations. The target aircraft responds to the interrogations with parameter information which includes identification (ID) . A method of interrogating the target aircraft comprises the steps of receiving unsolicited signals from the target aircraft in the vicinity of the monitoring aircraft. The received unsolicited signals are received by the monitoring aircraft at a first power level. Based on the first power level of the received unsolicited signals, the monitoring aircraft interrogates the target aircraft with a first interrogation signal. The first interrogation signal is transmitted at a second power level, the second power level being based on the first power level of the received unsolicited signal, thereby minimizing interference in the environment and optimizing receipt of the first interrogation signal by the target aircraft. [A1747]

"Digital video quantizer"

A digital video quantizer for use in TCAS and ATCRBS/SIF systems. A digital delay receives a digitized video signal and produces a plurality of delayed digital signals which are used throughout the quantizer. A threshold generator then produces a predetermined threshold and a dynamic threshold, and a quantized video generator compares one of the delayed digitized signals to a threshold to produce a quantized video signal. A slope quantizer detects a slope of the digitized signal which exceeds either a positive or negative threshold. In addition, a rise time detector detects an excessive rise time in the digitized video signal, and a chip amplitude comparator provides a signal which is used in detecting Mode S data bit values. The digital video quantizer's use of digital references rather than analog references, eliminates the inaccuracies caused by a reference voltage varying over time or temperature. The digital references also facilitate modification of the reference values at a later time. [A1748]

"Target acquisition, locating and tracking system"

In accordance with the present invention there is provided a monitoring system that monitors and locates objects such as airplanes and other vehicles on runways, taxiways, or other preprogrammed areas. The invention utilizes a minimum of three transmitters for generating a diffusion field and two receivers which detect displacements in a diffusion field. The receivers are coupled with a computer which calculates the position of the object causing the displacement in the diffusion field. The area to be monitored is divided into grids which are programmed onto the computer, and objects moving in the monitored area cause changes in the signal received by the receivers which are conveyed to the computer and compared by the computer to the programmed grid to indicate the location of the object causing the changes. [A1749]

"Method of reducing false tracks due to suppression pulse replies in an aircraft tracking system"

In an aircraft which has a tracking system, the aircraft interrogates all target aircraft in the vicinity of the aircraft in order to determine potentially dangerous situations. The interrogation has a predetermined interrogation sequence which includes interrogation pulses and suppression pulses. The target aircraft respond to the interrogation with predetermined parameter information, the target aircraft sometimes responding to the suppression pulses of the interrogation resulting in an indication of false tracks to the monitoring aircraft. A method is implemented which reduces the false tracks resulting from replies to the suppression pulses. The method comprises the steps of forming tracks on responses to the interrogations wherein the responses meet a first set of predetermined criteria. The formed tracks are then identified as suppression pulse tracks or non-suppression pulse tracks in accordance with a second set of predetermined criteria. Lastly, tracks labelled as suppression pulse tracks are inhibited from being displayed by the tracking system as a potentially dangerous target aircraft to the monitoring aircraft. [A1750]

"System for monitoring aircraft position"

A system for locating and identifying aircraft while on an airport. Each aircraft has an IFF transponder which is interrogated from on board the aircraft to produce replies at a slower rate than normal interrogation rates. A plurality of receiving stations at different locations about the airport measure the time of arrival of the replies and decode the replies. The time of arrival information is forwarded to a central receiving station along with the decode reply data. Using conventional correlation techniques, the location of each aircraft is established through the time of arrival information as well as the identity of the aircraft from the decoded reply data. [A1751]

"Wideband electromagnetic imaging system"

A synthetic aperture radar (SAR) system for determining the location of stering centers on low-observability aircraft or other vehicles has an antenna that moves along a linear track relative to the stationary unit under test. When the scan is complete, the system produces an image of the aircraft showing the scattering centers. The system may then superimpose graphics representing the outline of the unit under test on the image. The operator may use the graphics to correlate the scattering centers in the image with corresponding areas of the aircraft. [A1752]

"Method and apparatus for microburst and wake turbulence detection for airports"

A method and apparatus for detecting specialized meteorological conditions such as a microburst and also the wind condition generated behind an aircraft known as wake turbulence. The method and apparatus of the present invention is designed to display the location of the microburst directly on the flight controller's monitoring screen with the flight controller then being able to so inform any pilot of an aircraft of the microburst so that the pilot can take evasive action. The display on the flight controller's screen is to be in color. The displaying of the microburst on the screen is to be by means of a computer which utilizes as inputs the conventional aircraft surveillance radar, weather radar and ground radar as well as additional inputs of wind direction and velocity information obtained from detection devices mounted directly adjacent to the aircraft runway and along the approach and take-off areas for the runway. [A1753]

"Three dimensional interferometric synthetic aperture radar terrain mapping with unambiguous phase unwrapping employing subset bandwidth processing"

Synthetic aperture radar data is used to produce a terrain map. Two synthetic radar antennas are placed on an aircraft, which moves in a set of substantially parallel flight paths. At least one antenna repeatedly transmits radar signals whose return echoes are received by both the antennas. The echo signals are processed conventionally to yield slant range and Doppler frequency data for plural resolution cells. The measured phase difference for each resolution cell provides an ambiguous measure of slant range difference to the two antennas needed to determine terrain elevation and correct ground range. As in the prior art, the radar transmissions employ an extended bandwidth of wavelengths. The received echo data is reprocessed using less than the entire bandwidth of the radar transmission to achieve additional center wavelengths. This produces a differing ambiguity interval and permits unambiguous determination of the slant range difference. [A1754]

"Aircraft information system"

An aircraft landing information system is disclosed which provides to the aircraft pilot information regarding the actual and preferred sink rate of the aircraft, the distance between the landing gear wheels and the runway, and deviation of the actual sink rate from the preferred sink rate. An altitude determining sensor is provided on the aircraft and the information transmitted therefrom is fed into a microprocessor or like system which then presents the relevant data to the pilot in an audio and/or visual format to allow the pilot to touch down at the preferred sink rate. [A1755]

"Low-level wind-shear alert system"

The apparatus of the present invention improved low-level wind shear alert system that provides an improved method of identifying the presence and locus of wind shear in a predefined area. This system enhances the operational effectiveness of the existing LLWAS system by mapping the two-dimensional wind velocity, measured at a number of locations, to a geographical indication of wind shear events. This system can also integrate data and processed information received from a plurality of sources, such as anemometers and Doppler radar systems, to produce low-level wind shear alerts of significantly improved accuracy over those of prior systems. In particular, the apparatus of the present invention makes use of the data and processed information produced by the existing Low-Level Wind Shear Alert System as well as that produced by the Terminal Doppler Weather Radar to precisely identify the locus and magnitude of low-level wind shear events within a predetermined area. This resultant geographical indication is displayed in color-graphic form to the air traffic control personnel and can also be transmitted via a telemetry link to aircraft in the vicinity of the airport for display therein. [A1756]

"Collision warning system"

A collision warning signal for at least one vehicle is provided by transmitting from the surface of the earth a radio signal, receiving at the surface of the earth, a radio signal returned by a vehicle in response to the transmitted radio signal, determining an elapsed time between the transmitting of the radio signal and the receiving of the corresponding returned radio signal, determining the position of the vehicle at least in part in dependence upon the determined elapsed time, comparing the determined position of the vehicle with terrain data stored in a data base, and generating a warning signal based on the comparison if predetermined parameters are satisfied. [A1757]

"Tracking radar systems"

A tracking radar system comprising an aerial arrangement having a plurality of outputs, means for deriving from the aerial outputs a sum signal representative of the sum of the aerial outputs and a difference signal representative of the direction of a target relative to the aerial, a receiver for processing said sum and difference signals to produce corresponding intermediate frequency sum and difference signals, means for comparing the intermediate frequency sum signal with the output of an oscillator in a first phase-locked loop and using the resulting signal to control the oscillator frequency so as to cause the oscillator to lock on to the frequency of the intermediate frequency sum signal, a phase-sensitive detector for comparing the intermediate frequency difference signal with the output of the oscillator to produce an output signal representative of the phase difference between the sum and difference signals, and bandwidth alteration means responsive to the sum signal to alter the bandwidth of the first phase-locked loop. [A1758]

"Method of correcting rotational motion error in SAR and ISAR imagery"

A method of correcting rotational motion error in SAR and ISAR imagery includes shifting the center of the image to zero doppler and thus to the center of rotation of the target being imaged, selecting a dominant scatterer at an off-center range cell to provide a phase reference, calculating the rotational motion error function from the phase of the selected scatterer, using the rotational motion error function to interpolate raw radar return image data between the original unequal angular samples to obtain equal angular samples of the target reflectivity function, and performing an image quality check and producing a value which is a relative measure of focus of the image. Also, the method includes repeating the steps starting with selecting a new dominant scatterer as a phase reference. Further, the performing step of the method includes storing and comparing the relative measures of focus provided by repeating of the steps to arrive at the corrected image which is the most focused and then saving the corrected image determined to be the the most focused. [A1759]

"Multiple discrete autofocus"

A method and autofocus processor that is adapted to automatically correct focus phase errors associated with synthetic array radar signals. The method comprises processing the synthetic array radar signals to produce a SAR image, identifying and locating potential targets contained in the SAR image, storing the range bin and azimuth location of the target in a target list, bandpass filtering the SAR signals associated with the target scatterer to remove the interference therefrom, forming the pulse pair product of the phase history samples from each reference target to produce a differential phase function, integrating the differential phase function over all reference targets to provide the averaged differential phase history associated therewith, interpolating the averaged differential phase function to restore the original time scale and number of samples, and computing the focus error from interpolated differential phase history. The focus error is estimated as a weighted average of the phase history of the detected scatterers. The autofocus processor automatically finds targets and combines data from multiple scatterers effectively and efficiently. The autofocus processor extends the range and resolution limits of SAR systems, and enables the effective use of a SAR sensor with less expensive motion compensation function. The autofocus processor also decouples the SAR sensor (including motion sensors) from its SAR processor, so that the autofocus processor produces better images, no matter what sensor is employed. [A1760]

"TCAS II pitch guidance control law and display symbol"

An airplane pitch guidance control law and display symbol for a Traffic alert and Collision Avoidance System (TCAS) is disclosed. The control law converts a TCAS computer-generated vertical air speed command into a pitch guidance command. The pitch guidance command controls the location of a symbol (51) on the pitch axis of an electronic attitude display (21) that guides a pilot toward a pitch attitude that will result in a vertical speed that eliminates a collision threat. The preferred symbol is a pitch axis leg (53) and a pair of outwardly diverging legs (55a, 55b) . The pitch axis leg (53) defines the minimum climb or descent attitude required to achieve a safe climb or descent angle. The pitch axis leg (53) and the diverging legs (55a, 55b) combine to define a climb or descent attitude range to avoid. The distance between the pitch axis leg 53 and the boresight 39 of the airplane symbol of the display is controlled by a RA.sub.CMD signal produced by: subtractively combining the vertical speed command (V.sub.STCAS) produced by a TCAS II computer and the vertical speed of the airplane (V.sub.SIND) , multiplying the result by a sensitivity factor K whose value is related to the true air speed of the airplane and 57.3 to approximate the arc tangent of the quotient, and subtracting a factor that compensates for the fact that flight path angle changes lag pitch attitude changes. [A1761]

"Hertzian-wave intrusion detetor"

The detector indicates the presence of a body (28) which is sufficiently conductive of Hertzian energy in a predetermined volume with the possibility of determining approximately its distance from the receiving aerial from a few millimeters to several meters. A stationary conductive body (28) has no effect on the detection mode. The electronic device consists essentially of an emitter (1) of pulses which are preferably modulated and, if necessary coded, a signal (10) from the emitter (1) after amplification (9) is radiated by the aerial (2) . A receiver (13) receives directly the synchronization signal (4) and, if applicable, the coding signal (5) from the emitter (1) . If a body (28) which is sufficiently conductive of Hertzian energy passes between or disappears from between the aerials (2, 2a, 26) and (11) the signal received on the aerial (11) varies sufficiently for the receiver (13) to act on a control (12) and signalling (15) mode. [A1762]

"All weather tactical strike system (AWTSS) and method of operation"

An AWTSS is shown to be made up of an improved synthetic aperture radar (SAR) for generating radar maps with various degrees of resolution required for navigation of an aircraft and detection of ground targets in the presence of electronic countermeasures and clutter. The SAR consists, in effect, of four frequency-agile radars sharing quadrants of a single array antenna mounted within a radome on a "four axis" gimbal with a sidelobe cancelling subarray mounted at the phase center of each quadrant. Motion sensors are also mounted on the single array antenna to provide signals for compensating for vibration and stored compensating signals are used to compensate for radomeinduced errors. In addition, a signal processor is shown which is selectively operable to generate radar maps of any one of a number of desired degrees of resolution, such processor being adapted to operate in the presence of clutter or jamming signals. [A1763]

"High resolution synthetic aperture radar having rectilinear output image format"

A method and apparatus for providing a constant scale factor in azimuth and synchronism of data blocks for a second stage fast Fourier transform in a synthetic aperture radar having two stages of FFT by varying the sampling rate at the output of the first stage FFT as an inverse function of range. [A1764]

"Method and apparatus for determining target elevation angle, altitude and range and the like in a monopulse radar system with reduced multipath errors"

The present invention relates to a method and system for determining target elevation angle, altitude and range and the like in a monopulse radar system with reduced multipath errors. A transmitter/receiver unit receives monopulse sum and difference signals caused by echoes from targets. The sum and difference signals are then logarithmically-amplified in a logarithmic amplifier unit. A selector selects one of the sum and difference signals having the largest amplitude, and generates a selection signal indicating which of the sum and difference signals has the largest amplitude. The selection signal is provided to a search radar target tracking unit which determines whether a target at a given range interval and azimuth interval, for example, has been selected for tracking by an operator. The search radar target tracking unit then controls a gate unit to selectively provide either the logarithmically-amplified sum signal or the logarithmically-amplified difference signal to a peak detection unit based on the selection signal, and based on whether a particular target has been selected for tracking. The peak detection unit determines peak value (s) in the logarithmically-amplified sum and difference signals provided by the gate unit. A target elevation angle/altitude calculation unit uses the peak value (s) to determine target elevation angle or altitude values, or average target elevation angle or altitude values. Such values may be displayed on a CRT for in correspondence with the selected target (s) . [A1765]

"Angle-of-arrival measurement via time doppler shift"

To allow measurement of the angle-of-arrival (AOA) of the radar pulses from an uncooperative ground-based emitter, the method exploits the time doppler shift resulting from the velocity of a high performance aircraft and the high maneuver ability available to such aircraft to form initial angle calculations. These initial angle calculations along with inherent radar stability are then used for subsequent AOA measurements. The aircraft is flown at a constant velocity V.sub.B along successive legs with an angle .phi..sub.K between successive legs, and the velocity V.sub.B and the angles .phi..sub.K are found using a navigation system such as GPS or inertial navigation.

The time difference T.sub.n '-T.sub.1 ' is measured between the arrival of the first and last of n pulses for each sample. A general approximation equation of T.sub.n '-T.sub.1 ' is normalized such that for any K samples the following equation applies, wherein .theta..sub.K is the angle from the line of flight for a leg K to the emitter, where e.sub.K = (T'.sub.n -T'.sub.1) / (n-1) , s=V.sub.B /c (n-1) , c is the velocity of light, and R=e.sub.K / (1-s cos .theta..sub.2) . The value of the angle .theta..sub.K is calculated using the following equation. ##EQU1## where p=-e.sub.1 +e.sub.2 cos.phi. r= (e.sub.2.sup.2 -2e.sub.1 e.sub.2 cos.phi.+e.sub.2.sup.2) .sup.1/2. [A1766]

"Passive self-determined position fixing system"

A passive self-determined position fixing system for use by aircraft and other users such as sea-going vessels utilizes a directional radar in combination with an omnidirectional radar facility to produce a directional radar beam and simultaneous omnidirectional radar transmission. A television type broadcast facility provides a broadcast of the PPI display of the directional radar system. The directional radar pulse signals together with the omnidirectionally retransmitted radar pulse signals are processed by the position fixing system aboard the host aircraft or the like to determine range information. A display system such as a conventional television receiver responds to the broadcast PPI display to produce a similar display within the host aircraft. The position fixing system combines the PPI type display together with the information with the directional and omnidirectional radar transmissions to identify the user or host aircraft or vessel upon the PPI type display. [A1767]

"Ultra wideband radar employing synthesized short pulses"

An impulse radar that forms a predetermined radar pulse train in space by transmitting individual spectral components thereof. Thus, a train of extremely short pulses is obtained without switching a radio frequency signal on and off at a high rate. An oscillator is coupled to a harmonic generator, and a power divider distributes the output of the harmonic generator to a multiplicity of amplifiers. Each amplifier has a phase-locked VCO circuit that provides frequency accuracy, spectral purity, low noise and frequency stability. Thus, each amplifier provides one of the spectral components of the predetermined radar pulse train. The amplifiers are coupled to a multiplexing feed that illuminates a reflector. On receive, the multiplexing feed separates the spectral components of the incoming pulse train. Each spectral component is coupled to its own narrow band receiver, and one receiver is used to amplify and detect each spectral component. The signals from the receivers are coherently combined in a signal processor in which the signals add coherently and the noise signals do not. The output of the signal processor may be applied to a radar display. The short pulses produced by the radar provide very high resolution, and can map a target by sweeping across it, thus imaging it. The radar emits a wideband signal at a low power level, the signal is difficult to detect and intercept, and thus provides for a low probability of intercept radar. The radar may be used as a microwave link, wherein the oscillator may be frequency modulated to provide communications. It may also be used as a covert IFF system to identify friendly aircraft. The radar provides signals that penetrate sand and may be used for mapping and to locate land mines buried in the sand. It may also be used for clearing away land mines by detonating them. When the power is turned up, the radar provides for a directed energy beam. The radar may perform adaptive jamming, and is also a jam resistant radar. It is hard to jam because the receiver array is insensitive to noise at frequencies outside the narrow bandwidths of the individual receivers and also to noise which is not coherent across the multiplicity of receiver channels. [A1768]

"Method of correcting range migration in image generation in synthetic aperture radar"

In a method for correcting range migration in image generation in synthetic aperture radar (SAR) to eliminate the entire range migration or the residual range migration left by a conventional focussing method, prior to the range compression the data are transformed to the range-Doppler domain and there multiplied by a specific two-dimensional phase function, after an additional range Fourier transformatioin the range compression is then carried out with a specifically modified range transfer function and thereafter a range inverse Fourier transformation performed. Furthermore, a corresponding residual phase error is corrected. In addition, the data can if necessary be segmented in range or a range precompression performed. With the method according to the invention the range migration is completely eliminated without having to perform an explicit interpolation. Furthermore, with reduced processing expenditure improved image quality is obtained and moreover all known SAR focussing methods can be equipped with the method according to the invention. [A1769]

"Method and system for measuring the position of lightning strokes"

A method and system for unambiguous pre-detection real time measurement of lightning strokes. [A1770]

"Method of bearing determination utilizing a bottom antenna in an aircraft tracking system"

In a Traffic Alert and Collision Avoidance System on an aircraft having a plurality of antennas, an optimal bearing value is obtained for each target aircraft by generating a target data block for each response to an interrogation, each target data block including a measured bearing value and an associated priority code. A priority code is assigned based on the antenna receiving the information, and the number of valid bearing measurements used to determine a measured bearing value for the reply. If more than one target data block is obtained in a surveillance period, one target data block is retained based on predetermined criteria. The measured bearing value of all the target data blocks having the same, highest priority code are selected or combined, the result being saved in the target data block. The priority codes are then used to select the proper reply bearing measurement, the bearing track update filtering parameters, and to aid in the reply qualification for bearing track initialization. [A1771]

"Method for detecting and classifying helicopters"

To detect and classify a helicopter as a target by means of a radar system equipped with a Doppler filter bank, an initial determination is made as to whether the threshold value has been exceeded in a substantial number of the individual filters of the Doppler filter bank, and if so, the width of that amplitude band delimited by the highest and lowest amplitudes of the filter output signals is determined and a decision regarding the presence of a helicopter target is derived from the width of the amplitude band. [A1772]

"Contraband detection system"

A contraband detection system especially suited for detecting concealed non-metallic contraband such as ceramic or plastic weapons or illegal drugs carried by a person is disclosed. Plural sources of quasi-coherent millimeter wave radiation are disposed so as to uniformly illuminate a field of view. In the preferred embodiment, the radiation emitted by the sources is linearly polarized in a single plane such that the polarization of the radiation with respect to the plane in which linearly polarized radiation is preferentially received by the detectors can be controlled. for detection of dielectric objects, such as ceramic weapons or narcotics, these planes of polarization should be orthogonal to one another. The detector is a staring array which does not require scanning to generate an image of the entire field of view, the signal provided by each element of the detector array corresponds to the illumination reflected from objects in a single portion of the field of view. Real-time imaging of concealed dielectric and metallic objects is thus made possible. [A1773]

"Method of detecting the division of a radar target"

A method of detecting the division of a radar target can detect a target, for instance caused by the release of a weapon from an aircraft which is tracked by a monopulse radar whose antenna is aligned onto the target with the aid of azimuth and/or elevation difference signals. Division of the radar target can be detected irrespective of whether the target is equipped with and uses an interference transmitter, by establishing a search channel in the radar difference channels. This channel has a sensitivity which is very low in a direction towards the tracked target, but which increases rapidly in directions which deviate somewhat from the direction towards the target. The search channel can be established by comparison of the absolute values of the signal levels in the difference channels with a threshold value. [A1774]

"Inside/out perspective format for situation awareness displays"

A traffic information display format, situated in a craft, for observing traffic in a volume about the craft, having one or more viewing grids that display traffic on the display in a three-dimensional perspective so that the observer of the display can conceptually and immediately perceive the traffic entities and their statuses, distances, altitudes, ascending rates, descending rates, closing rates, receding rates and other information. The formats are generated by situation and symbol computers and provided to a stroke or flat panel display. The computers follow a system flow design that results in symbol and format generation for a display. [A1775]

"All weather tactical strike system (AWTSS) and method of operation"

An AWTSS is shown to be made up of an improved synthetic aperture radar (SAR) for generating radar maps with various degrees of resolution required for navigation of an aircraft and detection of ground targets in the presence of electronic counter-measures and clutter. The SAR consists, in effect, of four frequency-agile radars sharing quadrants of a single array antenna mounted within a radome of a "four axis" gimbal with a sidelobe cancelling subarray mounted at the phase center of each quadrant. Motion sensors are also mounted on the single array antenna to provide signals for compensating for vibration and stored compensating signals are used to compensate for radome-induced errors. In addition, a signal processor is shown which is selectively operable to generate radar maps of any one of a number of desired degrees of resolution, such processor being adapted to operate in the presence of clutter or jamming signals. [A1776]

"All weather tactical strike system (AWTSS) and method of operation"

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"Pilot warning system"

This invention relates to a system to alert an aircraft pilot of presence and general location of other aircraft that might constitute a collision threat to the pilot's aircraft. An antenna means operates in first and second modes characterized by respective first and second directivity conditions resulting in first and second gains for signals from a certain direction. Analysis means compares the amplitues of the first and second responses to produce an angle-indicating signal locating a potential collision threat without having to generate radio signals other than those already being generated by equipment in other aircraft in response to ground ATC interrogation. [A1778]

"All weather tactical strike system (AWTSS) and method of operation"

An AWTSS is shown to be made up of an improved synthetic aperture radar (SAR) for generating radar maps with various degrees of resolution required for navigation of an aircraft and detection of ground targets in the presence of electronic countermeasures and clutter. The SAR consists, in effect, of four frequency-agile radars sharing quadrants of a single array antenna mounted within a radome on a "four axis" gimbal with a sidelobe cancelling subarray mounted at the phase center of each quadrant. Motion sensors are also mounted on the single array antenna to provide signals for compensating for vibration and stored compensating signals are used to compensate for radomeinduced errors. In addition, a signal processor is shown which is selectively operable to generate radar maps of any one of a number of desired degrees of resolution, such processor being adapted to operate in the presence of clutter or jamming signals. [A1779]

"Anti-exploitation method and apparatus for controlling aircraft IFF"

A method and apparatus for preventing unauthorized sources from utilizing rcraft-borne I.F.F. for locating same. A bypass switch is inserted in the I.F.F. transponder antenna line which normally sends all incoming signals into a dummy load. Upon receipt of a proper interrogate command, the antenna is switched to the transponder. [A1780]

"Millimeter-wave aircraft landing and taxing system"

Apparatus, and a corresponding method, for generating navigational data to aid a pilot in landing or taxiing an aircraft in poor visibility conditions. Radio-frequency (rf) beacons at predetermined locations around an airport runway or taxiway are separately modulated to render them uniquely identifiable from the aircraft. A fixed array of receiving antennas on the aircraft has multiple, angularly spaced antenna beams that substantially overlap each other in coverage, such that a signal received from one of the beacons will in most cases be received in more than one adjacent receive beam. Signals received in each beam are processed by a fast Fourier transform module to separate signal components from the various beacons, then an interpolation process determines the arrival angles of the signals by comparing the amplitudes received in adjacent receive beams. Azimuth and elevation angle values are thereby obtained for each detected beacon, and this information can be used in conjunction with conventionally obtained aircraft attitude and altitude data to produce a visual display for the pilot when landing or taxiing the aircraft. [A1781]

"All-weather precision landing system for aircraft in remote areas"

An all-weather aircraft landing system includes a plurality of ground based passive 90.degree. dihedral reflectors for producing two-bounce reflected signals without ground reflections, and an airborne radar system which may transmit and receive "same sense" circularly polarized radiation, while completely rejecting "opposite sense" polarization returns or else utilizing them to indicate weather conditions. Radar clutter from objects such as rain, buildings and trees which produce opposite sense reflections are rejected by the "same sense" receiver or switched to an "opposite sense" receiver to provide weather/obstacle condition information. By properly orienting a plurality of 90.degree. dihedral angle reflectors of a particular size in a predetermined array pattern and tilt-angle adjacent a runway, the reflections from airborne radar signals are processed and displayed to provide a visual means for determining glide slope deviation and approach vector of the landing aircraft. In a preferred embodiment, two (portable) reflectors are utilized in conjunction with an conventional linearly polarized wave airborne radar system (e.g., standard modern weather radar) , requiring no modifications to the airborne equipment while still providing an inexpensive means to obtain precise visual indication of glide slope and approach vector information. [A1782]

"Glide slope surveillance sensor"

A surveillance sensor for detecting and monitoring aerodynamic conditions in a vicinity of an aircraft landing glide slope utilizes a radar transmitter to illuminate the glide slope. Radar reflections from aircraft induced vortices, clear air turbulence, and glide slope cross winds are received by a monopulse radar system wherein a sum beam doppler spectrum and a difference beam doppler spectrum for the radar returns is determined. The sum and difference beams doppler spectra are processed to determine the aerodynamic conditions in the glide slope vicinity. These aerodynamic conditions are assessed to determine whether aerodynamic hazardous conditions exist in the glide slope region. [A1783]

"Track extension for use with ATCRBS surveillance procedures"

During ATCRBS surveillance procedures, a multiplicity of target aircraft are typically detected through target replies from interrogation signals. However, the nature of the target acquisition procedures are such that positive identification of the target aircraft is not available. Rather than ordering the target tracks with increasing range and correlating the target replies with tracks based on the ordering of the target tracks, the tracks are prioritized, based on confidence in the reliability of the identification of each track, into groups. An attempt to correlate the tracks of each group with the set of target replies is performed for the groups in order of decreasing priority. A target reply is assigned to a track when a correlation between a track and a target reply is determined. [A1784]

"Low-level wind-shear alert system"

The apparatus of the present invention improved low-level wind shear alert system that provides an improved method of identifying the presence and locus of wind shear in a predefined area. This system enhances the operational effectiveness of the existing LLWAS system by mapping the two-dimensional wind velocity, measured at a number of locations, to a geographical indication of wind shear events. This system can also integrate data and processed information received from a plurality of sources, such as anemometers and Doppler radar systems, to produce low-level wind shear alerts of significantly improved accuracy over those of prior systems. In particular, the apparatus of the present invention makes use of the data and processed information produced by the existing Low-Level Wind Shear Alert System as well as that produced by the Terminal Doppler Weather Radar to precisely identify the locus and magnitude of low-level wind shear events within a predetermined area. This resultant geographical indication is displayed in color-graphic form to the air traffic control personnel and can also be transmitted via a telemetry link to aircraft in the vicinity of the airport for display therein. [A1785]

"Passive aircraft monitoring system"

A passive aircraft monitoring system (20) receives signals transmitted by an instrument landing system (14, 16) and reflected from aircraft (18) . The Doppler shift in the reflected signals is used to calculate the position or velocity of the aircraft. Using the ILS 90 and 150 Hz signals reflected from the aircraft and comparing their magnitude, the altitude and lateral position of the aircraft can also be determined. [A1786]

"Doppler radar/ultrasonic hybrid height sensing system"

A height measurement system uses an inexpensive ultrasonic height measuring evice to provide an apparent height of a descending airborne object. To compensate for movement of the object during the ultrasonic measurement, a Doppler radar velocity measuring device determines the vertical velocity in a short measurement period. The measured vertical velocity is used to determine the vertical distance travelled during the ultrasonic measurement and to compensate therefor by converting the apparent height to a true height of the descending object. Updates of the true height may be obtained by storing the vertical velocity and retrieving the vertical velocity for multiplication by a time value to obtain an updated value of the true height. [A1787]

"Doppler radar speed sensor"

A Doppler radar speed sensor for a land vehicle comprises a radar transmitter/receiver circuit (1) coupled to an aerial system (2) . R.F. energy from a source (3) is transmitted by the aerial system in forward (9) and backward (10) directions and energy reflected from these directions is mixed with a sample of the transmitted energy in a mixer arrangement (8) to yield a pair of Doppler frequency components representative of the vehicle speed. In order to ensure that these components always have mutually different frequencies, and thereby avoid the necessity of constructing the mixer arrangement as a pair of quadrature-related mixers, the forward and backward directions make different angles (.theta.+.DELTA..theta. and .theta.-.DELTA..theta. respectively) with the direction of travel (15) . [A1788]

"Millimeter wave imaging sensors, sources and systems"

A millimeter wave imaging system is disclosed which has wide applicability throughout transportation and related industries. for example, the system may be used to provide an aircraft pilot with an image of a landing field which is essentially unaffected by fog, rain, snow, blowing sand, etc. The system comprises an array of imaging elements as its fundamental component. Each of the imaging elements of the basic array comprises an antenna consisting of a pair of conductive elements and a non-linear circuit element connected thereacross. A image can then be formed responsive to millimeter-wave radiation without complex processing steps or any form of mechanical or electronic scanning. To increase the sensitivity of the imaging array system, a local oscillator signal may be mixed with the energy received from the field of view in each of the imaging elements by the non-linear circuit element. The oscillator used to provide the local oscillator signal can also be used to illuminate the field of view. Coded beacons emitting encoded millimeter wave energy for detection by the imaging array may also be employed. [A1789]

"Automatic horizontal and vertical scanning radar"

A Weather radar and map display system for use in aircraft includes a transmitter for transmitting radar signals outwardly from the aircraft, a receiver for receiving back reflected radar signals, a digitizer for digitizing the reflected radar signals, a processor for calculating the latitude and longitude coordinates of the locations in space from which the reflected radar signals were reflected based on detected range information of the reflected radar signals and detected heading, position and track information of the aircraft, and a storage device for storing the digitized signals and the latitude and longitude coordinates calculated for respective reflected radar signals. Also included is a second storage device for storing predetermined map and navigation data, reference to latitude and longitude, of the ground over which the aircraft will travel, and a display device responsive to the first and second storage devices for simultaneously displaying a plan view image over a selected horizontal range of weather, represented by digitized reflected radar signals, relative to the calculated latitude and longitude coordinates, and of the map and navigational data relative to the latitude and longitude of that data. The weather display and map and navigational data display are superimposed over one another to enable quick and efficient location of weather conditions and map and navigational aids such as airports, navigational stations, and other aircraft guiding structure. [A1790]

"System of an aircraft collision avoidance system for suppressing useless alarms"

The present invention is concerned with a system in which when the altitude of a subject aircraft becomes lower than a predetermined altitude, a warning limit value is reduced or made equal to zero on the minimum altitude side whereby a useless alarm based on response signals delivered from other aircraft staying in or taxiing in the airport are suppressed. [A1791]

"Direct entry air traffic control system for accident analysis and training"

A site-selectable air traffic control system and method for interacting with a user, the system and method generating a representation of at least one moving aircraft having an initial position and heading with respect to a selected site for producing a dynamic simulation of an air traffic scenario to monitor air traffic in real time and provide expert instruction when necessary, and to analyze air traffic at the selected site. The site selected may consist of one of a plurality of stored sites or a modification of one of those sites. Controller commands issued by a user are entered for altering the air traffic scenario. The air traffic scenario may be based on actual flight patterns of aircraft within the air space corresponding to the selected site. Rules and procedures stored in a general knowledge base and a site-specific knowledge base are compared to the present state of the simulation of the air traffic scenario or to the controller command by an expert system for issuing a warning upon the immediate or foreseeable failure to observe any rule or procedure in the knowledge bases. [A1792]

"Fourth-order-product phase difference autofocus"

The present invention is a computational method, defined by a computational algorithm, that automatically corrects synthetic array radar (SAR) focus errors more accurately than conventional procedures. The novel feature is that the present method estimates residual phase errors by forming fourth-order subarray products in lieu of conventional second-order subarray products. As a result, a pull-in range for residual phase errors is vastly improved. The present invention advances the state of the art by creating a SAR autofocus method that has an unlimited pull-in range for both a quadratic and a cubic phase errors. The invention thus extends the operational range and resolution of SAR systems, and enables the effective use of the SAR sensor with a limited (less expensive) motion compensation subsystem. The present invention provides for a phase difference autofocus method that estimates the residual quadratic and cubic phase error that often requires only one autofocus iteration. [A1793]

"Laser anti-missle defense system"

An attack missile is disabled during its travel through atmospheric regions, enroute to a selected target, by directing, with the aid of a pointer tracker, a first continuous wave laser beam produced by a chemical laser from a first location through the atmosphere onto a given area of the missile to release radiant heating energy in the given area, and simultaneously directing, with the aid of another pointer tracker, a second continuous wave laser beam produced by a second chemical laser from a second location through the atmosphere onto the same given area of the missile to release radiant heating energy in the given area. The beams are arranged so that there is no material overlap between the laser beams enroute to the missile. Over a short duration the laser beams release a combined radiant heating energy on the given area of the missile sufficient in amount to at least damage a portion of the given area of said missile, resulting in the missile's destruction. [A1794]

"Passive SSR system utilizing P3 and P2 pulses for synchronizing measurements of TOA data"

The range from which a collision avoidance system at an Own station can receive SSR interrogations and reply messages from Other stations, is extended by utilizing P2 pulses for timing TOA measurement in the event P1-P3 pulse pairs are unavailable from the scanning main beam or its side lobes. The amplitude of the P2 pulses in the SLS radiation pattern being greater than the P1-P3 side lobes of the main beam over an angular sector of about

60.degree. centered on the main beam can insure reception of P2 pulses at much greater ranges than P3 pulses contained in the main beam side lobes can be reliably received. Using P2 timing, interlaced Mode A and Mode C reply messages contained in a main beam burst reply sequence are separated into two "families" of TOAs, the Mode C (altitude) TOAs always being longer than the Mode A TOAs by 13 .mu.sec. A "true" TOA is obtained by subtracting an appropriate time period from the TOA of each family, from which identity, altitude and range information is readily derived. The system continuously adapts to the best instantaneously available timing pulses, alternating between P3 timing and P2 timing throughout the time it takes for a main beam rotation of the received SSRs, thereby extending the operation area of multiple TOA measurements from multiple SSRs which, in turn, provides added safety and reduced false alarms compared to prior passive collision avoidance systems. [A1795]

"Secondary surveillance radar system"

A secondary surveillance radar system combines a mechanical scanning type of mode-S sensor using a mechanical rotation type of antenna and an electronic scanning type of mode-S sensor using an electronic scanning type of antenna. The mechanical scanning type of mode-S sensor performs at least mode-A/C general inquiry/response with aircraft targets and create a file of surveillance data obtained by the general inquiry/response. This allows circumvention of problems, which would be encountered in performing the same processing by using the electronic scanning system, such as the deterioration of accuracy of monopulse angular measurement, the increasing probability that unwanted responses will be received, etc., which are due to the elevation dependence of horizontal beamwidths. The electronic scanning type of mode-S sensor performs at least mode-S individual inquiry/response, reducing the time interval allotted for the general inquiry/response, thereby permitting an increase in data link communications capacity, and real-time communications. [A1796]

"Apparatus and method for indicating a contour of a surface relative to a vehicle"

An apparatus and method for indicating a contour of a surface relative to a vehicle, in which a first electromagnetic radiation source projects a first beam to create a first reflection pattern on the surface. A second electromagnetic radiation source projects a second beam to create a second reflection pattern on the surface. An apparatus is provided for coupling the first and second electromagnetic radiation sources to the vehicle, such that a movement of the vehicle results in a movement of the first and second reflection patterns on the surface. [A1797]

"Individual target angle measurements in a multiple-target environment"

A target tracking system and methods that can isolate and maintain stable track on a selected target in multiple-target environment. In multiple-target environments, the signal returns received at the sum and difference channels are composites of individual targets. By decomposing received signals into individual components, angle measurements to each target are computed, and consequently, a specified target is isolated and accurately tracked in a stable manner. The present invention provides for apparatus and methods that compute angle measurements to each individual airborne target in a multiple target environment. The composite return signals from a number of targets that are closely spaced in Doppler are decomposed into their individual components, and hence, tracking measurements to each target are obtained without interference from other targets. The present invention may be used to determine the angular position of individual airborne targets within a multiple target environment. The present invention exploits the phase relationship between the sum and difference channel outputs of a single Doppler filter and between the sum channel outputs of two adjacent Doppler filters to decompose composite signal returns of targets into their individual components. Consequently, an independent angle measurement for each target is obtained. In addition, the number of targets with distinct velocities may also be determined. Implementation of the present invention improves the performance of single target tracking in multiple-target environments. Since independent measurement to each target is obtained, accurate and stable track on any target is maintained. [A1798]

"Device for measuring the distance to a runway for an aerial vehicle"

A device automatically measures a distance relative to the longitudinal axis of a runway to be destroyed. This device comprises: a radar transmitter-receiver, at least one depointed antenna, distance-measuring gates, a threshold circuit and a computer circuit. [A1799]

"Method for digital generation of SAR images and apparatus for carrying out said method"

In a method for digital generation of SAR images obtained by means of a coherent imaging system a signal compression in the azimuth and/or range direction is carried out with high resolution by means of a subaperture configuration. A stepwise linear approximation of a quadratic phase characteristic is performed with regard to a reference function and frequency overlapping of the subapertures is effected for optimizing the approximation of the phase characteristic. for the formation and synthesis of the subapertures complex multiplications are carried out, the signal of each subaperture thereby being shifted in the frequency. The individual subapertures are integrated twice by means of the moving average method for reducing the side lobes of the low resolution impulse response and after a time shift for equalizing the relative positioning of the subapertures and after the complex multiplications for the frequency shift the results obtained in the individual subapertures are coherently summated. [A1800]

"Method and apparatus for monitoring vehicular traffic"

A method and apparatus for monitoring moving vehicular traffic, especially adapted for the detailed profiling and counting of airport usage by aircraft employing Doppler radar and sound generated by target aircraft. A primary parabolic reflector operated in the Cassegrainian mode with respect to Doppler radar radiation, employed in combination with a hyperbolic sub-reflector constructed so that it will reflect the radar radiation but remain transparent to sound waves is used to propagate and receive radar radiation, and to receive sound waves emanating from a target aircraft. Sound waves emanating from the target are received by the parabolic reflector and directed toward the parabolic reflector's primary focus where they strike a microphone placed at the primary focus of such reflector. The signal from the microphone and the information from the Doppler radar unit are processed by a central processing unit to provide a variety of information relating to the target aircraft. In addition, a microphone array provides angular information about a target aircraft's operations so that aircraft using a cross-runway may be eliminated from a use total for a target runway or a second array may be added to track a target's position. [A1801]

"Three dimensional interferometric synthetic aperture radar terrain mapping employing altitude measurement and second order correction"

Synthetic aperture radar data is used in conjunction with altimeter data to produce a terrain map corrected for platform roll angle. The technique uses two synthetic radar antennas and a ranging altimeter placed on an aircraft. The aircraft is moved in a set of substantially parallel flight paths where each flight is directly over the strip of terrain viewed by the synthetic aperture radar of an adjacent flight. During each flight the at least one antenna repeatedly transmits radar signals whose return echoes are received by both the first and second antennas. Conventional synthetic aperture radar processing yields a terrain map uncorrected for roll angle. Altimeter data from an adjacent flight determines the first order corrected aircraft roll angle when the corresponding synthetic radar data was taken. This roll angle is used to correct the height and ground range of nearby points in the uncorrected terrain map. A second order corrected roll angle is determined using the first order corrected terrain map to identify the first return point of the altimeter measurements. The measured altitude is then realigned to the first return point to produce a second order corrected roll angle and a corresponding second order corrected terrain map. The result is a terrain map corrected for aircraft roll angle. [A1802]

"All weather tactical strike system (AWISS) and method of operation"

An AWTSS is shown to be made up of an improved synthetic aperture radar (SAR) for generating radar maps with various degrees of resolution required for navigation of an aircraft and detection of ground targets in the presence of electronic countermeasures and clutter. The SAR consists, in effect, of four frequency-agile radars sharing quadrants of a single array antenna mounted within a radome an a "axis" gimbal with a sidelobe cancelling subarray mounted at the phase center of each quadrant. Motion sensors are also mounted on the single array antenna to provide signals for compensating for vibration and stored compensating signals are used to compensate for radome-induced errors. In addition, a signal processor is shown which is selectively operable to generate radar maps of any one of a number of desired degrees of resolution, such processor being adapted to operate in the presence of clutter or jamming signals. [A1803]

"Primary flight display presenting resolution advisory information provided by a traffic alert and collision avoidance system"

A display for presenting symbolically to an aircraft flight crew the resolution advisory information developed by a Traffic Collision Avoidance System (TCAS) computer aboard an aircraft. The flight display shows a a line symbol representing the artificial horizon, a pitch scale extending perpendicular to said line symbol and indicating pitch angles with reference to said line symbol, and an aircraft reference symbol indicating by its position along said pitch scale the momentaneous aircraft pitch attitude. Furthermore a pitch cue symbol is displayed consisting of a first line segment extending parallel to the artificial horizon and across said pitch scale, said first line segment indicating a limit pitch value processed from the TCAS vertical speed limit ouput, and an area indicator extending below or above said line segment indicating a range of pitch values bounded by said limit pitch value, which range of pitch values has to be avoided by the aircraft flight crew. [A1804]

"All weather tactical strike system (AWTSS) and method of operation"

An AWTSS is shown to be made up of an improved synthetic aperture radar (SAR) for generating radar maps with various degrees of resolution required for navigation of an aircraft and detection of ground targets in the presence of electronic counter-measures and clutter. The SAR consists, in effect, of four frequency-agile radars sharing quadrants of a single array antenna mounted within a radome on a "four axis" gimbal with a sidelobe cancelling subarray mounted at the phase center of each quadrant. Motion sensors are also mounted on the single array antenna to provide signals for compensating for vibration and stored compensating signals are used to compensate for radome-induced errors. In addition, a signal processor is shown which is selectively operable to generate radar maps of any one of a number of desired degrees of resolution, such processor being adapted to operate in the presence of clutter or jamming signals. [A1805]

"Fast phase difference autofocus"

A phase difference autofocus method that only requires one FFT for estimating a phase error in the entire synthetic array radar data. The phase difference autofocus method of the present invention automatically and efficiently estimates phase errors from radar signals, allowing a well focused SAR image to be produced. The present method comprises the following steps. First, each range bin is divided into two subarrays. Next, the two subarrays are complex-conjugate multiplied together to produce a cross spectrum of the two submaps produced by the subarrays. Then, the phases of each cross spectrum are aligned with an accumulated sum of the cross spectrums from previous processed range bins. The phase aligned cross spectrum is then added to the accumulated cross spectrum sum. All range bins are processed to get a final cross spectrum sum. Next, a single FFT is performed on the final cross spectrum sum to produce the cross correlation function. Then, the cross correlation function is magnitude-detected. Since the location of the peak of the cross correlation function is proportional to the phase error, a phase error estimate is obtained. Finally, the phase error correction signal is produced for the entire synthetic array radar data. Since only one FFT is performed during autofocus processing, the method is relatively fast. [A1806]

"ISAR imaging radar system"

A method for removing range migration effects that produce doppler smearing in Inverse Synthetic Aperture Radar (ISAR) system (20) image of moving target (50) first generates a synthetic aperture radar image in the zero doppler cells from the target by summing a plurality of ISAR radar data points. Next, the method and system compensate each of the data points by a factor representing the effect of non-zero doppler frequency shift in said data points. Further, the method and system compensate the generated ISAR image for non-zero doppler frequency shift from the target using the compensated data points. This method and system may be used in an ISAR system doppler processor to reduce or eliminate doppler smearing in ISAR images. [A1807]

"Guidance apparatus with dual mode sensor"

Guidance apparatus for a tactical guided missile uses a dual-mode sensor having both active millimeter wavelength RF sensing capability and passive infrared sensing capability within a single aperture. A dual reflector-antenna assembly is formed by chemical vapor deposition of dielectric material transparent to infrared and RF radiation. Embedded within the reflector assembly is an RF microstrip antenna array, formed by thin-film metalization techniques, which defines an antenna beam axis. A surface of the reflector assembly is ground, optically polished, and coated with infrared reflective material to form a primary reflecting surface of a Cassegrainian optical system, which also includes a secondary mirror, for defining an infrared detection beam axis coincident with the antenna beam axis. Infrared radiation from a target is concentrated by the Cassegrainian optical system onto an infrared detector to produce a first guidance signal. RF energy is supplied to the antenna array to be transmitted to and reflected from a target. Reflected RF radiation from the target is received by the antenna array to produce a second guidance signal. [A1808]

"Enhanced performance mode S interrogator"

An enhanced performance Mode S interrogator that includes a matched channel receiver. The receiver includes equiripple-phase response filters with finite peaks of attenuation. This new class of filters provides a faster rise of attenuation than all-pole filter while extending the equiripple delay further into the stopband. [A1809]

"System for sensing the approach of a moving missile to a target"

A system for determining the trajectory of a missile and the minimum miss distance with respect to a target aircraft, comprises two transmitters on the aircraft each cooperating with four receivers on the aircraft. Each transmitter radiates a succession of pulses each having a very short duration of the order of 2 nanoseconds and each having a shape approximating to a single sine wave. The transmitted pulses are reflected from the missile and received by the receivers each of which is accurately time gated so that the received signal is sampled at a predetermined time delay after the radiation of each transmit pulse. A time delay corresponds to a particular missile range, and by gating at different delays the sampled signals indicate when the missile enters or leaves a plurality of range envelopes surrounding the target. Processing of the sampled signals enables the missile trajectory and minimum miss distance to be computed. [A1810]

"Method and apparatus for an air traffic control system"

An improved air traffic control (ATC) system which utilizes traffic alert and collision avoidance systems (TCAS) as a component together with a flight control computer of an aircraft autopilot, a data radio and an interactive touch screen display device to produce a system for allowing easy trailing of another aircraft on trans-oceanic flights and to reduce landing delays at busy airports under IFR conditions. [A1811]

"Device for identifying and localizing transponders"

The invention provides a Secondary Surveillance Radar (SSR) to be used on airports, in which the airport is divided in a considerable number (preferably 100 to 250) divisional regions, each of said regions having at least one and preferably at least two transmitters (1,2 if FIG. 1, 1,3, 2,4, 3,5, 4,6 in FIG. 4) and at least two receivers (1,2,3 in FIG. 1, 1,2,3, 2,3,4, 3,4,5, 4,5,6 in FIG. 4) to determine the location of interrogated transponder by means of multilateration, in which a transmitter may have the same location as a receiver and the transmitters and receivers are connected to a central processor. [A1812]

"Synthetic aperture radar processor to handle large squint with high phase and geometric accuracy"

A digital signal processor for synthetic aperture radar (SAR) data comprising a method of implementing range cell migration correction without the use of an interpolator, and a method of applying phase corrections and memory management to accommodate large squint in the radar sensor. With this method, the image quality of the processed SAR image is improved, particularly in regard to phase and geometric registration. [A1813]

"TCAS view display format with horizontal trend"

A TCAS view image format with horizontal trend for a traffic situation awareness display in a craft, having the craft represented by a center symbol, having traffic represented by position symbols that indicate by shape the horizontal heading of a craft, having the shape of the represented vehicle and varying size to represent level of traffic threat or closeness in altitude differential, having symbols that indicate altitude and trend of altitude, and having symbols that in shape and color redundantly indicate the level of traffic threat. [A1814]

"Combined radar altimeter, radiometer sensor employing multiport feed horn having blended sidewall geometry"

A remote sensing apparatus for conducting (spaceborne) measurements of ocean geophysical parameters integrates a radar altimeter subsystem with a radiometer subsystem through the use of a shared antenna feed horn that permits each subsystem to have the same viewing aperture, so that each subsystem sees the same location on the ocean. The horn is a multiport, multifrequency horn having a throat and a tapered sidewall portion extending from the throat to the outer edge of the horn. A first sidewall port is coupled to the transmit/receive channel of the radar altimeter. A second sidewall port is coupled to a first receive channel of the radiometer, and a third sidewall port is coupled to a second receive channel of the radiometer. A throat port is coupled to a third receive channel of the radiometer. The tapered sidewall portion has a first, generally linear shape adjacent to the throat, a second, conic (elliptical) shape at its outer edge, and a third, blending shape disposed between and joining together the generally linear shape and the conic shape at the outer edge. The blending shape is preferably a sinusoidal function and serves to blend the first shape into the second shape in such a manner that the horn presents, over the entirely of the surface of the sidewall portion, an effectively continuous surface to the E plane of an electromagnetic wave emitted or received by the horn. The distance over which the sidewall portion is tapered to effect the blending function is preferably no greater than two wavelengths of the lowest frequency of electromagnetic waves emitted or received by the horn. [A1815]

"All weather tactical strike system (AWTSS) and method of operation"

An AWTSS is shown to be made up of an improved synthetic aperture radar (SAR) for generating radar maps with various degrees of resolution required for navigation of an aircraft and detection of ground targets in the presence of electronic countermeasures and clutter. The SAR consists, in effect, of four frequency-agile radars sharing quadrants of a single array antenna mounted within a radome on a "four axis" gimbal with a sidelobe cancelling subarray mounted at the phase center of each quadrant. Motion sensors are also mounted on the single array antenna to provide signals for compensating for vibration and stored compensating signals are used to compensate for radome-induced errors. In addition, a signal processor is shown which is selectively operable to generate radar maps of any one of a number of desired degrees of resolution, such processor being adapted to operate in the presence of clutter or jamming signals. [A1816]

"Confirmed boundary pattern matching"

A method of aligning two images of the same scene by matching features in a first image to features in a second image is disclosed. The method comprises edges of objects in the first image using two different processes. The edges identified using both processes are compared and combined into one image representing confirmed edges which are readily identified in other images of the same scene. A template is then formed from the confirmed edges which is matched to a subregion of the second image. [A1817]

"Motion constraints using particles"

A system for detecting and resolving conflicts between a plurality of aircraft or other objects on potentially conflicting trajectories in space. A two-dimensional graph generated on a processor-controlled display depicts the trajectory of one of the aircraft and creates particles that have identical velocity as the particular aircraft of interest. Each particle is at a different initial position from all other particles (in the sense of mathematical physics, a field is defined) . That is, motion constraints are defined in terms of particles with specific characteristics and a algorithms for conflict avoidance are constructed by selecting a given particle which satisfies all of the constraints. [A1818]

"All weather tactical strike system (AWTSS) and method of operation"

An AWTSS is shown to be made up of an improved synthetic aperture radar (SAR) for generating radar maps with various degrees of resolution required for navigation of an aircraft and detection of ground targets in the presence of electronic countermeasures and clutter. The SAR consists, in effect, of four frequency-agile radars sharing quadrants of a single array antenna mounted within a radome on a "four axis" gimbal with a sidelobe cancelling subarray mounted at the phase center of each quadrant. Motion sensors are also mounted on the single array antenna to provide signals for compensating for vibration and stored compensating signals are used to compensate for radome-induced errors. In addition, a signal processor is shown which is selectively operable to generate radar maps of any one of a number of desired degrees of resolution, such processor being adapted to operate in the presence of clutter or jamming signals. [A1819]

"Radar processor with range sidelobe reduction following doppler filtering"

A multipurpose system provides radar surveillance for air traffic control purposes. The system includes four separate active phased-array antennas, each with .+-.45.degree. coverage in azimuth, from 0.degree. to 60.degree. in elevation. Each antenna element of each phased-array antenna is coupled by a low-loss path to the solid-state amplifier associated with a transmit-receive (TR) module. Each antenna produces a sequenc of pencil beams, which requires less transmitted power from the TR modules than a fan beam, but requires more time beacuse the pencil beam must be sequenced to cover the same volume as the fan beam. In order to scan the volume in a short time, the PRF is responsive to the elevation angle of the beam, so higher elevation angles use a higher PRF. Low elevation angle beams receive long transmitter pulses for high power, and pulse compression is used to restore range resolution, but the long pulse results in a large minimum range within which targets cannot be detected. A second scan is provided at low elevation angles with a short transmitter pulse to fill in the short-range coverage. Beams at higher elevation angles transmit pulse widths which are shorter than beams at low elevation angles, so that the minimum range requirement is met without a second scan, which also reduces the time required for volumetric scan. The number of pulses which are integrated to produce a return increases off-axis, to restore system margin lost due to off-axis power gain reduction. The volumetric scan rate is increased by a dynamic scan regimen by which subsets of beams are pulsed with a high transmitter PRF but with a low effective beam PRF to reduce range ambiguity and preserve Doppler resolution without the usual increase of scan time. for best range resolution, Doppler processing is used, with range sidelobe pulse suppression applied separetely to each Doppler frequency bin. [A1820]

"Air turbulence detection using bi-static CW Doppler radar"

A bi-static radar system with an autonulling feature. The system may be used to detect clear air turbulence, for example, in the vicinity of the airports, or to provide an electronic fence for moving air-borne targets having low radar cross sections. The receiver comprises signal and nulling antennas, and the signal received by the nulling antenna is electronically adjusted in phase and amplitude to provide autonulling of the background signal received directly from the transmitter. [A1821]

"All weather strike system (AWTSS) and method of operation"

An AWTSS is shown to be made up of an improved synthetic aperture radar (SAR) for generating radar maps with various degrees of resolution required for navigation of an aircraft and detection of ground targets in the presence of electronic countermeasures and clutter. The SAR consists, in effect, of four frequency-agile radars sharing quadrants of a single array antenna mounted within a radome on a "four axis" gimbal with a sidelobe cancelling subarray mounted at the phase center of each quadrant. Motions sensors are also mounted on the single array antenna to provide signals for compensating for vibration and stored compensating signals are used to compensate for radome-induced errors. In addition, a signal processor is shown which is selectively operable to generate radar maps of any one of a number of desired degrees of resolution, such processor being adapted to operate in the presence of clutter or jamming signals. [A1822]

"All weather tactical strike system (AWTSS) and method of operation"

An AWTSS is shown to be made up of an improved synthetic aperture radar (SAR) for generating radar maps with various degrees or resolution required for navigation of an aircraft and detection of ground targets in the presence of electronic countermeasures and clutter. The SAR consists, in effect, of four frequency-agile radars sharing quadrants of a single array antenna mounted within a radome on a "four axis" gimbal with a sidelobe cancelling subarray mounted at the phase center of each quadrant. Motion sensors are also mounted on the single array antenna to provide signals for compensating for vibration and stored compensating signals are used to compensate for radome-induced errors. In addition, a single processor is shown which is selectively operable to generate radar maps of any one of a number of desired degrees of resolution, such processor being adapted to operate in the presence of clutter or jamming signals. [A1823]

"All weather tactical strike system (AWISS) and method of operation"

An AWTSS is shown to be made up of an improved synthetic aperture radar (SAR) for generating radar maps with various degrees of resolution required for navigation of an aircraft and detection of ground targets in the presence of electronic counter-measures and clutter. The SAR consists, in effect, of four frequency-agile radars sharing quadrants of a single array antenna mounted within a radome on a "four axis" gimbal with a sidelobe cancelling subarray mounted at the phase center of each quadrant. Motion sensors are also mounted on the single array antenna to provide signals for compensating for vibration and stored compensating signals are used to compensate for randome-induced errors. In addition, a signal processor is shown which is selectively operable to generate radar maps of any one of a number of desired degrees of resolution, such processor being adapted to operate in the presence of clutter or jamming signals. [A1824]

"All weather tactical strike system (AWISS) and method of operation"

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"All weather tactical strike system (AWISS) and method of operation"

An AWTSS is shown to be made up of an improved synthetic aperture radar (SAR) for generating radar maps with various degrees of resolution required for navigation of an aircraft and detection of ground targets in the presence of electronic countermeasures and clutter. The SAR consists, in effect, of four frequency-agile radars sharing quadrants of a single array antenna mounted within a radome of a "four axis" gimbal with a sidelobe cancelling subarray mounted at the phase center of each quadrant. Motion sensors are also mounted on the single array antenna to provide signals for compensating for vibration and stored compensating signals are used to compensate for radome-induced errors. In addition, a signal processor is shown which is selectively operable to generate radar maps of any one of a number of desired degrees of resolution, such processor being adapted to operate in the presence of clutter or jamming signals. [A1826]

"All weather tactical strike system (AWTSS) and method of operation"

An AWTSS is shown to be made up of an improved synthetic aperture radar (SAR) for generating radar maps with various degrees of resolution required for navigation of an aircraft and detection of ground targets in the presence of electronic counter measures and clutter. The SAR consists, in effect, of four frequency-agile radars sharing quadrants of a single array antenna mounted within a radome on a "four axis" gimbal with a sidelobe cancelling subarray mounted at the phase center of each quadrant. Motion sensors are also mounted on the single array antenna to provide signals for compensating for vibration and stored compensating signals are used to compensate for radome-induced errors. In addition, a signal processor is shown which is selectively operable to generate radar maps of any one of a number of desired degrees of resolution, such processor being adapted to operate in the presence of clutter or jamming signals. [A1827]

"All weather tactical strike system (AWISS) and method of operation"

An AWTSS is shown to be made up of an improved synthetic aperture radar (SAR) for generating radar maps with various degrees of resolution required for navigation of an aircraft and detection of ground targets in the presence of electronic counter-measures and clutter. The SAR consists, in effect, of four frequency-agile radars sharing quadrants of a single array antenna mounted within a radome on a "four axis" gimbal with a sidelobe cancelling subarray mounted at the phase center of each quadrant. Motion sensors are also mounted on the single array antenna to provide signals for compensating for vibration and stored compensating signals are used to compensate for radome-induced errors. In addition, a signal processor is shown which is selectively operable to generate radar maps of any one of a number of desired degrees of resolution, such processor being adapted to operate in the presence of clutter or jamming signals. [A1828]

"Three dimensional interferometric synthetic aperture radar terrain mapping employing altitude measurement"

Synthetic aperture radar data is used in conjunction with altimeter data to produce a terrain map corrected for platform roll angle. The technique uses two synthetic radar antennas and a ranging altimeter placed on an aircraft. The aircraft is moved in a set of substantially parallel flight paths where each flight is directly over the strip of terrain viewed by the synthetic aperture radar of an adjacent flight. During each flight the at least one antenna repeatedly transmits radar signals whose return echoes are received by both the first and second antennas. Conventional synthetic aperture radar processing yields a terrain map uncorrected for roll angle. The uncorrected terrain map data from one flight are compared with the altimeter data taken during an adjacent flight. This permits the altimeter data to be used to determine the roll angle when the corresponding synthetic radar data was taken. This roll angle measure is then used to correct the height and ground range of nearby points in the uncorrected terrain map. The result is a terrain map corrected for roll angle in a manner more accurate than can be obtained by direct measurement of the roll angle. [A1829]

"Moving target discrimination from passive measurements"

A moving target discriminator uses only bearing information obtained from passive observations together with information about the movement of an observation platform to discriminate whether an object is moving. An underlying principle of the moving target discriminator is that the intercepts of successive line-of-sight observations taken from the moving platform will move only if the object is moving. In a specific embodiment, three line-of-sight observations are made, and an intercept is computed for two different pairs of observations. If the intercepts coincide, the cited object is classified as stationary otherwise, it is classified as moving. Measurement statistics are used to compensate the computed intercepts for navigational and observation errors. [A1830]

"Method and apparatus for determining a cross-range scale factor in inverse synthetic aperture radar systems"

Apparatus and methods for estimating the cross-range scale factor for a displayed inverse synthetic aperture radar image using received image data. The image data is first converted into a polar format. The image data is then processed by a two-dimensional Fourier transform filter to produce a plurality of image entropy estimates. The best image entropy estimate is selected, and then a cross-range scale factor is computed from the data associated with this estimate. This cross-range scale factor is then displayed on a display, from which an operator can accurately determine the size of target objects imaged by the radar. This, in turn provides for identification of the target objects. More specifically, by using polar-format processing, and by selecting the best image obtained for assumed values of rotation rate of a target object, an accurate estimate of the cross-range scale factor is obtained. The present method enables estimation of the length of a target object from it's image and thus provides for rapid identification of the object using the displayed length estimate. [A1831]

"All weather tactical strike system (AWTSS) and method of operation"

An AWTSS is shown to be made up of an improved synthetic aperture radar (SAR) for generating radar maps with various degrees of resolution required for navigation of an aircraft and detection of ground targets in the presence of electronic counter-measures and clutter. The SAR consists, in effect, of four frequency-agile radars sharing quadrants of a single array antenna mounted within a radome on a "four axis" gimbal with a sidelobe cancelling subarray mounted at the phase center of each quadrant. Motion sensors are also mounted on the single array antenna to provide signals for compensating for vibration and stored compensating signals are used to compensate for radome-induced errors. In addition, a signal processor is shown which is selectively operable to generate radar maps of any one of a number of desired degrees of resolution, such processor being adapted to operate in the presence of clutter or jamming signals. [A1832]

"Radar altimeter with self-calibration feature"

A radar altimeter incorporates circuitry for automatically adjusting altitude readings for variations caused by altitude and temperature changes. Normal target tracking of the radar is intermittently interrupted and a calibration sequence is interjected. The current altitude and receiver AGC information at the time of each interruption is temporarily stored and a test is initiated in which a pseudo radar return at that altitude is introduced to the receiver. The receiver operates on the pseudo return as it would on an actual return. The transmit power is adjusted automatically for the correct signal level at the tracker. The resultant altitude measured for the pseudo return is compared to a known test altitude and any difference is stored away as a correction factor to be applied to the altitude reading which had been stored at the time that its operation had been interrupted to perform the calibration test. [A1833]

"Over-the-horizon synthetic aperture radar"

An over-the-horizon, synthetic aperture radar (OTHSAR) system (10) is disclosed. The OTHSAR system is used to locate moving objects (14) at long distances in response to modulated high-frequency radiation reflected by the objects and distinguishes the objects from stationary clutter (16) that also reflects the radiation. Specifically, a central processor (26) synthesizes information received from an antenna (18) and receiver (22) over an interval of time t.sub.s to enhance azimuth resolution. Although ambiguous Doppler information is likely to be received from the moving object and the stationary clutter, the antenna is selected to have a real antenna beam that resolves the ambiguous data, ensuring that conflicting clutter data is eliminated. [A1834]

"Interferometric synthetic aperture detection of sparse non-surface objects"

A technique for detecting non-surface objects from a moving platform using radiant ranging. The platform moves perpendicular to a line through a pair of first and second transducers. A transmitter repeatedly transmits a radiant signal via a first transducer. The return reflection signals in both transducers include return reflection signals from sparse non-surface objects in the presence of surface clutter reflections. Respective synthetic aperture complex images of resolution cell in slant range and Doppler frequency are formed from the received reflections of the two transducers. The complex phase factor between received reflections for each resolution cell in the absence of non-surface objects is determined. This is feasible because the non-surface objects are sparse, that is rare and generally encountered individually. Each resolution cell of the first synthetic aperture complex image is multiplied with the complex conjugate of the corresponding resolution cell of said complex phase factor. The resulting product signal is subtracted from the second synthetic aperture complex image. The resulting signal is non-zero (except for second order effects) only in the presence of a non-surface reflecting target. The technique may employ a third transducer permitting detection of non-surface objects at otherwise blind heights. [A1835]

"Aircraft theft detection and location system"

A theft detection and location system for aircraft utilizing both a conventional aircraft transponder/encoder and a dedicated transponder/encoder. The dedicated transponder is fixed on an alarm code which when transmitted in response to interrogation signals from ground stations, alerts air traffic controllers that the aircraft has been stolen. The system includes electronic switching devices which automatically enable the dedicated transponder to be activated each time an aircraft electrical master switch is turned on. An arming device is provided for activating the dedicated transponder in response to a predetermined condition. The dedicated transponder will continue to function even if the entire aircraft electrical system is turned off since the electronic switching device directly couples the dedicated transponder to the aircraft battery. A disarming device is provided in order to deactivate the dedicated transponder and in turn activate the conventional transponder. [A1836]

"Aircraft traffic alert and collision avoidance device"

A passive aircraft Traffic alert and Collision Avoidance Device (TCAD) is based on sensing and responding to transponder replies of other aircraft to SSR interrogations. In order to avoid masking other aircraft replies by the host transponder TCAD repeatedly and randomly suppresses the host transponder and simultaneoulsly listens for other aircraft replies. Suppression on each occasion is effective for an equal and predetermined duration which is much longer than a typical replay, in a preferred embodiment the suppression/listen duration is 725 .mu.s. In this embodiment the time between successive suppression/listen occasions is random between 725 .mu.s. and 5.025 ms. with an average value of about 2.9 ms. Digital signal processing is used to detect and discard garbled or overlapping replies. Each valid reply, exhibiting a minimum pulse amplitude, is decoded and correlated with a calibrated range parameter and given a time tag. Successive replies which match to within predetermined criteria in time and calibrated range are merged to track the positional relation between the host and other aircraft. The positional relation between other aircraft and the host are evaluated via a priority table in terms of relative altitude and range to locate that craft which poses the highest threat to the host. Parameters of such a craft are displayed. In the event a craft penetrates a shield of programmable size an audible alert is sounded. TCAD provides for shields for each of a plurality of flight regimes, such as terminal, standard and enroute. [A1837]

"CW radar system"

A continuous wave radar system comprises a transmitter section (1) , a receiver section (2) and a common transmit/receive aerial (3) . A directional coupler (12) is used to couple the transmitter section output (9) to the aerial (3) and to couple the aerial (3) to a first input (5) of a mixer (4) included in the receiver section (2) . A second input (6) of the mixer (4) is fed with a reference signal from the transmitter section (1) via a fourth port (17) of the coupler (12) , thereby usefully utilizing at least some of the transmitter power which would be wasted were the fourth port (17) merely terminated in a matched impedance. [A1838]

"Warning system having low intensity wind shear enhancements"

A ground proximity warning system for aircraft having flight path angle based warning criteria generates a warning in the event of an excessively steep flight path angle during an approach to a landing. The warning criteria are altered to provide an earlier warning upon the occurrence of a low intensity wind shear or a below glideslope condition. A below glideslope warning system that is biased as a function of decreasing performance shear is also provided. A descent rate based warning system usable above a predetermined altitude may also be provided to supplement the flight path angle warning system. [A1839]

"Frequency dispersive transmitting array"

A Frequency Dispersive Transmitting Array (30) for propagating composite e energy (10) emulates narrow-band beams (20) of different frequencies which can be simultaneously radiated in all directions, or in any subset of directions, relative to an array (42) of radiating elements (32) because of the addition and cancellation of components of wave energy (10) radiated, is disclosed. A signal source (34) provides input signals (36) , having frequencies which may be acoustic or electromagnetic, which are coupled by feedline (37) to radiating elements (32) through a plurality of time delay devices (38) . Each one of time delay devices (38) is interposed between successive ones of radiating elements (32) and delays emission of replicas of signals (36) therefrom by a time delay .tau..sub.0 which is a multiple of the period of the dominant frequency radiated in a direction broadside to the array. Window weighting function devices (40) are coupled into feedline (37) modifying signals (36) ahead of radiating elements (32) to control the behavior of side lobes of the beam as in a conventional beam-forming array. Frequency dispersion of the beams (20) is controlled by selection of the bandwidth of input signals (36) having frequencies in a desired spectrum depending on the use of the system. Direction (.theta.) of an object from transmitting array (30) is determinable from the frequency of wave energy (10) either directly received at the object or reflected by the object to a remote receiver, because each direction (.theta.) corresponds to a distinct frequency (f) of transmitted wave energy (10) . [A1840]

"High Doppler rate, high altitude capability coherent pulse Doppler radar altimeter"

A pulse Doppler radar altimeter designed to resolve the ambiguous range problem associated with the use of a pulse repetition interval, which is less than the aircraft altitude, includes a radar transmitter configured to transmit first and second series of pulses where the first series has a pulse repetition interval slightly different from the pulse repetition interval of the second series. At a time when the first series is being transmitted, the receiver electronics including a range gate and a tracker searches for ground returns and positions the range gate in time coincidence with the detected ground return. Control then shifts so that the second series of pulses is transmitted and a determination is made whether overlap of the range gate with the ground return from the second series corresponds to the same altitude as when the first series was involved. If not, it is known that the detected range is ambiguous and the tracker continues repositioning the range gate (altitude) until an unambiguous range determination is made. [A1841]

"System for accurately monitoring aircraft position during training exercises"

Tracking system for monitoring aircraft position during simulated training exercises. Standard IFF transponders on the aircraft are periodically enabled by a squitter transmitter mounted on the aircraft. On the ground a plurality of receiving stations are interconnected through a communication link. The transponder replies are received at each receiving station. The time of arrival for each of the transponder replies is measured and communicated to one of the receiving stations. Using Loran techniques, accurate longitudinal and latitude coordinates are determined from the time of arrival data. [A1842]

"Method for improving the amplitude-frequency characteristic of a radar system"

A method of improving the amplitude-frequency characteristic when receiving a target echo (M) in a radar system installed on a satellite or an aircraft and carried at a given height (h) above the earth's surface. The method utilizes the known method of compressing a received pulse which contains a number of frequencies (f.sub.1 -f.sub.2) in order to obtain improved dissolution of the target. According to the method, the receiving lobe of the radar is swept, independently of frequency, over a given larger angular area (.theta..sub.b l-.theta..sub.a) within which the target (M) is located. Within the smaller angular area (.DELTA..theta.) occupied by the target as seen from the radar, i.e. the momentary width (.DELTA.w) of the target echo, however, the receiving lobe is controlled in dependence on the frequencies (f.sub.1 -f.sub.2) so as to obtain a number of optimally located receiving lobes for the smaller angular area (.DELTA..theta.) . [A1843]

"Continuous emission radar device for determining, at short range, the relative positions of a missile and a vehicle to which the device is fitted"

A continuous emission radar device for determining, at short range, the relative positions of a missile and a vehicle to which the device is fitted, includes a transmitting circuit connected to a transmitting antenna for emitting a continuous signal modulated by a pseudo-random binary sequence delivered at a clock frequency fH, and three receiving circuits connected respectively to three receiving antennae which receive echos of the emitted signal from the missile, a first receiving circuit generating the clock frequency and slaving it to the missile vehicle distance, and the other two receiving circuits determining the phase shift between the echo received by the first antenna and each of the echos received by the other two antennae, these three parameters being transmitted to a device for calculating the position of the missile in relation to the vehicle. [A1844]

"Method and apparatus for providing optimum radar elevation patterns at long and short ranges"

A method and apparatus are disclosed for providing optimum radar beam patterns to provide complete radar coverage at both short ranges and long ranges in a radar system using solid state transmitters. Long pulses for covering long ranges are generated and split into a pair of signals with a specific amplitude and phase relationship.

These signals are provided to a transmit beam forming matrix of an array antenna to generate an optimum pattern for long range coverage. Short pulses are generated for providing short range coverage and are split into a pair of signals which are phase shifted differently from the long pulses. These signals are then provided to the transmit beam forming matrix to generate a different beam pattern for providing short range detection. The short range beam pattern has a sufficient amount of energy to provide coverage to maximum desired altitude over a range extending to where echoes from the long pulses may be received undistorted. [A1845]

"Method for distributed data association and multi-target tracking"

A technique is disclosed for multiple sensor tracking which distributes data association and filtering processing among multiple processing entities but coordinates the track estimates such that track states and covariances represent the equivalent of a centralized estimate. The object of the invention is to establish and maintain a single system track for a single aircraft in a distributed processing environment. This is achieved through communication of track information among processing entities which process a single sensor's inputs. Continued updating and re-broadcasting of process data are performed between the multiple sensor's processing entities. [A1846]

"Modular solid state radar transmitter"

A solid state radar transmitter for use in airborne applications has a modular design which extends into the transmitter. The transmitter is formed of a plurality of power modules the number of which is selected based on the power required for a particular application. for example, two 75 to 100 watt modules may be used for weather radar, while 30 to 60 or more modules may be used for fire control in a military fighter. A radio frequency signal from a stabilized local oscillator is distributed by a splitter to the power modules and a combiner is used to combine the output from the power modules to produce the transmitter output signal. Each power module is formed of parallel connected power amplifiers, preferably formed by GaAs FETs and a power conditioning and control unit. The power conditioning and control unit produces a DC bias across the FETs as desired to produce a particular signal. The transmitter output signals which can be produced in this manner include rectangular, Gaussian on a pedestal and one amplifier at a time for testing purposes. [A1847]

"Method for navigation and updating of navigation for aircraft"

A method of using a method for navigating and updating of navigation for aircract under utilization of sensor image processing and reference store data, for purposes of automatic or assisted landing is disclosed. [A1848]

"Radio navigation system"

A radio navigation system including: a means to determine, at a point (M.sub.1) of the trajectory of a moving body to be localized, the speed vector of said moving body and, possible, the "n" order derivatives of said speed vector (with n>,1) , a means to perform at least three successive measurements of distance, respective between a geodesic point at the ground and three successive positions (M.sub.1, M.sub.2, M.sub.3) of said moving body, a means to computer the position (M.sub.3) of said moving body by resolving a system of equations from the results thus obtained, expressed in one and the same reference system. [A1849]

"Radar apparatus"

An imaging radar system for an aircraft includes four transmit antennas, connected to a central transmitter, and four receive antenna arrays for respectively receiving reflections of signals transmitted by the transmit antennas. A receiver circuit, associated with each antenna element of each receive antenna array, heterodynes the received signal to yield a resultant signal and combines the resultant signal with a reference signal to yield an interference grating signal. The grating signal of each receiver circuit is digitized and provided to a central processing unit that performs a spatial Fourier transform on the grating signals to determine angles of reflecting objects relative to each receive array. [A1850]

"Radar system with active array antenna, elevation-responsive PRF control, and beam multiplex control"

A multipurpose system provides radar surveillance for air traffic control purposes. The system includes four separate active phased-array antennas, each with .+-.45.degree. coverage in azimuth, from 0.degree. to 60.degree. in elevation. Each antenna element of each phased-array antenna is coupled by a low-loss path to the solid-state amplifier associated with a transmit-receive (TR) module. Each antenna produces a sequence of pencil beams, which requires less transmitted power from the TR modules than a fan beam, but requires more time because the pencil beam must be sequenced to cover the same volume as the fan beam. In order to scan the volume in a short time, the PRF is responsive to the elevation angle of the beam, so higher elevation angles use a higher PRF. Low elevation angle beams receive long transmitter pulses for high power, and pulse compression is used to restored range resolution, but the long pulse results in a large minimum range within which targets cannot be detected. A second can is provided at low elevation angles with a short transmitter pulse to fill in the short-range coverage. Beams at higher elevation angles transmit pulse widths which are shorter than beams at low elevation angles, so that the minimum range requirement is met without a second scan, which also reduces the time required for volumetric scan. The number of pulses which are integrated to produce a return increases off-axis, to restore system margin lost due to off-axis power gain reduction. The volumetric scan rate is increased by a dynamic scan regimen by which subsets of beams are pulsed with a high transmitter PRF but with a low effective beam PRF to reduce range ambiguity and preserve Doppler resolution without the usual increase of scan time. for best range resolution, Doppler processing is used, with range sidelobe pulse suppression applied separately to each Doppler frequency bin. [A1851]

"Dual satellite navigation system and method"

A system and method for determining the position of an airborne object, using a fixed station and a pair of earth orbit satellites whose positions are known. Separate periodic signals are transmitted from the fixed station via the first and second satellites to the object whose position is to be determined. The phase offset in periodic characteristics of the periodic signals as received from the first and second satellites is measured at the object. The phase offset corresponds to a realtive time difference in propagation of the signals traveling two different paths to the object. The object transmits via the first satellite a return signal indicative of the measured relative time difference. This return signal is activated some time in the future according to the object local time, which is slaved to receipt of the periodic signal sent through the first satellite. This future time is the start of the particular time period as decided by the fixed station's schedule. At the fixed station, an instantaneous round trip delay, determined by the time offset of the current transmission clock time relative to the receive clock time of reception of the return signal, along with the measured relative time difference sent back on the return signal, is used to calculate the distances between the first and second satellites to the object. From these distances, along with the combined altitude of the object with the distance from the surface of the earth to the center of the earth, the position of the object is calculated. [A1852]

"Coherent pulse radar system and method for the detection of a target presenting flashes of very short duration"

This radar system comprises an emitter (3, 4, 5) for the transmission of coherent non-equidistant pulses forming a periodic pattern and being distinguished from each other by a phase modulation according to different quasi-orthogonal laws, the average interval between pulses being of the order of magnitude of the minimum duration of the flashes. for reception, the system comprises a single receiver (7) and a device (8) for coherent elimination of the clutter and echoes of the target bodies, followed by N processing channels for pulse compression (9.1 to 9.N) by correlation with the particular phase modulation laws. The outputs from the processing channels are sent to a device (11) for elimination of secondary peaks due to partial ambiguities. The invention applies to radar surveillance systems for helicopter detection. [A1853]

"Phase only bearing mesurement with amiguity correction in a collision avoidance system"

A receiver system for measuring the bearing of a target having ambiguity correction. The receiver system includes a four element antenna array, three receivers and two phase detectors. The system further includes switching means for selectively connecting the antenna elements to the receivers and the receivers to the phase detectors to obtain two pairs of bearing components, from which the target bearing is computed. [A1854]

"Moving target imaging synthetic aperture radar"

A method and apparatus of imaging moving targets with an aircraft mounted complex radar system has a plurality of independent, but synchronized synthetic aperture radars (SARs) positioned on the aircraft at equal separation distance .DELTA.x along the flight velocity vector V.sub.p of the aircraft. Frequency modulated (or otherwise coded) pulses are transmitted therefrom with an interpulse period T.sub.p, where 1/T.sub.p is an integral multiple of V.sub.p /.DELTA.x. The pulse repetition frequency, platform velocity, and spacing between adjacent SARs are all chosen to create the effect of a stationary radar momentarily fixed in space. A two dimensional complex IF (intermediate frequency) output signal is recovered by the first SAR on the aircraft. This signal is identical to that recovered by a conventional SAR. The two dimensions are fast time and downtract position. If only one point target is present, the IF output signal is the point target's phase history. Typically, many point targets are simultaneously present, and the IF output signal is the sum of point target phase histories. Each additional SAR on the platform recovers a different two dimensional complex IF output signal. These signals are sequentially stacked to form a three dimensional complex data set. The stacking dimension is called subaperture time, and is unique to this invention. A two dimensional cut through the three dimensional complex data set and normal to the downtract position dimension, say at downtrack position x, contains the data which would be collected by a stationary radar at downtrack position x. This radar would transmit a total of M frequency modulated (or otherwise coded) pulses, where M is the number of SARs on the aircraft, at a rate of one pulse every .DELTA.x/V.sub.p seconds, as it observes all targets. for each target present, a slow doppler fluctuation, whose frequency is directly proportional to target slow relative velocity, appears along the subaperture time axis. Target slow relative velocity is the target velocity with respect to the fixed radar in space. Subaperture time and slow relative velocity are a Fourier transform pair. Consequently, targets, in terms of phase history RIGHTS of THE GOVERNMENT The invention described herein may be manufactured, used and licensed by or for the United States Government for Governmental purposes without payment to us of any royalty thereon. [A1855]

"Monitoring systems"

An aircraft threat monitoring system has several sensors responsive to a potential threat external to the aircraft such as a radar warning receiver, a radar sensor, a missile approach warning receiver, a forward-looking infrared detector and an electro-optic sensor. Each sensor has a respective inference processor the outputs of which are supplied to a groundspace map manager and an airspace map manager. The map managers collate the processor outputs to derive a threat output signal which is supplied to a planner programmed with tactical route information. The map managers also control operation of the sensors such as by modifying their sensitivity, scan or frequency in accordance with the output from other sensors. [A1856]

"Device for improving radar resolution"

A device for processing radar signals has the capability of obtaining single or multiple target information as well as target length by utilizing relative radar-target movement. The device includes a radar receiver, an Inverse Synthetic Aperture Radar processor, a list sensor for supplying listing data to the Inverse Synthetic Aperture Radar (ISAR) , an element for determining the presence of one or more targets as well as target length, a radar tracking loop for estimating parameters of target motion, and a display unit for displaying the processed information. [A1857]

"Radar system with active array antenna, elevation-responsive PRF control, and pulse integration control responsive to azimuth angle"

A multipurpose system provides radar surveillance for air traffic control purposes. The system includes four separate active phased-array antennas, each with .+-.45.degree. coverage in azimuth, from 0.degree. to 60.degree. in elevation. Each antenna element of each phased-array antenna is coupled by a low-loss path to the solid-state amplifier associated with a transmit-receive (TR) module. Each antenna produces a sequence of pencil beams, which requires less transmitted power from the TR modules than a fan beam, but requires more time because the pencil beam must be sequenced to cover the same volume as the fan beam. In order to scan the volume in a short time, the PRF is responsive to the elevation angle of the beam, so higher elevation angles use a higher PRF. Low elevation angle beams receive long transmitter pulses for high power, and pulse compression is used to restore range resolution, but the long pulse results in a large minimum range within which targets cannot be detected. A second scan is provided at low elevation angles with a short transmitter pulse to fill in the short-range coverage. Beams at higher elevation angles transmit pulse widths which are shorter than beams at low elevation angles, so that the minimum range requirement is met without a second scan, which also reduces the time required for volumetric scan. The number of pulses which are integrated to produce a return increases off-axis, to restore system margin lost due to off-axis power gain reduction. The volumetric scan rate is increased by a dynamic scan regimen by which subsets of beams are pulsed with a high transmitter PRF but with a low effective beam PRF to reduce range ambiguity and preserve Doppler resolution without the usual increase of scan time. for best range resolution, Doppler processing is used, with range sidelobe pulse suppression applied separately to each Doppler frequency bin. [A1858]

"Radar system with active array antenna, beam multiplex control and pulse integration control responsive to azimuth angle"

A multipurpose system provides radar surveillance for air traffic control purposes. The system includes four separate active phased-array antennas, each with .+-.45.degree. coverage in azimuth, from 0.degree. to 60.degree. in elevation. Each antenna element of each phased-array antenna is coupled by a low-loss path to the solid-state amplifier associated with a transmit-receive (TR) module. Each antenna produces a sequence of pencil beams, which requires less transmitted power from the TR modules than a fan beam, but requires more time because the pencil beam must be sequenced to cover the same volume as the fan beam. In order to scan the volume in a short time, the PRF is responsive to the elevation angle of the beam, so higher elevation angles use a higher PRF. Low elevation angle beams receive long transmitter pulses for high power, and pulse compression is used to restore range resolution, but the long pulse results in a large minimum range within which targets cannot be detected. A second scan is provided at low elevation angles with a short transmitter pulse to fill in the short-range coverage. Beams at higher elevation angles transmit pulse widths which are shorter than beams at low elevation angles, so that the minimum range requirement is met without a second scan, which also reduces the time required for volumetric scan. The number of pulses which are integrated to produce a return increases off-axis, to restore system margin lost due to off-axis power gain reduction. The volumetric scan rate is increased by a dynamic scan regimen by which subsets of beams are pulsed with a high transmitter PRF but with a low effective beam PRF to reduce range ambiguity and preserve Doppler resolution without the usual increase of scan time. for best range resolution, Doppler processing is used, with range sidelobe pulse suppression applied separately to each Doppler frequency bin. [A1859]

"Autonomous synchronization of a bistatic synthetic aperture radar (SAR) system"

An airborne bistatic radar synchronization apparatus and process is presented which receives clutter point echo returns from the bistatic radar receiver on a penetrator aircraft, and determines therefrom the location of the illuminator aircraft without the need of receiving direct path signals from the radar transmitter on board the illuminator aircraft. Once the state of the illuminator aircraft (position and velocity) has been determined, the estimate of the illuminator state may be refined using direct path data. Finally, a target location algorithm is applied to bistatic target echo returns to calculate an equivalent monostatic range for a desired target, and provide an estimate of the location of the target. [A1860]

"Automatic integrated real-time flight crew information system"

An integrated real-time information dissemination system for aircraft within a predetermined range of an air traffic control facility (ATC) , includes airborne components for receiving ground-disseminated data concerning dynamic conditions, such as air traffic and meteorological conditions, and for storing data concerning static features, such as terrain and moving map features, within the range of the ATC. An airborne computer and display is provided in a subject aircraft for generating a continuously updated integrated graphic display of representations of the dynamic and static conditions. The graphic display is egocentric with respect to the ATC until the subject aircraft has been identified to the ATC, after which the graphic display is egocentric with respect to the subject aircraft. The airborne computer includes a computer program for detecting potential collisions with the dynamic or static features and for issuing a warning based upon the level of collision threat. When a potential collision is detected, the aircraft display isolates the threatening target and provides critical information to facilitate collision avoidance actions. The system provides real-time information to the flight crew of air traffic that has been previously restricted to ground-based air traffic controllers, to provide an added level of security against mid-air collisions and crashes caused by inadequate or erroneous information provided to the ATC or flight crew. [A1861]

"Method for aircraft velocity error detection with a Doppler radar"

A method for preventing errors in the Doppler radar measurement of velocity in aircraft that result from the radar receiver being locked to backscatter from side lobes of a plurality of main lobes radiated in a fixed radiation geometry. The inertial vertical velocity component (V.sub.IZ) obtained by a baro-inertial control loop is compared with the vertical velocity component (V.sub.DZ) determined from the Doppler frequencies to derive an error detection signal. When the error signal occurs, the inertial vertical velocity component replaces the corresponding velocity component supplied from the Doppler system while the horizontal velocity components are determined, for example, from the last calculated wind and the corresponding airspeed components, for the duration of the error signal. [A1862]

"Method of multipath track reduction in an aircraft tracking system"

In a Traffic Alert and Collision Avoidance System (TCAS) , response to interrogations can result in normal, multipath (image) , and mixed multipath (potential image) tracks. The method for reducing the number of false tracks includes the steps of selecting a track to be updated from an existing track list. The selected track has the shortest measured range within the highest priority category track. A reply which has not yet been utilized is selected which has parameters which are within predetermined windows of the selected track parameters. (The predetermined windows are equal to or smaller than the windows for lower priority targets.) The selected track is updated using .alpha..beta..gamma. range squared filter, and the selected reply is marked as used. After all tracks are updated, the unused replies are tested to generate new tracks. Then all the tracks are examined to insure that predetermined track category criteria are met, otherwise the track is recategorized. [A1863]

"Radar system with elevation-responsive PRF control, beam multiplex control, and pulse integration control responsive to azimuth angle"

A multipurpose system provides radar surveillance for air traffic control purposes. The system includes four separate active phased-array antennas, each with .+-.45.degree. coverage in azimuth, from 0.degree. to 60.degree. in elevation. Each antenna element of each phased-array antenna is coupled by a low-loss path to the solid-state amplifier associated with a transmit-receive (TR) module. Each antenna produces a sequence of pencil beams, which requires less transmitted power from the TR modules than a fan beam, but requires more time because the pencil beam must be sequenced to cover the same volume as the fan beam. In order to scan the volume in a short time, the PRF is responsive to the elevation angle of the beam, so higher elevation angles use a higher PRF. Low elevation angle beams receive long transmitter pulses for high power, and pulse compression is used to restore range resolution, but the long pulse results in a large minimum range within which targets cannot be detected. A second scan is provided at low elevation angles with a short transmitter pulse to fill in the short-range coverage. Beams at higher elevation angles transmit pulse widths which are shorter than beams at low elevation angles so that the minimum range requirement is met without a second scan, which also reduces the time required for volumetric scan. The number of pulses which are integrated to produce a return increases off-axis, to restore system margin lost due to off-axis power gain reduction. The volumetric scan rate is increased by a dynamic scan regimen by which subsets of beams are pulsed with a high transmitter PRF but with a low effective beam PRF to reduce range ambiguity and preserve Doppler resolution without the usual increase of scan time. for best range resolution, Doppler processing is used, with range sidelobe pulse suppression applied separately to each Doppler frequency bin. [A1864]

"System to correct the trajectory of a projectile"

A system for correcting the trajectory of a projectile so that it reaches a designated target. The system comprises an optical radar comprising a laser emitting in the infrared band that makes it possible, in association with a processing device, to follow the movements of the target and of the projectile at the same time. The pieces of information given by the processing device enable a computer to calculate corrections to be made to the trajectory of the projectile in a final stage so that it meets the target. By modifying the trajectory of a projectile, such as a self-propelled missile or a shell, launched towards a target, the projectile can be made to hit a moving target or pass by at a reasonable distance that is small enough for the explosion provoked by its charge to definitely destroy the target. [A1865]

"IFF authentication system"

The device is an IFF Authentication System for sending and receiving of coded intelligence. So as to reduce an alien's chances of using the intelligence transmitted, the system uses a clock to provide signals for additional encipherment or scrambling of the coded intelligence. The clock is easily synchronized and provides continuously changing code encipherment for maximum protection and is connected into the system at a variety of predetermined places depending on the componential design of the particular system being used. [A1866]

"Point target filter"

A method and apparatus of point target filtering in a weather radar system for eliminating point targets such as airplanes in real time. A one-dimensional filter is used that operates on a single radar dwell of data at a time. The filter searches for point targets in a reflectivity data field by looking for increases and decreases in the magnitude of the radar return. Each sample volume of the radar dwell is compared to adjacent sample volumes and the differences are tested against predetermined point target thresholds. The differences greater than such predetermined thresholds are flagged. After the entire radar dwell is processed, flagged point target data in the sample volumes are replaced with the data from the sample volume just before the point target which is not considered to part of the point target. The point target filter removes the point targets and the performance limiting contamination they represent to automatic weather data processing programs. [A1867]

"Low altitude wind shear detection with airport surveillance radars"

Method and apparatus for detecting low altitude wind shear through the use of autocorrelation on the received and processed echo signals. Self Autocorrelation of echo signals and autocorrelation of echo signals from consecutive pulses are used to calculate the low altitude Doppler velocities over distance. In an alternate embodiment, autocorrelation of echo signals from alternate pulses is also required. Wind shear is calculated from low altitude Doppler velocity as a function of location. [A1868]

"Interrogation signal processor for air traffic control communications"

The present invention is directed to a Mode S uplink or interrogation signal demodulation system which can quickly recognize the Mode S signal and also filter out of noise present in the Mode S uplink or interrogation signal, thereby reducing the bit error rate. To realize this goal the present invention includes a digital differential phase-shift keyed demodulator to demodulate the differential phase-shift keyed data, thereby reducing the time needed to acquire the Mode S uplink or interrogation signal. This digital demodulator also reduces the noise present in the Mode S uplink or interrogation signal and provides an integrated system which is small in structure that can be easily implemented in an aircraft. This Mode S system also includes a preamble and sync phase reversal detection circuit to recognize if the transmitted signal is a Mode S signal. This signal also utilizes Mode A and Mode C detection devices to make the system compatible with present communication systems. [A1869]

"Doppler radar for the detection and localizing of helicopters"

This Doppler radar for the detection and localization of helicopters through blade flashes works in a band located between 300 MHz and 20 GHz and identifies the blade flashes by the width of their frequency spectrum and their duration. It uses, at reception, a multilobe antenna associated with several parallel signal processing chains specialized in the detection of helicopters, enabling detection over a widened zone as well as precise localization. Each chain has a phase amplitude detector PAD (10, 10') followed by a Doppler filter MTI (20, 20') selecting the wide frequency spectrum, a module computing circuit (30, 30') , a contrast circuit (40, 40') eliminating excessively long echoes, a threshold circuit (50, 50') and a false alarm reduction circuit FAR (60, 60') eliminating excessively short echoes. The chains lead to a relative bearing computation circuit (100) performing angle measurements when this is possible. [A1870]

"Apparatus for reducing synchronous fruit in TCAS surveillance systems"

A system wherein TCAS transmissions have two jitter components added to the jitter component utilized in the interscan interval to minimize TCAS interference with ground station operation. The jitter components minimize the establishment of false intruder tracks caused by responses to ground station interrogations or interrogations by other TCAS interrogators which are received in synchronism with the TCAS interrogation signals. [A1871]

"Method of detecting unknown object and apparatus therefor"

In visualizing an unknown object possessed by a person to be checked, a narrow pulsating radio wave beam is scanned over the whole surface of the person to observe the intensity of a reflected radio wave at each scan point. The frequency of the radio wave beam is set at a frequency easy to be transmitted by the human body to suppress the reflection from the human body and emphasize the unknown object to thereby discriminate between them. An image of the person to be checked is displayed and the portion having a strong reflection is color-displayed on the image to allow the check of the unknown object possessed by the person without contacting the person. [A1872]

"Sequential image synthesizer"

A method and apparatus for producing an image of a target area, by: at an observation location spaced from the target area, transmitting a beam of electromagnetic radiation toward the target area, and receiving reflections of the radiation from the target area, providing a representation of the magnitude and direction of the distance between points on the target area which produce reflections that travel in phase to the observation location, varying the spatial relation between the observation location and the target area and/or the given radiation frequency, in order to establish a plurality of different observation states which succeed one another in time, each state being associated with a distinct combination of magnitude and direction of the distance between points on the target area which produce reflections that travel in phase to the observation location, producing two coherent radiation beams, directing the two beams onto a receiving plane provided with an array of radiation receiving cells and storing output signals from each receiving cell, and controlling the two beams, for each observation state in succession, such that the two collimated beams have: beam axes which are inclined relative to one another by an angle corresponding in magnitude and direction to the magnitude and direction representations, a phase difference corresponding to the phase difference between the transmitted and received radiation, and intensities such that the product of the intensities of the two beams corresponds to the intensity product of the transmitted and received radiation. [A1873]

"Aircraft traffic alert and collision avoidance device"

A passive aircraft Traffic alert and Collision Avoidance device (TCAD) is based on sensing and responding to transponder replies of other aircraft to SSR interrogations. In order to avoid masking other aircraft replies by the host transponder TCAD repeatedly and randomly suppresses the host transponder and simultaneously listens for other aircraft replies. Suppression on each occasion is effective for an equal and predetermined duration which is much longer than a typical reply, in a preferred embodiment the suppression/listen duration is 725 .mu.s. In this embodiment the time between successive suppression/listen occasions is random between 725 .mu.s. and 5.025 ms. with an average value of about 2.9 ms. Digital signal processing is used to detect and discard garbled or overlapping replies. Each valid reply, exhibiting a minimum pulse amplitude, is decoded and correlated with a calibrated range parameter and given a time tag. Successive replies which match to within predetermined criteria in time and calibrated range are merged to track the positional relation between the host and other aircraft. The positional relation between other aircraft and the host are evaluated via a priority table in terms of relative altitude and range to locate that craft which poses the highest threat to the host. Parameters of such a craft are displayed. In the event a craft penetrates a shield of programmable size an audible alert is sounded. TCAD provides for shields for each of a plurality of flight regimes, such as terminal, standard and enroute. Selection among shields is via a single pushbutton. TCAD allows the pilot to program each of the different shield sizes. Peripheral functions such as altitude deviation alert, density altitude and barometric pressure correction for altitude reporting are also provided. [A1874]

"Airborne wind shear detection weather radar"

An airborne wind shear detection radar includes a transmitter for transmitting successive radar beams into airspace in front of an aircraft and a receiver for receiving reflected signals. The radar analyzes the received reflected signals in the frequency domain to determine if a wind shear condition exists in the airspace in front of the aircraft. [A1875]

"Airborne surveillance method and system"

An airborne surveillance method and system allows an observer aircraft to determine the position and change of position of a multiplicity of target aircraft and thus allows analysis of collision threats from these aircraft. The system uses a phase comparison direction finding antenna to determine direction of nearby ground based SSRs and all target aircraft of interest. The system further makes use of all other available data including Mode C transponder generated altitude information of the target aircraft, the altitude of the observer aircraft, the received signal strength of both the SSR beam and the received transponder signal, the time difference of arrival between the SSR interrogation signal and the response from the target aircraft, and a variety of other factors to determine the position of the target aircraft. The system compensates for the attitude of the observer aircraft and performs optimal Kalman filtering on the input data set to produce an estimate on target position based upon prior estimates and upon information contained in the data set while making estimates of the error magnitude of each measurement and compensating for these errors. The covariance matrix Q of the Kalman filter is adaptively varied so as to optimize the estimate of the degree of correlation between various input values. [A1876]

"Method and apparatus for monitoring vehicular traffic"

A method and apparatus for monitoring moving vehicular traffic, especially adapted for the detailed profiling and counting of airport usage by aircraft employing Doppler radar and sound generated by target aircraft. A primary parabolic reflector operated in the Cassegrainian mode with respect to Doppler radar radiation, employed in combination with a hyperbolic sub-reflector constructed so that it will reflect the radar radiation but remain transparent to sound waves is used to propagate and receive radar radiation, and to receive sound waves emanating from a target aircraft. Sound waves emanating from the target are received by the parabolic reflector and directed toward the parabolic reflector's primary focus where they strike a microphone placed at the primary focus of such reflector. The signal from the microphone and the information from the Dopple radar unit are processed by a central processing unit to provide a variety of information relating to the aircraft. [A1877]

"Contraband detection system"

A contraband detection system especially suited for detecting concealed non-metallic contraband such as ceramic or plastic weapons or illegal drugs carried by a person is disclosed. Plural sources of quasi-coherent millimeter wave radiation are disposed so as to uniformly illuminate a field of view. In the preferred embodiment, the radiation emitted by the sources is linearly polarized in a single plane such that the polarization of the radiation with respect to the plane in which linearly polarized radiation is preferentially received by the detectors can be controlled. for detection of dielectric objects, such as ceramic weapons or narcotics, these planes of polarization should be orthogonal to one another. The detector is a staring array which does not require scanning to generate an image of the entire field of view, the signal provided by each element of the detector array corresponds to the illumination reflected from objects in a single portion of the field of view. Real-time imaging of concealed dielectric and metallic objects is thus made possible. [A1878]

"Beacon data acquisition and display system"

A system for transmitting aircraft beacon information received by a secondary surveillance radar through telephone lines to a remote display includes a digitizer connected to the radar for preparing a serial file of data records containing position and identification information of the beacons detected by each sweep of the radar. This information is transmitted through the telephone lines to a remote computer where it is displayed. [A1879]

"Pulse doppler radar systems for helicopter recognition"

A pulse doppler radar system for helicopter recognition has a receiver (5) for receiving reflected pulse radar signals. A distinguishing circuit (22) is provided for distinguishing a group of received frequencies within a predetermined spectral range and for ignoring at least the largest amplitude frequency within that group. A threshold detector (24) is arranged to determine when the amplitude of the remaining frequencies in the group exceed a predetermined value to provide a recognition signal. [A1880]

"Recursive system for image forming by means of a spotlight synthetic aperture radar"

Recursive system for the forming of a radar image by means of a SAR sensor, for application preferably related to the radar field, essentially having a monodimensional transformation system (1) of the signal received by the radar, a convolution element (2) of the same signal by means of a monodimensional inverse transformation (3) . The result of the convolution is retro-projected by means of element (4) . In turn, the result of this operation, envelope-detected (5) , provides an estimate of the electromagnetic characteristics of the teledetected scene. The invention belongs to the radar application field, and more precisely to that of synthetic aperture radars for teledetection. It finds its best application in the area of synthetic aperture radar signal processing. [A1881]

"Apparatus and method for displaying weather information"

A weather display apparatus and method wherein the relative positions of weather information and reference marks are accurately displayed. Information obtained from typical airborne weather radars is distorted due to the use of imperfect beams, such as a conical beam. The distorted weather information is displayed to a pilot. At least one reference mark is also displayed on the display in positions in accordance with relative positions in the airspace and with a distortion factor. [A1882]

"Synthetic aperture radar system"

A synthetic aperture radar system wherein a plurality of beams is formed for receiving echo signals and the spectra of the received signals are synthesized in an azimuth compression unit to improve the cross-range resolution. [A1883]

"Method for providing a polarization filter for processing synthetic aperture radar image data"

A polarization filter can maximize the signal-to-noise ratio of a polarimetric SAR and help discriminate between targets or enhance image features, e.g., enhance contract between different types of target. The method disclosed is based on the Stokes matrix/Stokes vector representation, so the targets of interest can be extended targets, and the method can also be applied to the case of bistatic polarimetric radars. [A1884]

"Generation of topographic terrain models utilizing synthetic aperture radar and surface level data"

Topographical terrain models are generated by digitally delineating the boundary of the region under investigation from data obtained from an airborne synthetic aperture radar image and surface elevation data concurrently acquired either from an airborne instrument or at ground level. A set of coregistered boundary maps thus generated are then digitally combined in three dimensinoal space with the acquired surface elevation data by means of image processing software stored in a digital computer. The method is particularly applicable for generating terrain models of flooded regions covered entirely or in part by foliage. [A1885]

"Doppler compensated airborne weather radar system"

An airborne weather radar system having a capability of compensating for variable Doppler shift caused by the forward motion of the aircraft and the relative motion of the antenna sweep which includes a local oscillator having a single low phase noise crystal which is operated in its fundamental mode at a predetermined frequency for increasing the pullability away from the tuned frequency of the local oscillator. [A1886]

"Radar system employing a method for motion and range closure compensation"

A method of providing motion compensation (i.e. phase, doppler frequency, and range closure correction) for wide band synthetic aperture radar (SAR) or classification/identification radar modes is disclosed. An improved radar system employing the method is also disclosed. The method involves dividing the motion compensation into both a focusing function and a range closure function. Either or both these functions is achieved by modifying the transmitted signal. for stretch waveform processing systems, the method involves generating both the transmitted and reference signals. The radar system includes a waveform generator capable of implementing the various motion compensation techinques when the transmitted waveform is a linear FM waveform. [A1887]

"Angle measurement compensation technique for amplitude comparison monopulse receiver"

A compensated amplitude comparison monopulse receiver (10) having an angular measurement capability substantially unaffected by mismatches in channel transient response and target range tracking inaccuracy is disclosed herein. The inventive monopulse receiver (10) includes a first receiver channel (24) for impressing a first output voltage S1 on a first output port (28) thereof in response to excitation by a sum signal. A second receiver channel (26) impresses a second output voltage S2 on a second output port (30) thereof in response to excitation by the sum and a difference signal. In a calibration mode, a calibration source (22) provides a series of calibration pulses to the first and second channels (24, 26) which induces first and second calibration voltages to appear on the first and second output ports (28, 30) thereof. Sampling gates (32, 34) sample the first and second calibration voltages subsequent to application of each calibration pulse to the first and second receiver channels (24, 26) . In a tracking mode the sample gates (32, 34) are operative to sample the first and second output voltages present on the first and second output ports (28, 30) . The inventive receiver 10 further includes circuitry (48, 50) for calculating the angular location of the first object from the sampled first and second output voltages. A compensation network (36) then adjusts the calculated angular location on the basis of the sampled calibration voltages. [A1888]

"Winds aloft estimation through radar observation of aircraft"

A method and a system for determining the wind velocity vector in a region in which a turn is being executed by an aircraft using a positional detection system to obtain aircraft positional data during the turn, calculating the ground speed vector of the aircraft at a plurality of points during the turn and determining the wind vector that best fits the ground speed vector data. The wind velocity vector can be calculated even when the aircraft airspeed vector is not constant. [A1889]

"Synthetic aperture radar assembly and a method of creating a radar image of a planet surface using such an assembly"

A synthetic aperture radar assembly (1) locatable on a satellite (2) for radar imaging of a planet surface (3) in swaths, including means (8) for transmitting pulses (4) of electromagnetic radiation towards the planet surface (3) to be imaged, means (8) for receiving echoes of said pulses (4) returned by said planet surface (3) , means for creating an image of a swath (5) of said planet surface (3) from said returned echoes and means for randomly varying the frequency of transmission of said pulses (4) to increase the width (11) of swath (5) imagable. [A1890]

"Locating system"

A locating system and method in which a network of communication stations are spread over a surveillance area. Each moveable element is provided with a transponder having an associated identification code. A paging signal sent out over the surveillance area is picked up by the transponders and the one with the identification code provided in the page responds. The response is made at a frequency different from the page. The response is picked up by the nearest communication stations. A master station communicates with the communication stations at a frequency different from that used by the paging signal or the transponder. The master station which interrogates all the communication stations locates the paged transponder to within a sector bordered by the communication stations that received the response from the transponder. The communication stations can be subdivided into three or more interspersed arrays. [A1891]

"Millimeter-wave imaging system"

An improved millimeter imaging system is disclosed which generates high quality images from the field of view. Such system can be employed in a variety of application ranging from providing an aircraft pilot with an image of the landing field in fog, rain, snow, blowing sand, etc. to detection of concealed non-metallic contraband. The system elements, in which different elements detect signals from different portions of the field of view, so that images of the entire field of view are generated in real time, without using electrical or mechanical scanning. The outputs of the array elements are mapped to display pixels. The resolution of such images has previously been limited by the response characteristics of array elements to energy from only a portion of the corresponding field of view. One aspect of the invention is a significant improvement in image resolution. In the preferred embodiment, a radiation redirecting element redirects incident radiation toward the centerline of each element, so that the elements are uniformly exposed to different portions of the corresponding field of view. As a result, a plurality of display pixels corresponding to different portion of the field of view of each array element are generated, thus significantly increasing display resolution. Another aspect of the invention relates to a novel way of periodically illuminating the imaging array with background noise signal, which is then subtracted from the field of view signal, in order to reduce signal-to-noise ratio. In the preferred embodiment, an optical arrangement of a reflector/load element and a rotating polarization rotation element supplies background signal synchronously with generation of the field of view images, without utilizing electronic switching devices or special "noise" power illuminators. [A1892]

"Radar sensing generator in a monopulse radar system"

An improved airborne target tracking monopulse radar system is disclosed which includes a null command generator, designed to provide an error signal which represents the angle between a target direction and the antenna's monopulse null direction. The generator is supplied with signals on sum and difference channels and a frequency which represents a selected target. The error signal is produced by first differentiating the sum channel signals and subtracting the differentiated output from the difference channel signals. The difference output is then multiplied with properly phased sum channel signals to produce the desired error signal. [A1893]

"Aircraft radar altimeter with multiple target tracking capability"

An aircraft radar altimeter includes a programmed microcontroller which permits effective simultaneous tracking of at least two targets such that, for example, both ground and obstacles on the ground can be simultaneously tracked, thus avoiding crashes when the aircraft is operating at very low altitudes. The microcontroller is operatively coupled to the radar transmitter and to the receiver so that information relating to a first target can be stored away while a search and track operation is run on a second target. The information concerning a detected second target is likewise stored away and the microcontroller permits alternate tracking of the two targets with the stored information being used as the basis for establishing an initial position for a target when tracking of that target is resumed. [A1894]

"Fixed-echo cancelling radio altimeter and method of operating same"

A low altitude radio altimeter of the FM/CW type which transmits a sawtooth frequency wave and has a transmitting and a receiving aerial. A beat frequency signal Fb.sub.t between the transmitted and received waves is produced at the output of a mixer. The altimeter includes means for digitizing Fb.sub.t at the rate of n samples per sawtooth, a first memory (M1) to store n.times.k samples S.sub.j.sup.i (where i varies from 1 to k and j varies from 1 to n) , a second memory (M2) to store n sums ##EQU1## first computing means (PR) for determining ##EQU2## representative of Fb.sub.4, for storage in a third memory (M3) , and additional computing and storage means (PR, M4) producing difference signals Fb.sub.t -Fb.sub.f. [A1895]

"Discrete autofocus for ultra-high resolution synthetic aperture radar"

The invention provides improved focus by phase corrections for Synthetic Aperture Radar images by operation on the range bin containing a selected isolated target. A phase correction signal is generated by first obtaining a non-interfering radar return from the selected target through band pass filtering operation and then extracting a non-linear residual phase from the band pass filtered data with an arc-tangent generator. The residual phase derived by the arc-tangent generator is then applied to the range compressed SAR data as a phase correction signal. [A1896]

"Pulse compression radar and application for mapping or meteorology"

A radar device, of the almost linearly frequency-modulated type of the transmission signal during the pulse, comprises a transmit circuit including a high-frequency oscillator (29) , a transmit-receive aerial (7) and a receive circuit including a pulse compression element (33) . According to the invention, inside the transmit circuit, an Impatt diode (17) of a diode switch (16) produces directly at microwave frequency a synchronizing signal of the oscillator (pulses modulated in accordance with negative frequency slopes) . for this purpose, a clock pulse generator (26) commands a switch (25) arranged in series on the conductor (19) of the supply current of the Impatt diode (17) which current is substantially continuous, to conduct for the duration of each pulse to be transmitted. [A1897]

"Synthetic aperture radar apparatus"

A synthetic aperture radar apparatus comprising an altitude calculation device, and means to feed back altitudinal information obtained by the altitude calculation device, to a synthetic aperture radar device in the synthetic aperture radar apparatus at all times. Thus, an observational region is observed with the synthetic aperture radar device, while at the same time, the altitude of an artificial satellite is calculated by measuring the acceleration thereof in the altitude calculation device, the altitudinal information being continually fed back to an operation controller in the synthetic aperture radar device, whereby the synthetic aperture radar device is operated continuously and automatically. [A1898]

"Device of suppressing incorrect alarms for use in a collision avoidance system installed in an airplane"

A device of suppressing incorrect alarms to be issued from an airplane collision avoidance system installed in a first airplane, wherein when it is found that a product obtained by multiplying a relative distance of the first airplane relative to a second airplane by a sine of a relative horizontal angle is constant or when it is found that results derived from a comparison between a relative speed of the first airplane relative to the second airplane and a speed vector in the direction toward the second airplane obtained from a relative horizontal angle of the first airplane relative to the second airplane and a speed of the first airplane in the direction of extension of a nose is substantially zero, it is determined that the second airplane is held in an immovable state, i.e., it stays in a waiting state. [A1899]

"Icing hazard detection for aircraft"

An airborne Icing Hazard Detector for aircraft uses dual frequency radar beams which are transmitted into a cloud ahead of the aircraft. The reflected signals at each of the two frequencies are compared and processed to determine the presence, amount and location of regions of liquid water in the cloud. The presence of liquid water is determined as a result of liquid water attenuating the power of one of the signals a greater amount than the other signal, due to different attenuation characteristics of the two signals at the two frequencies. A temperature sensor provides ambient temperature information to determine if the detected liquid water is super-cooled. Upon detection of a predetermined amount of liquid water and the determination that it is super-cooled, an advance warning indication is provided to allow the pilot to avoid flying through the volumetric region of supercooled liquid water and risking ice formation on the aircraft. [A1900]

"Real-time high resolution autofocus system in digital radar signal processors"

This autofocus is a system for improving the image quality of an airborne Synthetic Aperture Radar (SAR) , that is mechanized in the high-speed digital signal processors with some control capability from the operating console to perform on-line focusing, to provide a unique and superior focusing technique. It includes (a) selecting the range bins which contain the strongest signals, (b) forming the subapertures from the end pulses in the selected range bins and performing map correlations, (c) judging the quality of each map correlation by its associated discriminate and determining the best one, and (d) generating the correcting phasors based on the best correlation and correcting the radar data accordingly. [A1901]

"Data link and return link"

This invention relates to a data coder, code searching mechanism, data deer, and range computer for a missile wherein the missile receiver is able to discriminate between the real signals and jamming signals. The system provides discrimination in aircraft receiver systems for the return synchronization signal. This is accomplished by utilizing a random code generator wherein the command data signals modulate the code train which in turn modulates the RF carrier. The missile contains a second code generator with a code searching mechanism which synchonizes the second code generator with the first generator. The comparison of the second code generator signal with the received signal produces the command signal as an output. [A1902]

"Precision landing system"

A precision aircraft landing system comprising at least four receivers which are located at different predetermined positions. Each receiver includes a precision timer for measuring the timer interval between the receiver's detection of an interrogation signal and a reply signal from a transponder onboard the aircraft. The system also includes a central processing unit (computer) at a base station which collects the time measurements from the receivers, and calculates the location of the aircraft. Because more than three independent measurements are used, the base station can compute not only the three-dimensional coordinates of the aircraft, but also the transponder reply time. Preferably estimation filtering calculations, such as Kalman filtering, are used to improve the accuracy. The aircraft's position is compared with a mathematical description of a desired approach path, and the position error is then communicated to the aircraft. Any desired approach path than can be mathematically represented may be used in the system, including paths having curves, steps and segments. [A1903]

"Volume-scattered echo discrimination device for FM/CW range measuring radar and use in a radio altimeter"

The device comprises, in a control loop of the subtractive beat frequency fb between transmitted waves and waves received as an echo, a pursuit discriminator (11) establishing the frequency fb at f.sub.0 and a pursuit validation circuit (12) . This device is characterized by the combination of a contrast discrimination set (CDS (15 to 18) and a VSE discrimination set (21 to 25) for detecting energy in a guard band situated at the upper end of the frequency bands of the CDS, the latter comprising a contrast discriminator (15) , a first attenuator (16) and controlling the pursuit validation circuit (12) . The VSE discrimination set is arranged for controlling the gain of the first attenuator (16) . [A1904]

"Integrated altimeter and doppler velocity sensor arrangement"

A transmitter section of the arrangement includes an altimeter transmitter and a Doppler transmitter. The transmitters both provide frequency-modulated outputs. The altimeter transmitter is linear-FM while the Doppler transmitter is sine-FM. [A1905]

"Synthetic aperture radar system having a third order tuned auto compensator for residual antenna motion and method for its use"

In a SAR system a method is provided for compensating for antenna residual motion relative to a motion sensor, wherein such residual motion causes phase corruption in a radar image produced by the SAR system. Residual motion compensation is provided by first correlating a received radar signal to a range line having a plurality of azimuth positions. Such signal is transformed into a frequency spectrum indicating the reflectivity of point reflectors at the various azimuth positions. Then, the range line is sampled for symmetric sets of sequential point reflectors positioned along the range line at a consecutive distance from each other corresponding to a specified frequency associated to a mode of residual vibration of the antenna. The amplitude and phase angle of said mode of the antenna residual motion may be obtained from such symmetric sets. [A1906]

"Collision avoidance transmit system with autocalibration"

A transmit system for collision avoidance systems having autocalibration. A four element antenna array is provided. Each element is selectively connectable to a transmitter through a power divider and a isolator. Three of the elements further have a programmable phase shifter in line to the transmitter. A phase detector having a first input selectably connectable to one of the elements and a second output connected to the transmitter is provided. By selectively connecting one element to the transmitter and one element to the phase detector and then selectively programming the appropriate phase shifters, the differentiated phase delay in each channel of components associated with an antenna element can be calibrated. [A1907]

"Ranging and processing system for mobile surveillance and data link"

The satellite system includes at least two satellites having on-board processing capability so that data messages may be exchanged and the position of mobiles may be determined with direct access from multiple ground control facilities. The satellites transmit data and poll individual mobiles upon command by one or more of the control facilities and receive replies from the mobiles including the mobiles' altitude and other data of interest to the control facility. The at least two satellites communicate with one another by means of a cross-link communication path. Computer processing apparatus is included on the satellites to compute the ranges between the mobiles and each of the satellites from the replies received from the mobiles, and to store and process messages. The position information and messages are transmitted to at least one of the control facilities. It is preferred that the control facilities employ TDMA or FDMA protocols in the uplinks to the satellites. The on-board processing makes it readily possible for a number of control facilities to gain access to the satellites directly rather than through a central earth station, and to increase the capacity of a discrete address polling system for a given allocation of radio frequency spectrum. A discrete address polling system is one where each mobile is polled on an individual basis by only responding to polls that contain its identification. [A1908]

"Phase difference auto focusing for synthetic aperture radar imaging"

The present invention discloses an autofocusing method and apparatus for Synthetic Aperture Radar which employs operation on two or three subarrays of the SAR compressed data to estimate quadratic and cubic phase errors in the data. Focusing of the SAR array may then be accomplished by removing the estimated phase error from the data to sharpen the image. Phase error is estimated by FFT filtering product arrays formed by multiplying the complex conjugate of one subarray by another of the subarrays to form a correlation function. The correlation functions are integrated. A peak detection of the integrated correlation functions yields a peak location in the filter which is proportional to the phase error which may then be calculated. [A1909]

"Processing of concatenated radar measurements to re-establish signal phase coherence"

A method and apparatus for re-establising frequency, phase and amplitude coherence for radar samples generated by mutiple frequency transmitter pulse trains. A plurality of transmitter means 10-12 produce pulses of different frequencies and an antenna 22 and waveguide 24 direct the pulses 26 towards the aircraft 30. The reflected radar signal 32 returns to the antenna 22 l and waveguide 24 and is measured by the receiver 14. The reflected radar signal is then frequency rescaled, phase realigned, and amplitude normalized by the computer processor 18 and output to a processor/display unit 20. [A1910]

"Method of detection and identification of one or more remote objects"

A method of identifying and detecting remote objects by transmitting wave energy and receiving wave energy reflected from the object. Separate signal parameters pertaining to the wave energy received are processed forming a measured signature of the object. The measured signature is compared with a number of prestored signatures having the same signal parameters relating to known objects of interest. A recording is made of which prestored signatures correspond to the measured signature within predetermined tolerances. Subsequent transmission and reception of wave energy is used for updating the separate parameters and the measured signature. The updated measured signature is compared with the recorded prestored signatures for updated recording of a smaller number of prestored signatures corresponding to the updated measured signature within the predetermined tolerances. [A1911]

"System and method for measuring ocean surface currents at locations remote from land masses using synthetic aperture radar"

This is a system for measuring ocean surface currents from an airborne platform. A radar system having two spaced antennas wherein one antenna is driven and return signals from the ocean surface are detected by both antennas is employed to get raw ocean current data which is saved for later processing. There are a pair of GPS systems including a first antenna carried by the platform at a first location and a second antenna carried by the platform at a second location displaced from the first antenna for determining the position of the antennas from signals from orbiting GPS navigational satellites. This data is also saved for later processing. The saved data is subsequently processed by a ground-based computer system to determine the position, orientation, and velocity of the platform as well as to derive measurements of currents on the ocean surface. [A1912]

"Multi-mode microwave landing system"

A guidance system for landing an aircraft is described which uses a source of signals identifiable with the aircraft and a ground station which is linked to the aircraft. Specifically, the ground station includes a receiver which is connected to one or more pairs of antennas having a fixed, overlapping, directional sensitive pattern symmetically located relative to the center of the landing path, a receiver and a processor for measuring the relative sensitivity of the signals received at the antennas and for using the relative signal intensity to determine the location of the aircraft relative to the center of the landing path. [A1913]

"Stabilizing air to ground radar"

Air-to-ground radar (2) is stabilized by comparing the power of the returning echo occurring during an initial period after the transmission of each pulse with that occurring during a following period after the transmission of each pulse, and using the result of this comparison to control an elevation controller (13) of the radar (2) . Means (7, 8) provide a first power signal representative of the power of the returning echo occurring during an initial period after the transmission of each pulse, means (7, 9, 10) provide a second power signal representative of the power of the returning echo occurring during a following period after the transmission of each pulse, and a comparator (12) compares the magnitude of the first and second power signals and outputs a control signal causing the elevation controller (13) to raise or lower the elevation at which output pulses are projected. [A1914]

"Processing parameter generator for synthetic aperture radar"

A signal processor for synthetic aperture radar comprises a processing parameter generator (17) for generating processor filter parameters for use in squint compensation multiplication means (3) and azimuth replica evaluation (4) . The parameter generator products and stores tables of data to be used in the subsequent processing. [A1915]

"Monopulse first detector array"

In a millimeter wave monopulse first detector array for use in seeker applications in a guided missile employing quasi-optical, or Gaussian beam, signal transmission, a first detector is shown to include a patch antenna array, a mixer and a power divider in a monolithic implementation for extraction of the monopulse information in a radar receiver. [A1916]

"Aircraft instrument systems"

An aircraft collision avoidance instrument system has a display located in the aircraft glareshield in the peripheral field of view of the pilot when the pilot is looking forwardly through the aircraft window. The display has a matrix array of LCD elements which is controlled to provide a continually changing image that is visible in the peripheral field of view of the pilot when a possible collision with another aircraft is likely. The changing image may be arrows moving up or down the display to indicate climb or decend, or a flashing horizontal line to indicate that present height must be maintained. An alphanumeric legend indicative of the collision avoidance action to be taken is also provided by the display. When no collision is likely, the display is used to present other information to the pilot. [A1917]

"Air traffic control training system"

An air traffic control training system and method for interacting with a user, the system and method generating a representation of at least one moving aircraft having an initial position and heading for producing a dynamic simulation of an air traffic scenario. Controller commands issued by a user are entered for altering the air traffic scenario. Rules and procedures stored in a knowledge base are compared to the present state of the simulation of the air traffic scenario or to the controller command by an expert system for issuing a warning upon the immediate or foreseeable failure to observe any rule or procedure in the knowledge base. [A1918]

"Synthetic aperture radar with dead-ahead beam sharpening capability"

A synthetic aperture radar is disclosed, having the capability of dead-ahead beam sharpening. A monopulse antenna having sum and difference ports is employed, generating from the radar returns sum port signals and difference port signals. The respective sum and difference port signals are provided to respective first and second SAR processors. The processor output data is processed to separate the returns from each side of the SAR velocity vector and yield an unambiguous, doppler beam sharpened ground map about the velocity vector. [A1919]

"Alarm suppressing system in aircraft collision avoidance system"

The present invention is concerned with a system in which when the altitude of a subject aircraft becomes lower than a predetermined altitude, a warning limit value is reduced or made equal to zero on the minimum altitude side whereby a useless alarm based on response signals delivered from other aircraft staying in or taxiing in the airport are suppressed. [A1920]

"Timed dielectrometry surveillance method and apparatus"

Dielectrometry monitoring method and apparatus for three-dimensional profiling and colorable imaging of the material contents of articles carried on a conveyor through an interrogation region are disclosed. In a preferred embodiment, the apparatus includes a plural, stationary, collimated, microwave transmitter/receiver antennae array and associated electronics for measuring the dielectric constant of the materials to produce data for interpretation in real time as to the article's dielectric material configuration and contents. High-speed, GaAs gates and switching devices, as well as microstrip delay lines, are used to perform the precisely timed, depth-wise sampling of data reflective of dielectric-constant material characteristics, with sampling periods in the sub-nanosecond range. By comparison to predefined criteria, computerized analysis determines whether the data profile of the material within the interrogation region is indicative of any of a variety of contraband or hazardous conditions, including narcotic drugs and explosives. In the preferred embodiment of the invention, one each of such collimated arrays is positioned above and below the article-carrying conveyor in order to avoid potential blind spots that may be caused by conductive structures within an article. [A1921]

"Time domain electronic antenna beam shaping"

An apparatus for electronically narrowing the beam width of interrogation transmissions of an interrogator utilizes three beams of the four beam system not used as the main beam for the transmission of suppression pulses. One side of the main beam is suppressed by the first sidelobe suppression pulse of the interrogation pulse sequence and then the other side of the main beam is suppressed by the second sidelobe suppression pulse within the interrogation pulse sequence. In another mode of operation, the interrogation beam width is controlled by transmitting a suppression pulse on a beam positioned 180.degree. from the main beam. This electronic narrowing of the interrogation beam width reduces the number of overlapping replies received by the interrogator and enables the interrogator to properly sort out and not lose or misinterpret replies received by proximity transponder equipped aircraft. [A1922]

"Method for detecting surface motions and mapping small terrestrial or planetary surface

deformations with synthetic aperture radar"

A technique based on synthetic aperture radar (SAR) interferometry is used to measure very small (1 cm or less) surface deformations with good resolution (10 m) over large areas (50 km) . It can be used for accurate measurements of many geophysical phenomena, including swelling and buckling in fault zones, residual, vertical and lateral displacements from seismic events and prevolcanic swelling. Two SAR images are made of a scene by two spaced antennas and a difference interferogram of the scene is made. After unwrapping phases of pixels of the difference interferogram, surface motion or deformation changes of the surface are observed. A second interferogram of the same scene is made from a different pair of images, at least one of which is made after some elapsed time. The second interferogram is then compared with the first interferogram to detect changes in line of sight position of pixels. By resolving line of sight observations into their vector components in other sets of interferograms along at least one other direction, lateral motions may be recovered in their entirety. Since in general, the SAR images are made from flight tracks that are separated, it is not possible to distinguish surface changes from the parallax caused by topography. However, a third image may be used to remove the topography and leave only the surface changes. [A1923]

"Radioaltimeter type of detector and a proximity fuse equipped with such a detector"

The invention relates to a radioaltimeter type detector comprising an oscillator-transmitter (10) , a modulator (20) suitable for frequency modulating the oscillator-transmitter according to a given characteristic, a mixer receiving the signal from the oscillator-transmitter and a corresponding echo signal reflected by a target, and a discriminator circuit (50, 60) connected to the output from the mixer. According to the invention, the modulator (20) includes a digital memory (21) containing a series of values defining the frequency modulation characteristic of the oscillator-transmitter (10) . [A1924]

"Guiding method and on-board guidance system for a flying body"

An on-board guidance system for a flying body, such as a cruise missile, includes a radar device for a self-sufficient scanning of the topography during flight. Scanning antennas provide signals for evaluation and further application in a search and guide logic circuit. An on-board computer calculates an exact horizon angle which is used as an altitude guide or control value. [A1925]

"Air traffic control radar beacon system multipath reduction apparatus and method"

A system and method for detecting and removing specular multipath reports from terminal ATCRB systems for aircraft targets having Mode 3/A transponder reporting capabilities. Reports are delayed for a first time, or azimuth, interval to determine whether the report is multipath or to identify future occurrences of multipath reports. After the first azimuth interval, the report is released for display and a fragment of the report is retained for an additional azimuth interval. of two reports with matching Mode 3/A code, the one with the greater range is considered to be a multipath reply. If the multipath report range falls within a multipath range interval and has not been released for display, it is discarded by the system as an erroneous report. [A1926]

"Processor for radar system"

In a synthetic aperture radar system the radar pulse echo return signals are sample, which samples are correlated with a replica of the original signal to produce range line samples with increased resolution in the range direction. To increase resolution in the azimuth direction, a series of range lines are correlated or combined in some other way with Doppler or other reference-coefficents a problem with this is that there is relative movement between any particular point on the ground and the radar system, and the samples in the range lines corresponding to that position lie on a slant line such as 103 (skew axis y) . To utilize the incoming data, the skew axis is arranged in a saw-tooth form. To facilitate processing data is fed into an input sequence of data storage location in for example a buffer 51, at a variable starting position which moves corresponding to each discontinuity in the zig-zag, so that the discontinuities are transparent to the processor. In one embodiment, azimuth processing can take place along columns in bands 83 in a two-dimensional memory 53 corresponding to swaths on the ground 101. [A1927]

"Position determination and message transfer system employing satellites and stored terrain map"

A radio position determation and message transfer system is implemented using a pair of satellites in geostationary orbit for replaying interrogation and replay signals between a ground station and a user-carried transceiver. The user portion is calculated based on the arrival times of replay signals received at the ground station via the two satellites, the known transmission time of the interrogation signal from the ground station, and the user's elevation on the surface of the earth. The elevation is derived from a stored terrain map providing local terrain elevations at a plurality of points of the earth's surface. The stored terrain map allows accurate position fixed to be obtained for surface users regardless of the deviation of the local terrain from the spherical or ellipsoidal model of the earth's surface. [A1928]

"Method for radar mapping an area and a radar equipment to carry out the method"

The invention relates to a method for radar mapping an area and a radar equipment for wideband exploration at frequencies below 300 MHz. A large number of frequencies, for instance 1000, are distributed over a frequency band between for instance 12.5 and 200 MHz, and approximately corresponding to terms in a geometrical series but being different harmonics to a certain fundamental frequency. This is accomplished by a synthesis generator coupled to a phase control device and the generated frequencies are each amplified in a separate amplifier, the outputs of which are guided in groups to a number of antennas, tuned to different frequency bands and fewer than the number of frequencies. The reception is carried out in a similar way from the antennas with pre-amplifiers and a mixer each and an A/D-converter and a registration device. The equipment is meant to use the principle of so called synthetic aperture radar (SAR) . [A1929]

"Synthetic aperture radar"

A synthetic aperture radar system includes a distortion correction device arranged for autofocussing of raw data by contrast maximization. Reference functions are selected on the basis of a range of trial accelerations. The acceleration producing the highest contrast is taken as the current radar platform across-track acceleration. This information is used to generate phase and range corrections for the data. [A1930]

"Method and apparatus for determining the position and velocity of a target in inertial space"

A method for determining the position and velocity of a target in inertial space including the steps of (a) tracking the target and providing three orthogonal velocity components in inertial space, (b) computing the scalar velocity V.sub.T of the target in an inertial reference frame by providing the square root of the sum of the squares of the orthogonal velocity components, and (c) computing the aspect angle .beta..sub.cue of the target relative to a line-of-sight to a platform as an inverse sinusoidal function of the ratio of one of said orthogonal components and V.sub.T, when such tracking data is available, and otherwise, (d) estimating actual target maneuver to develop a minimum uncertainty zone using an assumed worst case lateral target acceleration. Also disclosed are techniques for bounding the aspect angle and for providing global range and range rate estimates which account for uncertainties in the measurements of target and platform ranges and velocities. [A1931]

"Digitally generated two carrier phase coded signal source"

A high frequency signal is converted to a signal characteristic of two simultaneously present, closely spaced high frequency signals. A high frequency signal is passed through a controllable bi-phase modulating switch. The switch is controlled by the resultant output of a multiplier which multiplies the sign of two phase-related pulse trains. [A1932]

"Frequency-modulated continuous-wave radar altimeter system"

The radar system of the FM/CW type transmits a wave which has a virtually linear frequency, between two frequencies f.sub.1 and f.sub.2 and supplies a first beat signal (Fb.sub.1) between transmitted and received waves, it is suitable for measuring the altitude h by measuring the overall phase rotation. According to the invention the radar supplies a second beat signal (Fb.sub.2) in quadrature with the first signal, the signals Fb.sub.1 and Fb.sub.2 are digitized (23 to 26) and comparing means (36) compare the consecutive samples of Fb.sub.1 and Fb.sub.2, then calculating means (37) derive therefrom by means of successive increments/decrements the number of zero crossings of the phase plane in a predetermined direction minus the number of zero crossings in the opposite direction (result m) . The calculated altitude h is proportional to m. [A1933]

"Collision detection system"

The detection, by doppler frequencies in reflected wave energy, of an obt, such as an obstruction on a landing surface approached along a path at a shallow angle to the surface, using doppler frequencies returned from a fixed range. The frequencies returned by the surface and the obstruction are distinguished by their relation to a threshold frequency determined by the velocity along the path and the angle. Returns from the surface as the angle of incidence at the fixed range increases from the initial normal angle of incidence are minimized by selection of the carrier frequency, and clutter is rejected by ignoring a return at the fixed range that does not correspond to a subsequent return at a nearer range. [A1934]

"Site-selectable air traffic control system"

A site-selectable air traffic control system and method for interacting with a user, the system and method generating a representation of at least one moving aircraft having an initial position and heading with respect to a selected site for producing a dynamic simulation of an air traffic scenario. The site selected may consist of one of a plurality of stored sites or a modification of one of those sites. Controller commands issued by a user are entered for altering the air traffic scenario. Rules and procedures stored in a general knowledge base and a site-specific knowledge base are compared to the present state of the simulation of the air traffic scenario or to the controller command by an expert system for issuing a warning upon the immediate or foreseeable failure to observe any rule or procedure in the knowledge bases. [A1935]

"Radar altimeter"

The present radar altimeter operates in accordance with the frequency modulated continuous wave principle in the C-band. The altimeter is constructed with microminiaturized integrated circuits and provides a completely digital signal evaluation and mode control which enables the transmitter to produce a wave-form providing the altimeter with the following advantages. A silent mode during the signal evaluation greatly improves the resistance of the altimeter against electronic countermeasures. The transmitter frequency is stabilized and a compensation for Doppler frequency drift is provided. Further, the altimeter is able to discriminate between intended proper targets on the one hand and false or erroneous targets on the other hand. The altimeter is equipped with a self-testing unit which provides different functions in different modes. [A1936]

"Two parameter clutter map"

A two-parameter clutter map for storing two variables for every spatial location in order to define both the intensity of the interference and the fluctuation characteristics of the interference from scan-to-scan. The two variables are obtained by processing input data from an integrator in two n-pole integrators having different orders. The ratio of the two variables or their difference in logarithmic form is employed as a measure of the scan-to-scan fluctuation characteristics. An option to control alarms and the leading edge of moving rain storms is also provided. [A1937]

"Automatic horizontal and vertical scanning radar"

An automatic horizontal and vertical scanning radar for aircraft for displaying weather conditions includes an antenna system mounted in the aircraft for sweeping horizontally and vertically in response to horizontal and vertical drive signals and for transmitting radar signals forwardly of the aircraft and receiving back reflected radar signals, a receiver for digitizing received reflected radar signals, a storage unit for storing the digitized signals, a display unit responsive to display control signals for displaying a plan view image of weather conditions ahead of the aircraft represented by reflected radar signals received by the antenna system sweeping back and forth horizontally and a vertical view image of weather conditions represented by reflected radar signals received by the antenna system moving up and down vertically, and a control unit for supplying horizontal and vertical drive signals to the antenna system, and for producing control signals from the stored digitized signals. [A1938]

"Method and apparatus for continuous on line recording and processing of synthetic aperture radar signals in real time"

A method and apparatus for real time SAR recording and processing includes a first movable recording medium in the form of a rotatable disc having reusable and erasable photosensitive materials thereon to record SAR returns in the form of radial traces. The first recording medium is rotated to move successively through a write zone where the SAR returns are recorded and a read zone where the recorded SAR returns are optically processed to produce a SAR image. The SAR image is recorded on a second rotatable recording medium having reusable and erasable photosensitive materials. The second rotatable recording medium moves successively through a record zone where the SAR image is recorded in a transfer zone where the SAR image is interfaced with a further optical processing system such as an optical correlator. [A1939]

"Synthetic aperture radar systems"

In a synthetic aperture radar system, information concerning the radar reflectivity of a point on the ground is placed in an image at an azimuthal (cross-range) position which corresponds to the position of zero Doppler frequency shift of the received signal, under the assumption that the antenna has followed a straight line trajectory. In practice, the antenna trajectory will undergo small deviations about this straight line path which are not taken into account in the azimuth processing and which, consequently, cause incorrect azimuthal positioning in the image of the information concerning a point target on the ground. The invention uses the value of the slope of the frequency modulation of the received signal, calculated by means of an autofocus procedure, to determine the intercept of this frequency modulation at successive azimuth positions. This true intercept value is then incorporated in the azimuth processing, instead of the assumed intercept of the frequency modulation, allowing imagery which is free from azimuthal positioning errors to be produced. [A1940]

"Phase correction system for automatic focusing of synthetic aperture radar"

A phase gradient autofocus system for use in synthetic aperture imaging accurately compensates for arbitrary phase errors in each imaged frame by locating highlighted areas and determining the phase disturbance or image spread associated with each of these highlight areas. An estimate of the image spread for each highlighted area in a line in the case of one dimensional processing or in a sector, in the case of two-dimensional processing, is determined. The phase error is determined using phase gradient processing. The phase error is then removed from the uncorrected image and the process is iteratively performed to substantially eliminate phase errors which can degrade the image. [A1941]

"Method for determining aircraft flight altitude"

A method for determining the flight altitude h above ground of an aircraft equipped with a radar altimeter and an additional (baro-inertial) altitude measuring device or a course and position reference system capable of determining altitude. The method relies upon restriction of high-frequency emissions from the radar altimeter to very short periods of time. The radar altimeter measures h.sub.RO within the high-frequency intermission intervals to calibrate the altitude value supplied by the other altitude-measuring device. The method permits the omission of any radar altimeter from aircraft-launched missiles without degrading system performance. [A1942]

"Topographic mapping"

The present invention relates to a method for topographically mapping the surface of the Earth under utilization of measuring the altitude by means of radar, and under further utilization of a synthetic aperture for the radar, as well as an electronically controlled antenna lobe. In accordance with the preferred embodiment of the present invention, it is suggested to conically pivot the antenna lobe around a nadir, whereby pivoting of the center line follows a path such that the line constitutes the geneatrix of a cone. [A1943]

"Apparatus for detecting heterogeneity of water surface"

An apparatus for detecting heterogeneity of water surface has a series circuit including a transceiver, a hydrometeorological information processing and storage unit and an indicator. According to the invention, the hydrometeorological information processing and storage unit has a cathode ray storage device with a mode selector unit and an electron beam control system as well as a driving generator and a control unit. [A1944]

"Low altitude warning system for aircraft"

To provide a predictive emergency warning to the pilot of flight and terrain conditions which will result in a collision with the ground unless the pilot takes immediate action, without issuing excessive nuisance warnings, the system uses input parameters from other aircraft systems such as the radar altimeter. Inertial Navigation System, and Central Air Data Computer which are processed in an on-board computer to determine when a warning is required. A software program which is part of the warning system provides a logic link between the on-board aircraft parameters and the on-board voice command ("pull-up, pull-up") . The software program is readily adaptable to all aircraft applications with varying amounts of modification depending on specific mission requirements for which this protection is required. A feature is the use of a continuously computing predictive warning algorithm (based on classical flight dynamics equations) in combination with unique inhibit logic equations. Another feature is the introduction of "extended coverage" logic which permits the altitude dependent, time limited use of an alternate (other than radar) altitude reference signal when the radar altimeter is beyond limits. [A1945]

"Traffic advisory-instantaneous vertical speed display"

An electronic display for presenting to an aircraft flight crew the combined information outputs of a vertical speed sensor and a TCAS computer aboard an aircraft. TCAS traffic advisories, i.e. the locations of other aircraft in the vicinity of the protected aircraft, are presented in a first display area of an electric display panel, preferrably in PPI format, showing range, relative bearing and relative altitude, if known. Vertical speed of the protected aircraft is indicated in a second display area adjacent the first display area on the same display panel. Whenever the TCAS computer determines that a particular aircraft constitutes a collison threat and that the establishment or maintainence of a specific flight path is necessary to minimize the probability of collision, the TCAS computer issues a resolution advisory which is displayed by identifying the threatening aircraft with a characterizing symbol in the first display area and by indicating symbolically and by other distinctive visual means, such as contrasting colors, in the first and second display areas the specific flight path to be established or maintained. [A1946]

"Method of processing in a pulse doppler radar"

A method of operating a pulse Doppler radar to increase the probability of detection of an airborne target is shown to consist of transmitting interrogating pulses with a high pulse repetition frequency and processing received signals using any conventional pulse Doppler technique for echo signals having a Doppler shift frequency outside the spectrum of Doppler shift frequencies of clutter and using a DPCA technique at a submultiple of the pulse repetition frequency for echo signals having a Doppler shift frequency within the spectrum of Doppler shift frequencies of clutter. [A1947]

"Radar apparatus for realizing a radio map of a site"

The sensor (1) , of the FM-CW type, comprises a transceiver aerial (2) which is rigidly attached to the support of the sensor and is of the frequency scanned beam steering type. The sensor radiates a frequency F of several GHz according to a sawtooth pattern which is nearly linear, generates a beat signal (F.sub.b) between a transmitted wave and a received wave an comprises an analog processing circuit (17) for the signal F.sub.b, digitizing means for F.sub.b (22) , memories for time-division samples (28) and frequency-division samples (33) , and digital processing means (31) transforming sequences (SU) of time-division samples into sequences (SV) of frequency-division samples. The order number of each sequence is representative of a strip of pixels of the map and the order number of a sample in a sequence is representative of a distance of a pixel on the map. [A1948]

"Airborne surveillance method and system"

An airborne surveillance method and system allows an observer aircraft to determine the position and change of position of a multiplicity of target aircraft and thus allows analysis of collision threats from these aircraft. The system uses a phase comparison direction finding antenna to determine direction of nearby ground based SSRs and all target aircraft of interest. The system further makes use of all other available data including Mode C transponder generated altitude information of the target aircraft, the altitude of the observer aircraft, the received signal strength of both the SSR beam and the received transponder signal, the time difference of arrival between the SSR interrogation signal and the response from the target aircraft, and a variety of other factors to determine the position of the target aircraft. The system compensates for the attitude of the observer aircraft and performs optimal Kalman filtering on the input data set to produce an estimate on target position based upon prior estimates and upon information contained in the data set while making estimates of the error magnitude of each measurement and compensating for these errors. The covariance matrix Q of the Kalman filter is adaptively vaired so as to optimize the estimate of the degree of correlation between various input values. [A1949]

"Dual band communication receiver"

Diclosed is a dual band communication receiver for use in a burst communication sytem. The receiver is capable of esentially simultaneous reception at a first carrier frequency (L) , such as L-band and a higher carrier frequency (H) , such as S-band, using distinct codes and replying in the frequency band received. A typical system is composed of a transponder and an interrogator. The incoming coded signal is down converted to an i.f. frequency compatible with surface acoustic wave (SAW) convolvers. The i.f. signal is then divided between two SAW convolvers, each having a convolution interval of two times the message symbol length (2T) . Reference signals A and B are composite signals comprised of alternate L-band and H-band signals, each having a time period equal to T and each L- or H-band signal operating at a 50% duty cycle. Reference signals A and B are time reversed to the input signals applied to the convolver and are orthogonal to one another. Each of the convolver outputs are processed through log video detection circuits to reduce the dynamic range followed by peak detecting and stretching to reduce the pulse bandwidth. The outputs from each peak detection and stretching circuitry are coupled to a smaple-and-hold circuit which are in turn divided such that one path is to synchronization and interrogation sidelobe suppression (also referred to as sidelobe inhibit, ISLI or control signal) matched filters designed to look for the particular symbol sequences between the two convolver channels characteristic of the preamble and ISLI signals. The synchronization signal and the sidelobe suppression signal are used in order to determine if a valid preamble has been detected by the receiver and if the receiver is in a desired portion of the interrogator radiation pattern, if so, then a timing or address signal and the remaining portion of the message which contains the data is clocked into a memory. [A1950]

"High speed synthetic radar processing system"

A synthetic aperture radar processing system receiving return data from a plurality of transmitted pulses which utilizes frequency alignment for partitioning the received data into patches of data in an orderly sequence, a plurality of patches of data being formed in each of a plurality of range subswaths and being sequentially aligned in range columns. for each subswath, the return data is filtered in patch filters having wide bandwidths and passband overlaps selected so that each patch of data is totally included within a passband. The patch filters are selected for each subswath to provide sequential columns of data. Each patch of data for each subswath is then frequency shifted to an interpolator narrow band filter having a passband selected so that data outside of each patch is eliminated. As a result, the patches of data at the outputs of the interpolators are in the proper sequence for each column to be further processed without the addressing and bookkeeping problems associated with partitioning of data into patches with conventional patch filter banks. [A1951]

"Extraction of radar targets from clutter"

The extraction of radar targets, in particular airplanes or cruise missiles, from clutter is typically based on the target's velocity relative to the ground. Equipment using this principle is usually referred to as a doppler processor or moving target indicator. In situations where severe clutter is encountered, as for example where a look-down radar is trying to find low-flying cruise missiles, extraction of the target solely through its velocity relative to the ground is generally unsatisfactory. A similarly situated human observer looking down can recognize a target both from its motion and the characteristic shape of a fuselage with wings. The principle of this "shape recognition" or "pattern recognition" is here applied to radar by utilizing the so-called radar signature of the target. The conventional small-relative-bandwidth radar which uses signals that are amplitude modulated onto a sinusoidal carrier does not yield enough of a radar signature for this application but the so-called "carrier-free radar" does. Carrier-free radar is also known as "impulse radar", "nonsinusoidal radar", or "large-relative-bandwidth radar". [A1952]

"Detection system for locating aircraft"

A portable detection system, including a receiver tuned to the frequency of signals transmitted by an aircraft transponder, will detect the presence of an aircraft in proximity to the system. The system has signal processing circuitry to transform the received signals to indicate the altitude of the detected aircraft. A display or alarm may alert the user to the presence of an aircraft. The system is useful to determine whether an aircraft may be engaged in a speed detection and ticketing operation or the closeness of other aircraft. The aircraft detection system may be used in conjunction with a radar detection system to provide a means by which various methods of traffic control can be detected. [A1953]

"Angular discrimination process and device for radar"

In a process and device for the angular discrimination of targets by airborne radar, the angular position of a point on the ground is ascertained as a function of the Doppler frequency of an echo signal relating to the point under consideration, as determined by passband filtering the echo signals. The Doppler frequencies are selected by a bank of filters and an angular determination is made by analyzing signals including a signal representing the position in the bank of that filter selecting the Doppler frequency of the echo signal, and a reference frequency subject to closed loop control and representing the true Doppler frequency of the ground. Means are provided for maintaining data relating to the position and the range of the target constant during the process of analysis. [A1954]

"High accuracy coordinate conversion method for air traffic control applications"

A computer method is disclosed for accurately transforming multiple radar observations of aircraft into a common coordinate system for air traffic control applications. The method involves a transformation from radar observables of the target slant range, azimuth and altitude to the target position coordinates in a stereographic system plane for display. The method includes a conformal coordinate conversion process from geodetic to conformal spherical coordinates followed by a conformal stereographic projection process onto a system display plane. The resulting display of aircraft position on the system plane is more accurate than has been available in the prior art. [A1955]

"Leading edge detector/reply quantizer"

An improved Leading Edge Detector/Pulse Quantizer (LED) for use in a pulse code communications system. A prior LED included three shift registers for storing in relative time order, according to the time of reception of video pulse signals by an associated receiver, (a) pulse leading edges, (b) pulse trailing edges and (c) Quantized video (quantized video comprises a pulse having a width equal to the time the received video exceeds a threshold amplitude) . The prior LED further included a plurality of logic means for examining the contents of the three registers to determine whether pulse leading or trailing edges of the received video signal were possibly missing because of interference between received video pulses and for inserting extra leading edges in the leading edge register if such extra leading edges could be logically inferred to be present. The improvement of the invention includes expansions of the functions of the logic means for detecting and inferring the presence of leading edges and trailing edges, improved control means to insure that the logic means operate in proper sequence and improved logic means for deleting signals from the leading edge register when their presence is determined to be illogical. [A1956]

"Beacon fruit filter"

A method and apparatus for prefiltering received target and fruit replies to filter out more obvious occurrences of fruit replies in an air traffic control system. A detector detects reply signals occurring during sweeps of a radar. After each sweep of the radar, the sweep interval is scanned for the occurrences of reply signals. If a received reply is repeated in any of a predetermined number of successive sweep intervals, then standard sequential observer detection is performed on a larger predetermined number of beam sweeps. If, however, the received reply is not repeated in any of the beam sweeps of the first window, then the signal is considered to be a fruit signal and is discarded. [A1957]

"Radar altimeter systems"

An aircraft microwave altimeter system has a threshold detector with two parallel channels that provide two sets of output signals at two different levels of sensitivity. The signals at the higher sensitivity are supplied to a display whereas those at the lower sensitivity are supplied to a navigation system. A comparator indicates a fault in the system if the two sets of output signals differ by more than a predetermined amount. [A1958]

"Method of data reduction in non-coherent side-looking airborne radars"

A method of data reduction in non-coherent SLAR systems enhances the usefulness of such systems in moving target environments. Digitized MT data is processed to identify and classify target footprints. At least some of the footprints are replaced by an indicator of the centroid thereof and its motion. Clutter is rejected. Other footprints are replaced with truncated versions thereof. The technique is suitable for real time application. [A1959]

"Aircraft radar arrangement"

In an aircraft on-board radar arrangement including a search radar and a radar warning receiving system, an additional receiving branch is provided to which are fed foreign radar signals received by the sharply focused transmit/receive antenna of the search radar, with the output of the additional receiving branch being connected to the radar warning receiver. This results in a greater angular resolution and a considerable increase in range, which again leads to a more detailed and early detected of threatening situations. By using already available components and because of the simple configuration of the additional receiving branch, additional costs remain low. [A1960]

"Azimuth processor for SAR system having plurality of interconnected processing modules"

Synthetic aperture radar is a known system for producing a high resolution image of the terrain under a moving platform, in which the effect of a large antenna (which would give high resolution in the direction of travel (azimuth direction)) is synthesized by processing together with suitable phase shifts a large number of radar returns from a smaller antenna for which the footprints overlap. In order to simplify the image processing task, which is preferably carried out at high speed and on the moving platform itself, according to the invention an azimuth processor comprises a plurality of data processing modules 35.sup.1 -35.sup.R/N, each associated with a different part of the (range line) samples of echo returns, for example, by virtue of being connected to successive sections 33.sup.1 -33.sup.R/N of a shift register into which successive range lines are clocked. Each module 35.sup.i includes a memory 39.sup.i to store the sets of range line samples, a processing section 37.sup.i to azimuth process the samples contained in the memory. To accommodate the range migration effect whereby the range of a point on the terrain varies between different echo returns as the platform moves relative to the terrain, adjacent modules are interconnected by links 49.sup.i so that samples required for processing by a module and not contained in its memory may be obtained from another module. [A1961]

"Data compression method and apparatus for radar image formation and like data processing operations"

Synthetic aperture radar (SAR) images are formed by storing in electronic memory possible outputs of a lossy data compressor, f.sub.1,1 [m], f.sub.1,2 [m], . . . f.sub.1,P [m], where f.sub.1,i [m] represents a segment of the unprocessed radar return, by storing range-correlated segments of the SAR data, g.sub.1,1 [m], g.sub.1,2 [m], . . . g.sub.1,P [m], where g.sub.1,i [m] is the range-correlated version of f.sub.1,i [m], by storing all possible outputs of a second lossy data compressor, f.sub.2,1 [n], f.sub.2,2 [n], . . . f.sub.2,Q [n], where f.sub.2,i [n] represents a segment of the range-correlated SAR image, and by storing segments of the range-azimuth focussed SAR image data, g.sub.2,1,m [n],g.sub.2,2,m [n], . . . g.sub.2,Q,m [n], where g.sub.2,i,m [n] represents a segment of the SAR range-azimuth focussed image. Thereafter, a sequence of separate radar pulses are transmitted from an aircraft and the return signal is sampled and placed in an array. Vectors of the array are compared with segments f.sub.1,i [m], and the indices of the segments which most closely match the vectors are stored in an array. An intermediate image is formed by adding together segments, g.sub.1,i [m] whose indices match those in the array, while maintaining a predetermined offset. Vectors of this intermediate image are compared with segments f.sub.2,i [n] and the indices of these segments which most closely match the intermediate range vectors are stored in a second array. The final image is formed by adding together segments, g.sub.2,i,m [n], whose indices match those in the second array, while maintaining a predetermined offset between each segment during the addition. [A1962]

"Communications system"

A communication system particularly adapted for use in an aircraft collision avoidance system wherein the transmitted portions of messages changed between aircraft consist of pulses or pairs of pulses at the beginning and end of a message. The data or information content of a message is defined by the time duration between start and end pulses, an interval during which the sender's transmitter is off. Thus the media is clear for other aircraft to use during the major portion of any message, thereby greatly increasing the number of aircraft which can be accommodated by the system without overloading the communication medium. The system provides for determining the presence of other aircraft in the near vicinity which may be a collision threat and for sending intent messages to threat aircraft to assist in collision avoidance. [A1963]

"Excessive ground-closure rate alarm system for aircraft"

An alarm means including a digital microcomputer having a memory programmed for storing a look-up table defining an alarm envlope which, above a predetermined altitude, is based on a relationship between altitude and ground-closure rate which is independent of ground velocity, and below said predetermined altitude, is based on a relationship between altitude and ground-closure rate which is dependent on ground velocity. [A1964]

"Signal processor for synthetic aperture radar, particularly for parallel computation"

This invention concerns a synthetic aperture radar system within which focussing processing is achieved through the use of filter banks, based upon undersampling and polyphase networks. The focussing operation consists of the correlation of the datum with system response to a point scatterer. [A1965]

"Method for radar mapping an area and a radar equipment to carry out the method"

The invention relates to a method for radar mapping an area and a radar equipment for wideband exploration at frequencies below 300 MHz. A large number of frequencies, for instance 1000, are distributed over a frequency band between for instance 12.5 and 200 MHz, and approximately corresponding to terms in a geometrical series but being different harmonics to a certain fundamental frequency. This is accomplished by a synthesis generator (1) coupled to a phase control device (7) and the generated frequencies are each amplified in a separate amplifier (2) , the outputs of which are guided in groups to a number of antennas, tuned to different frequency bands and fewer than the number of frequencies. The reception is carried out in a similar way from the antennas with pre-amplifiers and a mixer (3) each and an A/D-converter (4) and a registration device (5) . The equipment is meant to use the principle of so called synthetic aperture (SAR) . [A1966]

"Processor for discriminating between ground and moving targets"

A processor adapted for use in conjunction with a monopulse radar system for discriminating between ground and airborne moving targets and comprising: Doppler filter circuits for detecting moving targets, angle measurement circuits which respond to the received sum and elevation difference signals so as to provide an indication of the relative angle of each moving target and of the ground, and means for identifying a detected target as a ground or an airborne target as a function of whether the angle of the target is substantially the same as or different from that of the ground. [A1967]

"Microwave proximity sensor"

The invention relates to a type of proximity sensor. In one form, two sinusoidal signals travel along two transmission lines near an object. When the distance between one or both of the lines and the object changes, the speed of travel of one or both of the signals changes. There is a correlation between the speed change and the distance, thus allowing one to infer distance from speed change. One way to measure the speed change is to measure the phase relationship between the two signals. [A1968]

"Communication adaptive multi-sensor system"

A multi-sensor system adaptively utilizes communications or data bus facilities for multi-sensor signal fusion. for each source of sensor signals, a local signal processor compares each signal against a pre-determined set of hypotheses, and generates a ranking value corresponding to each hypothesis. An adaptive interface unit then selects the highest ranking values and transmits them, together with an identification of the hypothesis to which they correspond, through the multi-sensor system communication network or data bus, to the system signal processor. The system signal processor then multiplies the ranking from the various sensors, or adds their logarithms and selects the hypothesis whose product (or logarithmic sum) is greatest. This provides for transmission of the highest ranking hypothesis, or of a selection of hypotheses, to identify the target detected by multiple snsors. [A1969]

"TCAS bearing estimation receiver using a 4 element antenna"

A direction finding receiving system for use on a protected aircraft in which a signal from an ATCRABS transponder on an intruder aircraft is received has been described incorporating a four element interferometer type antenna array, reversing switches, individual receivers, a phase detector and a processor for processing the outputs of the phase detector. The invention overcomes the problem of correcting for the difference in phase delay of signals passing through the receivers. [A1970]

"Method of target imaging and identification"

A method of high resolution imaging and identifying of targets with an Inverse Synthetic Aperture RADAR (ISAR) coupled with Adaptive Beam Forming (ABF) is disclosed. The ISAR system utilizes a pulsed RADAR transmitter and a highly thinned, dispersed phased array with random, non-colinear elements. An adaptive processor and feedback loop performs the ABF process such that high resolution of a moving target is possible. The high resolution signal allows accurate imaging and identification of the moving target. [A1971]

"Device to measure the relative position and attitude of two bodies"

A method of determining the position and attitude of a first body, e.g. a body movable in six degrees of freedom, with respect to a second body comprising establishing three or more reference points which are not colinear on the first body, establishing three or more reference points which are not colinear on the second body and measuring at least six of the distances or angles between the reference points on the two bodies to determine the relative position and attitude of the two bodies. [A1972]

"Indicating system for warning airspace or threatening aircraft in aircraft collision avoidance system"

The present invention relates to a indicating system for warning airspace or threatening aircraft in aircraft collision avoidance system which provides simply and inexpensively information required for safe cruising of aircraft with respect to range of warning airspace of aircraft, positions of other aircraft involving threatening of collision, and flight courses of proximate said other aircraft involving threatening of collision. The present system can provide simply and inexpensively information indispensable for safe cruising of aircraft with respect to range of warning airspace of aircraft, positions of other aircraft involving threatening of collision, and flight courses of proximate said other aircraft involving threatening of collision by such manner that the warning airspace is changed into a required shape in response to speed of a subject aircraft, and indication range for the threatening aircraft is changed in response to angle of climb or descent of the subject aircraft, besides detected data of distances and bearings with respect to the other aircraft are indicated by a prescribed afterglow time. [A1973]

"Method for cancelling azimuth ambiguity in a SAR receiver"

A method for cancelling azimuth, i.e., doppler ambiguity, in a SAR receiver on board a moving craft, e.g., an aircraft, which permits a lower PRF, without causing range ambiguity. Radar returns are received on board the craft with an antenna having first and second apertures to produce corresponding first and second return signals. The first return signal is processed over a given time period to generate a first series of component SAR signals representing radar returns from respective cells of an azimuth-range grid. The second return signal is processed over the given time period to generate a second series of component SAR signals representing radar returns from the respective cells of the azimuth-range grid. The component signals, individually weighted, are additively combined to produce a third series of resultant SAR signals representing the radar returns from the respective cells of the azimuty-range grid. The weighted additive combination of the component signals resolves azimuth ambiguity, even though the PRF is less than the minimum PRF prescribed by conventional wisdom. [A1974]

"Decorrelation tolerant coherent radar altimeter"

A pulsed coherent radar altimeter is described which employs a narrow band receiver and utilizes a novel digital coherent pulse generator. A coherent pulse radar transmits a pulse comprised of the sum of at least two phase related RF signals closely spaced in frequency. The phase shift due to platform motion and return surface irregularity of the return signal is approximately the same for each carrier. The receiver produces a signal representative of the difference of the two carriers which is substantially free of decorrelation effects, and which can be processed in a narrow band receiver to produce range information. [A1975]

"Frequency agile synthetic aperture radar"

A radar transmission, reception and signal processing system generates high esolution synthetic aperture radar ground maps from air or space platforms using waveforms in which frequency is changed pulse-to-pulse. The transmitted radar signal is comprised of a series N bursts with n pulses per burst wherein each of the pulses is a fixed frequency step, .DELTA.f, either above or below one or the other of the n pulses, i.e. the n pulses comprises an ordered set and further, preferably, wherein the set of n pulses is arranged in time as a random permutation of the ordered set. In each of the k sample gates for each burst the n complex samples of reflectivity are inverse Fourier transformed from frequency domain samples of reflectivity to synthetic range domain profiles to result in an array of aligned range profiles in each of k coarse range delay positions. Azimuth or cross-range processing is accomplished by convolving complex range data appearing in each synthetic range cell with a suitable azimuth reference to result in a set of complex numbers that represent complex reflectivity maps of the earth's surface in that coarse range bin. "Zoom" capability is achieved by discrete Fourier transforming the data in each synthetic range cell of the selected delay. "Zoom" is achieved by increasing the target dwell time and simultaneously increasing the radar signal bandwidth. In both the spotlight "zoom" mode and the SAR mode, the processed data is converted from complex numbers to absolute magnitudes before display. [A1976]

"Distributed-array radar system comprising an array of interconnected elementary satellites"

A radar system for primary and secondary airspace surveillance, and especially for the detection and tracking of moving targets, consisting of a number of elementary satellites connected to nonrigid structures and of a main satellite, which performs accurate measurement of the position and altitude of elementary satellites and real-time adaptive combination of radar signals coming from them, so as to provide a large-phased array operating in the microwave band. This system overcomes the limitations on dimensioned large space-bound antennae found in the literature, minimizing the incidence and effects of undesired echoes and interference and assuring high detection accuracy. The fact that the elementary satellites are all the same (modular) makes possible gradual assembly of the system with possible expansion in time and assures particularly high operating availability. [A1977]

"Trihedral radar reflector"

A new type of passive trihedral corner reflector is described which rotates the polarization of a reflected microwave beam by 90.degree. and thereby permits a reflected radar beam to be more easily distinguished by the interrogating radar system from the random reflections from nearby objects, i.e., clutter. Rotation of the incident beam is provided by locating a passive polarizing or "twist" grid of closely spaced thin parallel wires spaced above one conducting surface by air or by a dielectric to give an electric spacing from the surface of about 0.25 .lambda.. The spacing of the wires is less than 0.25 .lambda. so that the wires constitute a reflecting surface for signals polarized parallel to the wires. The reflector can have triangular or square sides which are mutually orthogonal. In a preferred embodiment the reflector is tipped forward by 35.degree. from a reference horizontal plane and tilted clockwise in a vertical reference plane by 15.degree. to optimize reflections. The reflector has particular application to navigation systems, especially to maritime navigation systems. [A1978]

"Position determination and message transfer system employing satellites and stored terrain map"

A radio position determination and message transfer system is implemented using a pair of satellites in geostationary orbit for relaying interrogation and reply signals between a ground station and a user-carried transceiver. The user position is calculated based on the arrival times of reply signals received at the ground station via the two satellites, the known transmission time of the interrogation signal from the ground station, and the user's elevation on the surface of the earth. The elevation is derived from a stored terrain map providing local terrain elevations at a plurality of points on the earth's surface. The stored terrain map allows accurate position fixes to be obtained for surface users regardless of the deviation of the local terrain from the spherical or ellipsoidal model of the earth's surface. [A1979]

"Expert system for air traffic control and controller training"

A expert system form of artificial intelligence for control of air traffic which may also be utilized for air traffic controller training. The expert system receives input data representing the altitude and heading of all aircraft in the control area. The aircraft data is compared with the data of the other aircraft. Sequencing and local flow control is optimized and if a potential conflict arises between two aircraft, clearances are transmitted to the aircraft to resolve the conflict. The aircraft data is also compared with a knowledge base of air traffic control rules for the particular airport involved. An inference engine written in LISP (or another AI language) allows real time access to the knowledge base. The position and heading of each aircraft is monitored and controlled until turned over to the tower for final approach. The expert system may also be used for air traffic controller training and be used as a intelligent tutor. The air traffic controller trainee's clearances are input and compared to those generated by the system. If the trainee's clearances are in error, or can be improved, the expert system prompts the trainee and coaches him in a way so that he learns from his past errors. [A1980]

"N-Dimensional information display method for air traffic control"

Critical differences in the position and motion of aircraft in congested N-dimensional airspace are highly discernible when processed and mapped onto a parallel N-coordinate plane. Trajectory intersection in both time and space may be constantly monitored. The airspace may be accurately controlled by descriptively and prescriptively configuring proposed trajectories and monitoring critical differences before assignment to aircraft. Attributes such as angular deviation, in addition to closing speed and distance, can be evaluated. [A1981]

"Method of correcting navigation system errors caused by drift"

In a two way ranging system of the type employing pseudonoise spread spectrum codes there is provided a method for correcting the navigational system of one of two moving stations in space to compensate for relative drift. The point positions of the two stations are calculated by the on-board navigation systems of the individual stations at a first and subsequently at a second position after relative movement. The range from station 1 to station 2 is calculated employing the highly accurate pseudonoise communications ranging systems. The range uncertainty of the range calculation and the trigonmetric relation of the two calculated ranges and the include angle between the line of sight of the range directions is employed to calculate a range of uncertainty parallelogram more accurate that the navigation systems. When a station's point position is indicated by its navigation system to be outside the parallelogram, the navigation system is corrected to compensate for relative drift. [A1982]

"Closed loop velocity/altitude sensor for FM-CW doppler radars"

A Doppler navigation system includes an altimeter section with increased accuracy resulting from closed loop operation of signal processing portions for reflected signals including phase shift information. Quadrature processing of the reflected signal includes compensation for differences between quadrature processing channels, wherein the reflected signals are periodically processed by alternate ones of the channels. A maximum amplitude signal is forwarded by the signal processing portions to a frequency tracker of the navigation system. Periodic calibration of the altimeter section corrects for delays introduced in the signal processing portions. Effects of FM to AM conversion in a Gunn oscillator are reduced by connection of the signal processing portions to a short circuit during the calibration periods. [A1983]

"Radar-optical transponding system"

An airport landing system includes an airborne transmitter and receiver for transmitting RF energy at a first frequency and receiving RF energy at a second frequency. A stationary RF energy focusing means for focusing received RF energy. At least four receive/transmit modules and at least one RF source module. The RF source module for amplitude modulating and amplifying the received RF energy for retransmission by the receive/transmit modules. The receive/transmit modules having RF energy collector horns physically arranged with at least two vertically disposed horns and two horizontally disposed horns for transmitting at least four relatively high gain powered beams whose patterns cross over at their half power points with the crossover point defining the approach path. [A1984]

"Airborne stereoscopic imaging system"

The imaging system includes widely-spaced sensors on an airborne vehicle providing a base-line distance of from about five to about 65 meters between the sensors. The sensors view an object in adjacent air space at distances of from about 0.3 to 20 kilometers. The sensors may be video cameras or radar, sonar infrared or laser transponders. Two separate images of the object are viewed by the spaced sensors and signals representing each image are transmitted to a stereo display so that a pilot/observer in the aircraft has increased depth perception of the object. In effect the interpupillary distance of the human viewer is increased from the normal 5.9-7.5 cm to from about 5 to about 65 meters resulting in depth perception of objects at a distance of from about 0.3 km to 20 km or more. [A1985]

"High-speed data compressor/decompressor for synthetic aperture radar"

Apparatus is provided for compressing unfocused synthetic aperture radar (SAR) phase history pixel data by coupling the complex inphase phase history data output from the SAR to a first converter/compressor which produces compressed scalar log amplitude data and scalar phase pixel data. The output from the first converter/compressor is applied to a series to parallel converting means for converting plural scaler pixel data into vector data representative of a plurality of pixels. The output of the series to parallel conversion means is coupled to a second converter/compressor for converting the plural scalar pixel data into compressed encoded data representative of a plurality of pixels of unfocused SAR phase history data which is transmitted as compressed unfocused phase history data. [A1986]

"Static-split tracking radar systems"

A static-split tracking radar system with substantially improved performance. The system includes parallel signal processing channels for processing sum and difference signals from a target-seeking aerial array, to produce target tracking signals. Novel means are provided for trimming relative phase and gain of these channels to achieve substantially perfect matching, which gives a receiver stability sufficient for homing head use in a guided missile system. The system also includes a receiver for acquiring a reference frequency signal, the receiver having novel bandwidth adaptation and doppler tracking facilities. Other novel features provide improved clutter rejection and jamming immunity. [A1987]

"Method of motion compensation in synthetic aperture radar target imaging and a system for performing the method"

When determining the detailed radar reflection cross-section of a radar target by ISAR techniques it is a known problem that one of the target motion components is to be compensated. This was done in the past by complicated numerical calculations of the path of the target. According to the described method, the motion compensation is determined by means of an auxiliary signal which is transmitted form the target. The described method enables the achievement of a radar reflection cross-section by real time data processing of the signals received. Also an apparatus for performing the method is described. [A1988]

"Method and apparatus for passive airborne collision avoidance and navigation"

A passive method for an aircraft to use its on-board locating apparatus to monitor interrogation signals and ISLS signals transmitted by at least one secondary surveillance radar, and coded reply signals transmitted by at least one fixed ground transponder, to match said transponder reply signals with said ISLS signals, in order to associate said transponder reply signals with interrogations from said radar, to repetitiously compute said aircraft's instantaneous position in space, said computations being based on hyperbolic and linear functions related to said aircraft, said radar, and said associated fixed transponder, and to display said positions for navigational purposes. Furthermore, having said computations, said passive method uses said locating apparatus to monitor coded reply signals from transponders of other aircraft, to match said other-aircraft reply signals with said ISLS signals to determine which other-aircraft transponder reply signals are associated with interrogations from said radar, to repetitiously compute the instantaneous positions of other aircraft in space, said computations being based on elliptic and linear functions related to said locating apparatus' own aircraft, said other aircraft, and said radar, and to display said positions for collision-avoidance purposes. [A1989]

"Method of, and apparatus for, area and air space surveillance"

The proposed surveillance system for surveilling a given scenario in azimuth and in elevation comprises an infrared surveillance detection device passively operating in the infrared region and a radar search and/or tracking device operating in the active mode for range determination. The targets or target information data are obtained as video signals from the infrared surveillance detection device during each search cycle and are processed in an infrared data processor. The video signals are discriminated and stored in an infrared signal processor with respect to their elevation angle values (.lambda.) and azimuth angle values (.alpha.) . The values of the azimuth angle (.alpha.) are simultaneously fed to a radar activation and contol unit for triggering a momentary or short-time emission by the radar search and/or tracking device. Genuine target coordinates with respect to elevation, azimuth and range as determined by the infrared surveillance detection device and the radar search and/or tracking device are fed to a superordinate fire control system while false alarms or false-target related data are suppressed in order to prevent further radar emission in the direction of such target objects. [A1990]

"Sar image encoding for data compression"

A technique is disclosed for encoding SAR image data to achieve data compression. In the image encoding stage, the SAR image is transformed into a list of high reflectivity radar discretes and a small array of frequency filters. In the target list, the location data and intensity levels above the local average background clutter are tabulated for a predetermined number of the highest intensity radar discretes. The array of frequency filters is divided into three zones, the inner, middle, and higher frequency zones relative to the d.c. filter. Only the inner and middle zones of filters are retained and the outer filters are discarded, thus acheiving the desired data reduction. The inner zone filters are quantized to a higher level of precision than the middle zone of filters. The saturation levels of the filters are determined adaptively. In the decoding stage, the original SAR image is reconstructed from the radar discrete list and the small array of frequency filters. [A1991]

"Systems for receiving messages transmitted by pulse position modulation (PPM)"

The present invention relates to remote control or trajectory calculation systems for missiles for example, and in particular to a message receiving device which may be mounted on the missle itself. The receiver of the invention comprises means for receiving the j sequences of the message, means for shifting each sequence by a time .DELTA.t.sub.j, means for confirming that the sequences of 1's are indeed associated with sequences of 0's, means for reading the word formed of the j sequences, j being an appropriately chosen integer. The invention applies to radar responder and any transmission carriers. [A1992]

"Collision avoidance system"

A position-finding collision avoidance system (CAS) at an Own station within the service areas of at least two identified SSRs at known locations derives differential azimuth (A) , differential time of arrival (T) , identity and altitude data regarding one or more transponder-equipped Other station from standard ATCRBS interrogations and replies. These data are used to compute the positions of Own and Other stations for display at the Own station. [A1993]

"Apparatus for the detection and destruction of incoming objects"

Detection apparatus which is sensitive both to radiation and to the proximity of the radiation source, as well as destruction apparatus embodying detection apparatus. [A1994]

"Microwave rendezvous system for aerial refueling"

A microwave rendezvous system for use on a tanker aircraft for aerial refueling of a receiver aircraft. The tanker providing a larger rendezvous envelope in space between the tanker and receiver aircraft thereby requiring less tedious navigation and attention during a refueling operation. [A1995]

"Arrangement for measuring the distance separating the arrangement from a moving body"

A distance-measuring arrangement including transmission means for transmitting a wave in a measuring field, receiving means for receiving the wave reflected from a moving body moving in the measuring field and for producing a beat signal from the Doppler frequency. Delimiting means is provided for forming, in the measuring field, at least two datum lines (Ca and Cb) and processing means is provided for processing the distance information obtained from measuring the Doppler frequencies at the instants when the moving body crosses the datum lines. The delimiting means are formed from thermal detectors disposed in an optical assembly having at least two optical axes for defining the datum lines. A timing circuit is provided for defining the instants at which the moving body crosses the datum lines and for applying this information to the processing means. [A1996]

"Pulse discriminating system for reply signals in a transponder"

A pulse discriminating system for reply signals and the like in transponders which may independently and correctly discriminate respective pulse trains in the case where a plurality of reply signals are overlapping with respect to time in the transponders. The pulse discriminating system for reply signals and the like in transponders according to the present invention is operated by controlling the gate circuits thereof under a predetermined condition. [A1997]

"Apparatus and method for adjusting set clearance altitude in a terrain following radar system"

An apparatus and method for adjusting set clearance altitude of an aircraft to control the aircraft to fly along a predetermined path relative to the terrain below. A terrain following radar system and a stored terrain elevation data base are used to determine the respective positions and elevations of selected portions of the terrain downrange from the aircraft. This information is used along with pre-stored information relating to the ability of a ground threat to detect the aircraft and the roughness of the terrain to compute three different altitudes. The first altitude (Ia) represents the maximum height at which the aircraft can fly without being detected by the ground threat. The second altitude (Da) represents the maximum desired altitude of the aircraft at any time during a flight. The third altitude (Ra) represents the minimum altitude at which the aircraft is allowed to fly. The set clearance altitude is determined for each of the selected positions on the terrain by first comparing Ia and Da and taking the lesser altitude as between the two. The lesser altitude is then compared with Ra and the greater of those two values is selected as the set clearance altitude. Set clearance altitude is one of the variables used to determine the desired vertical flight vector angle of the aircraft to control the aircraft to fly along a path corresponding to the respective set clearance altitudes above the terrain. [A1998]

"Identification of ground targets in airborne surveillance radar returns"

A method and apparatus are described for use during testing of air-borne ground surveillance radar installations to provide positive identification of targets and other ground features in the recorded or displayed radar returns. The apparatus includes a first imaging system, such as a film camera (6) , arranged to film an area (3) on the ground ahead of the aircraft (1) which is also surveyed by the surveillance radar (2) , a second imaging system, such as another film camera (7) , arranged to film an area on the ground directly below the aircraft and a synchronisation unit (9) operating in dependence of the aircraft's ground speed (V) and either marking or labelling the films and the radar returns or controlling the timing of operations of the camera (6 and 7) and a radar return recorder (4) so that images produced by the second camera (7) are correlated with the image and the radar return stored and recorded by the camera (6) and recorder (4) respectively to facilitate analysis of test data relating to the performance of the radar installation. [A1999]

"Method of reconstructing images from synthetic aperture radar's data"

A method of reconstructing original images from synthetic aperture radar image data, wherein in order to speed up the reconstruction of an original image from image data provided by synthetic aperture radar (SAR) , the process for generating a point image pattern in correspondence to each point on the original image and the fast Fourier transformation (FFT) process for the generated point image pattern and 1-line image data are carried out once for every certain number of lines. Positional and phase displacement created on a reconstructed image are corrected by multiplying a phase rotation factor to the product of the FFT-processed point image pattern and 1-line image data. [A2000]

"Method and apparatus for measuring distance"

A signal is transmitted from a first location to a remote second location where a target carrying a transponder is positioned. The transponder re-radiates the signal to the first location where it is received. A phase comparator generates from the transmitted and received signals a measurement of their phase difference which is functionally related to the distance between the first and second locations. In one embodiment, the transponder is a passive parametric oscillator, being powered by energy received from the transmitted signal, which generates and transmits a subharmonic of the transmitted signal. [A2001]

"Tracking radar systems"

A missile guidance system having means for deriving from a target angle tracking loop a signal indicative of an apparent movement of a target off a missile-to-target sight line caused by a change in missile attitude, and means for feeding said apparent movement signal into a space stabilization loop to adjust the position of the aerial to compensate for said apparent movement. [A2002]

"Apparatus and methods for locating a target utilizing signals generated from a non-cooperative source"

The positions of a non-cooperative emitter (illuminator) and reflector (target) relative to a receiver of electromagnetic energy, which neither directly nor indirectly controls the illuminator, is determined utilizing emissions received directly from the illuminator as well as reflected emissions from the target. A range R.sub.I between the receiver and the non-cooperative illuminator is determined by measuring the time difference between receiving the reflected signals at a pair of interferometer antennas located at the wing tips of a receiver aircraft. Calculation of the location of the target is accomplished by utilizing range R.sub.I, as well as a time differential .DELTA.t between the receipt of the reflected signals at the interferometer antennas and the receipt of a corresponding direct signals at a radar antenna located at the aircraft. In the event there is clutter in the reflected signal which hinders the determination of the time differential .DELTA.t, clutter processing is performed utilizing the direct signals as a coherent reference and by cross-correlating the direct and reflected signals. The determination of the bearing of the target and the illuminator relative to the receiver is accomplished by an amplitude comparison of the signals received at multiple ports of a multiple beamed phased array radar antenna. The bearing information together with the range and time differential is processed to provide the necessary commands for generating a visual display of the positions of target and illuminator relative to the receiver. [A2003]

"Method of and device for removing range ambiguity in a pulse-doppler radar and radar including such a device"

This invention relates to a method of and a device for removing range ambiguity in a pulse Doppler radar and to a radar including such a device especially for missile guidance. On tracking operation at a high pulse repetition frequency the method consists in switching the repetition frequency f.sub.R (k) for each time interval .DELTA.t, over a new value f.sub.R (k+1) obtained in a circuit from the measured ambiguous range y (k) and from the ambiguity number n (k) , as estimated in a circuit from radar information supplied by the radar, in order to remove eclipsing, to maintain the ambiguity number constant and to estimate the range with a growing accuracy in the course of the tracking operation. [A2004]

"Frequency modulation radio altimeter"

A frequency modulation radio altimeter has a directional antenna which is connected to a transmission-reception switch controlled by a signal generator. The generator delivers periodic signals whose recurrence period is proportional to the delay time of the ground echo. The transmitter includes a radio frequency modulator modulated in frequency by a saw tooth signal whose recurrence period is proportional to the delay time of the ground echo. A homodyne receiver includes circuits for acquiring and tracking the ground echo signal, and supplies an output signal representative of the altitude and a control signal which is supplied to the inputs controlling the recurrence period of the transmission modulator and of the generator controlling the transmission-reception switch. [A2005]

"Scaler scoring system"

A radar transceiver and communications transmitter mounted on a target for communicating video signals from the radar to a remote receiver which has associated therewith an FFT detector for detecting scoring encounters, and a computer or microprocessor which first analyzes the video signals to provide signals indicative of the Doppler frequency shift at a plurality of different times through the use of autoregressive spectral estimation and then computes a model projectile flight pattern, including miss distance and closing velocity, which flight pattern fits the computed Doppler frequency shifts at the plurality of different times. [A2006]

"Helicopter obstacle detector"

A pulsed Doppler radar mounted adjacent to the tip of a helicopter rotor blade for sensing obstacles in the helicopter path. The rotor tip velocity shifts the frequency of radar echos so that, through pulsed Doppler radar techniques, the echos from obstacles can be separated from clutter. [A2007]

"Radar altimeter"

A Radar Altimeter signal presence circuit which provides improved useable system sensitivity for a given false track probability by providing an improved method for detecting the adequacy of the return signal. This return signal is composed of many small, rapidly changing reflections that vary between additive and substractive combination giving the net return the characteristic of noise. A non-linear detector is used to enhance the signal presence detectors sensitivity to weak but adequate returns while (1) reducing the ability of short periods of strong returns to cause a positive signal presence indication when the overall signal is inadequate, and (2) retaining a high sensitivity to periods of signal fades that produce measurement errors. This is accomplished by using a non-linear detector that reduces the effect of strong returns when the many small reflections tend to combine additively, and increases the effect of weak returns when the many small reflections tend to combine subtractively. [A2008]

"Signal acquisition circuit with variable bandwidth phase locked loop"

A signal acquisition circuit for a missile guidance system has a phase lock loop which is responsive to incoming signals received from a target and will lock on to the frequency of the received signal. The bandwidth of the phase lock loop is altered in dependence on the signal being received in order to distinguish between a valid target and noise. [A2009]

"Synthetic aperture radar focusing"

An extended depth-of-focus synthetic aperture radar (SAR) system (13) mounted on a moving platform, including a controller (120) , pulse timer (83) , synthesizer (105) and modulator (17) for varying the pulse rate interval (PRI) and/or the radar carrier frequency of radar pulses produced, in order to establish a radar return which, when conventionally processed, results in a SAR terrain map exhibiting extended depth-of-focus under conditions of platform acceleration. Depth of focus is established by ensuring the establishment of two or three separate, independently selected focal points in a target region of interest. [A2010]

"Extended SAR imaging capability for ship classification"

Capability is provided using coherent synthetic aperture radar (SAR) techniques for substantially extending the useful range for producing 3 scaled high resolution orthogonal image projections on a CRT of a translating ship under the influence of rotational motions arising from sea state conditions, for the purpose of ship classification and weapon delivery from an airborne platform at long stand-off ranges. This advantage is brought about by determining image coordinates on the basis of range, doppler, and doppler rate measurements of individual scatterers and from ship angular rotational velocities derived from a weighted multivariate regression solution to doppler processed interferometric azimuth and elevation angle measurements of all significant ship target scatterers. In this manner, the image degradation suffered by plotting angular measurements directly, whose location accuracies are known to deteriorate rapidly with increased range due to high signal-to-noise requirements, is circumvented. [A2011]

"Process and device for passive detection of aircraft, namely helicopters"

A process and device for passive detection of helicopters includes detection of helicopter noise and ambient noise by means of an electro-acoustic transducer, and outputting of an amplitude modulated signal therefrom, amplitude demodulation of the signal in the frequency band between 300 Hz and 3500 Hz, spectral analysis of the demodulated signal, and selection and registration of characteristic frequency lines reflective of the rotary units of the helicopter. The process and device permit passive detection of helicopters in the lower noise, higher frequency band, thereby also permitting utilization of smaller antenna arrays. [A2012]

"Microwave receiver making deviation measurements more especially in combination with a secondary airborne radar and a secondary radar containing it"

A microwave deviation measurement receiver particularly applicable to airborne secondary radars making deviation measurements with two logarithmic amplifiers which increase the reliability of deviation measurements for targets close to the direction of aim of the radar. A programmable phase shifter preferably is controlled to compensate for aircraft movements by shifting the phase of the sum or control signal. [A2013]

"High resolution imaging doppler interferometer"

A system for simultaneously locating a plurality of targets and distinguishing the targets from noise which utilizes phase detector techniques to generate complex voltage signals and obtain phase information. Spectral analysis is performed on the complex voltage temporal functions to generate doppler frequency functions. Both spectral phase functions and spectral amplitude functions are generated from the doppler frequency functions. Spectral phase functions are analyzed using interferometry techniques to determine if a potential target has a common locational source from returns of a plurality of sensors. A zenith angle is also generated using interferometry techniques to provide locational information of the multiple targets. Range gating and two frequency range detection methods provide high resolution range information as to the location of the targets. High resolution range information and two dimensional zenith angle information are used to provide an image of the targets. The present invention uses a two-frequency pulse which can be generated simultaneously or sequenced within a pulse in a manner which is phase coherent. The two-frequency pulse eliminates problems associated with range aliasing, zenith angle aliasing, scattering point analysis and allows for range location with high resolution. An error correction factor is also generated which eliminates spectral smearing. [A2014]

"Radar altimeter static accuracy circuit"

A Radar Altimeter static accuracy circuit which provides improved system accuracy when the altimeter platform is stationary over the ground. Most often this stationary condition occurs in helicopters while hovering at low altitudes but also occurs, for example, in altimeters used to measure the level of grain in elevators. The altimeters output, a voltage proportional to altitude, is used to control a voltage controlled oscillator (VCO) , the output of which is summed into the receiver intermediate frequency (IF) amplifier output to fill in the return signal fades. These fades otherwise cause altitude processor errors leading to erroneous altitude measurements. The VCO is adjusted to produce an output frequency equal to the IF amplifier output frequency. [A2015]

"Binaural doppler collision alert system for general aviation aircraft"

An aircraft collision avoidance system is disclosed which presents target or threat information to a pilot using a pair of doppler radar transceiver systems directed orthogonally about and centered on the user aircraft's pitch plane to produce binaural audio tones that by their amplitude, frequency and phase difference allow the user pilot to visualize the location and closing rate of a potential target or threat, aurally, while maintaining an effective visual traffic scan. [A2016]

"Aircraft collision avoidance system"

A communication system particularly adapted for use in an aircraft collision avoidance system wherein the transmitted portions of messages exchanged between aircraft consist of pulses or pairs of pulses at the beginning and end of a message. The data or information content of a message is defined by the time duration between start and end pulses, an interval during which the sender's transmitter is off. Thus the media is clear for other aircraft to use during the major portion of any message, thereby greatly increasing the number of aircraft which can be accommodated by the system without overloading the communication medium. The system provides for determining the presence of other aircraft in the near vicinity which may be a collision threat and for sending intent messages to threat aircraft to assist in collision avoidance. [A2017]

"Synthetic aperture radar focusing"

An extended depth-of-focus synthetic aperture radar (SAR) system (13) mounted on a moving platform, including a controller (120) , pulse timer (83) , synthesizer (105) and modulator (17) for varying the pulse rate interval (PRI) and/or the radar carrier frequency of radar pulses produced, in order to establish a radar return which, when conventionally processed, results in a SAR terrain map exhibiting extended depth-of-focus under conditions of platform acceleration. Depth of focus is established by ensuring the establishment of two or three separate, independently selected focal points in a target region of interest. [A2018]

"Synthetic aperture radar focusing"

An extended depth-of-focus synthetic aperture radar (SAR) system (13) mounted on a moving platform, including a controller (120) , pulse timer (83) , synthesizer (105) and modulator (17) for varying the pulse rate interval (PRI) and/or the radar carrier frequency of radar pulses produced, in order to establish a radar return which, when conventionally processed, results in a SAR terrain map exhibiting extended depth-of-focus under conditions of platform acceleration. Depth of focus is established by ensuring the establishment of two or three separate, independently selected focal points in a target region of interest. [A2019]

"Dual mode target seeking system"

A dual mode target seeking system for airborne vehicles which operates under two different frequencies simultaneously includes a radio frequency antenna comprising a slotted plate defining a ground plane with an image plate positioned in front of the ground plane at a distance chosen such that multiple reflected rays are in phase with each other and with waves incident on the image plate. The slotted plate and image plate have aligned central openings through which an electro-optical system for operating under a chosen electro-optical frequency range, for example under infrared frequencies, projects. The electro-optical system includes a detector unit positioned behind the antenna and a focussing system for directing incoming electro-optical radiation into the detector unit. The focussing system includes first and second lenses mounted in the openings in the image plate and slotted plate, respectively. The lenses each transmit radiation in the chosen electro-optical frequency range while at least partially reflecting radio frequency radiation. [A2020]

"Ground speed determining radar system"

A ground speed determining radar system for take off roll and landings and roll out maneuvers has a ground based modulating radar reflector and a carrier based radar. The radar transmits microwave energy to the reflector where it is modulated by rotating spaced reflectors and returned to the radar receiver. The receiver is a heterodyne receiver having a log IF stage and a fast time control (FTC) circuit for attenuating clutter and an acquisition loop circuit, lock-on circuit and tracking loop circuit. The acquisition loop circuit includes a center, gate, modulation bandpass filter, switch, acquisition sweep generator and gate generator, the lock-on circuit adds a delay line and a good data indicator to the loop acquisition circuit, and the track loop circuit includes early/late gates, early/late gate low pass filters, subtractor, integrator, the switch and gate generator. Prior to acquisition or upon loss of lock-on, the modulation band pass filter has zero output to the switch and the switch switches in the acquisition sweep generator and a ramp voltage is applied to the early/late gates. During the time the early/late gates are swept over the desired modulated frequency from the ground reflector the modulated band pass filter outputs a signal to the switch which switches in the integrator of the tracking loop. The lock-on circuit's delay means delays the modulation band pass output a time sufficient for the integrator to settle down and spurious noise to the disappear before activiting the data indicator. At times, the early/late gates are not centered on an echo return, thus more echo energy is in one (late) gate than in the other (early gate) , for example. The subtractor outputs the difference to the integrator which output a dc voltage proportional to the range to the reflector. A differentiator and range indicator and the switch are connected to the integrator for receiving its dc output and, respectively, outputting velocity and range information and feed back to center the early/late gates on the echo. [A2021]

"Radar guidance system"

Improved radar guidance system for the navigation apparatus of an aircraft s it flies over substantially flat terrain with random and different features. The system is generally made up of an airborne radar altimeter, a video signal processor and a master processor. The altimeter transmits a series of pulses at predetermined time intervals for impacting a plurality of spaced points along the aircraft ground track. The echo signal of each pulse-impacted point processor divides the amplified signal into corresponding signals. A comparator of the signal processor transforms one of the divided signals into a constant output. A track and hold arrangement of the signal processor correlates the delayed leading edge of the comparator output with the other of the divided signals so as to determine a point of intersection therebetween. The intersection point is a quantitized value of the delay sample of a given echo signal that is indicative of the average weighted reflectivity value of a preselected annulus of one or more random and different features about a pulse-impacted track point. The master processor combines a series of delay samples into a sample data array and then compares the sample array with a series of data arrays of a stored data matrix at a given altitude of the aircraft for the purpose of determining the aircraft flight path. Depending on the requirements of the signal processor, a Doppler filter may be used. [A2022]

"Antennas for wide bandwidth signals"

A system for transmitting and receiving very wide instantaneous bandwidth signals. Synchronized short pulse generators are positioned at the feed location of each element of a linear array of short capped monopole antennas to sequentially excite the antenna elements which are spaced in accordance with the sequential interval to provide a beam in the desired direction and space. Reflections of the radiated short pulses are received by a feed monopole backed by a reflecting monopole and coupled to a short pulse receiver through a duplexing switch. [A2023]

"Aircraft radar arrangement"

For an aircraft radar arrangement, particularly helicopters, a first frequency is provided at a maximum of atmospheric attenuation and a second frequency near the first frequency in a region of less atmospheric attenuation, preferably at 60 GHz and 50 GHz. The first frequency serves to provide obstacle warnings, the second to provide for moving target detection and navigation. The mm wave components of the arrangement can substantially be used for both frequencies so that significant savings in weight, space and costs result. [A2024]

"Apparatus for providing constant azimuth cells in an airborne radar"

In a side looking radar, electronic timing circuits for dividing the radar beam into a plurality of groups of azimuth cells of equal size, the switching circuits being dependent upon the number of pulse repetition intervals per unit of travel to maintain the size of the azimuth cells in the different groups relatively constant. The apparatus also contains circuitry for scaling the output in each of the different azimuth groups. [A2025]

"Adaptive learning controller for synthetic aperture radar"

An adaptive learning controller (ALC) for use with an inertial navigation system (INS) . To correct quadratic position errors which result from acceleration bias errors, the ALC produces a position correction signal. The position correction signal is generated by twice integrating an acceleration correction signal produced by the ALC. The ALC receives signals which indicate a current system state based on the corrected position signal and the velocity bias signal. The ALC also receives a failure signal determined by comparing the corrected position signal to predetermined failure criteria, these criteria relating to excursions of the corrected position signals beyond acceptable error limits. [A2026]

"High resolution radar system"

A radar system for tracking airborne targets, in which the transmitted pulse signal is swept over a predetermined frequency range (3) . A local oscillator (15) in the receiver is swept over a similar frequency range the L.O. sweep modulation being initiated (20) by the first significant target return signal. Reflectors on the target at different ranges therefore produce different I.F.s in the receiver. Discrimination between the various target reflector features is thus achieved by filtering (25, 27, 29) the I.F. signals in a series of small bands, each band corresponding to a particular target-feature range. Azimuth, elevation and magnitude of a target feature can thus be obtained for each range cell. [A2027]

"Ground proximity warning system having modified terrain closure rate warning on glide slope approach"

An aircraft ground proximity warning system having an excessive terrain closure warning mode and a below glide slope warning mode monitors the glide slope signal and modifies the terrain closure warning envelope to accept a lesser terrain clearance when the aircraft is within the glide slope beam. [A2028]

"Instrument landing system"

In a single-frequency precision guidance landing system, the use of a DME interrogator in the aircraft and a DME receiver at the ground installation, each tuned to the same DME channel frequency, to uniquely interrogate a selected ground station and hence identify it by virtue of its replies being synchronous in the aircraft with the interrogations, the interrogations and the replies also being used to obtain range to the ground installation. This technique uses airborne already-installed DME interrogators for selective interrogation of a desired landing installation, thereby to eliminate any need to add additional special purpose equipment to the aircraft to accomplish the desired uniqueness of interrogation and ground installation identification achieved by this invention. [A2029]

"Terminal-guidance or position-adjustment system for aircraft using distance and angle measurements"

An aircraft is equipped with a system of the FM-CW type including an on-board radio altimeter which cooperates with a transponder/beacon located at A. The radio altimeter is adapted for the measurement, alternately with the measurement of the altitude H, of the distance D in relation to point A, and of the angle .beta. in relation to a horizontal axis (46) linked to the transponder. The radio altimeter includes two aerials and a supplementary processing chain for the measurement of angle .beta.. The transponder is equipped with a base with two receiving/transmitting aerials (25, 27) , switched alternately to sequentially operated circuitry in the transponder. Furthermore, the exact position of the aircraft within the vicinity of point A is determined by at least two measurements of distance D and of the angle .beta. in relation to the aerial base of the transponder. [A2030]

"Frequency agile radar system"

A frequency agile radar system allows tracking of noncooperative targets with high accuracy. The system is particularly useful in an automatic landing system aboard an aircraft carrier. The radar employs an electronically steered planar array antenna system in which a symmetrical pencil beam of 1.degree. beamwidth is steered in 1/2.degree. steps in a raster scan. A space-stabilized acquisition window allows target acquisition, and target scanning modes are chosen as a function of target range. At far range, target scan is effected by those four beam raster positions which bracket the target whereas when the target is at near range where its cross section is larger than a single beamwidth, the raster is "ballooned" to paint or cover the target fully. The computed track of the target provides a continuing update of autopilot command signals radioed to the target to bring it to and hold it on a selected glideslope which effects the automatic landing. [A2031]

"Method and system for detecting and combating covered ground targets"

A system for manned or unmanned flying bodies detects covered or hidden targets on the ground by using relatively "longwave" radar radiation for immediately attacking such ground targets, which may be covered by trees for example, but located on a strip of ground extending with a given width below the flight path of the flying body travelling in low altitude flight. Four radar receiver antennas are equally spaced from each other along the wings of the flying body and one transmitter antenna is located between two pairs of receiver antennas. The receiver signals are submitted by a fast Fourier transformation for providing a wavefront reconstruction. The so transformed, received signals are then evaluated in accordance with the known SAR principle directly as the signals are received and transformed by correlation with expected signal functions, so-called reference function, for producing a control signal for the direct or indirect discharge of a weapon. [A2032]

"Automotive collision avoidance and/or air bag deployment radar"

A Doppler radar system for a vehicle providing driver warning, vehicle brake application and air bag deployment. The system produces voltage level input directed to the distance and approach rate to an object, vehicle speed and driving monitor inputs, such as steering angles, turning rates, braking, and acceleration/deacceleration. These voltages are properly weighted as to their importance. These weighted instantaneous input voltages are summed. The summed voltage is then compared with a predetermined voltage level dividing safe and danger zones. If the summed level falls within the safe zone, the radar system produces no output signals. If the summed voltage level falls within the danger zone, the radar system produces audio warning signals and if impact with an object is eminent vehicles braking signals are then produced. The invention further includes an air bag deployment feature. A vehicle air bag is deployed when the vehicle speed exceeds a pre-determined value and the distance to impact is within a predetermined distance. The air bag deployment and audio and braking functions are independent. [A2033]

"Median filter for reducing data error in distance measuring equipment"

A set containing an odd number N of successive raw range data samples from precision distance measuring equipment is established. The set is arranged in ascending order of sample magnitude. The median member of the ordered set, i.e. the (N-1/2+1 member, is selected for processing in an alpha-beta type digital filter. The filter output is compensated for the delay introduced by using the median member of the set as the input to the alpha-beta filter. The compensated filter output is utilized as the distance input signal to a display or aircraft flight control system. [A2034]

"Doppler tracking processor and time of closest approach detector"

Disclosed is a Doppler tracking processor and time of closest approach detector for use in active or semi-active radar-guided missiles. A known processor uses a fractional Doppler gate (FDG) to process the Doppler signal to activate the warhead detonation properly at time of closest approach (TCA) , it indicates when the Doppler energy has rolled off to, for example, one-half the pre-intercept Doppler frequency. The present invention uses a Doppler tracking processor and TCA detector. The tracking filter can extract the instantaneous value of the Doppler frequency even during roll-off. The system processes the Doppler from the pre-intercept frequency up to an appropriate fractional frequency occurring at TCA, at which time it provides a signal for use in warhead detonation. [A2035]

"Depression angle ranging system and methods"

A system and related methods for passively detecting range and/or elevation of a signal emitting target by employing an X-beam antenna system which has a fixed angle .theta. between planes of receipt and which rotates those planes of receipt at a rate of sweep .gamma.. A first correlator is employed to measure the time delay .DELTA.T.sub.1 between receipt of a signal directly from a target in the first plane of the X-beam and receipt of a signal from the target in that first plane but reflected from a remote surface. A second correlator is employed to measure the time delay .DELTA.T.sub.2 between receipt of a signal from the target in the first plane and subsequent receipt of a signal from that target in the second plane as the first and second planes rotate. Receiver altitude R.sub.H is measured by conventional means and thereafter target range and/or elevation is calculated in response to .theta., .gamma., .DELTA.T.sub.1, .DELTA.T.sub.2 and R.sub.H. [A2036]

"Aircraft position determining system"

An aircraft position determining system including an on-board radio altimeter which cooperates with a ground based transponder/beacon located at a position A. The radio altimeter is adapted as a distance meter and comprises means (9, 14, 15, 16) for shifting the frequency of the local oscillation signal. The system has a range sufficient to enable it to operate in a second predetermined volume defined with respect to the position A which includes a first volume defined by the lateral distance accuracy (d) and vertical distance accuracy (h) of the position determined by an independent on-board guidance device. The exact position of the aircraft when close to A is determined by at least two successive measurements of distance from to the position A. [A2037]

"Active visual display system for remote three-axis flight path guidance of landing aircraft"

An active, electro-optical display system for use on fixed-wing, land-based airport runways, is disclosed for remotely guiding a pilot during visual approach and landing of an aircraft. Conventional Microwave Landing System (MLS) ground-transmitted data is air-derived on board the aircraft and data-linked to a ground receiver to produce a continuous digital data signal indicative of aircraft slant range, elevation and azimuth relative to the desired landing position. The resulting data signal is electrically coupled to a signal processor governed in accordance with control guidance laws to produce three discrete signals indicative of the magnitude and direction of the descent rate error, the flight path acceleration, and the lateral drift rate of the aircraft relative to the intended landing area. The three control signals are respectively coupled to display drivers which produce a plurality of drive signals for energizing individual light cells in horizontally oriented linear arrays located adjacent to the runway. The resulting light signals provide a continuous visual indication of the flight path acceleration and flight path angular error, in the elevation and azimuth planes, for appropriate corrective action by the pilot. [A2038]

"Electronically adjustable delay-simulator for distance-measuring apparatus operating on the frequency-modulated continuous wave principle"

A simulator is provided for testing a radio altimeter of the type which emits a frequency-modulated wave, the modulation being according to linear segments of slope p, and which compares the frequencies of the emitted wave and of the wave which is received after reflection to provide a distance measurement. The simulator according to the invention is connected between the transmitting antenna and the receiving antenna of the altimeter, and comprises two signal-processing chains which are arranged, in parallel, between a receiving section and an SSB mixer, the output terminal of which is connected to a transmitting section. The first chain is formed by first devices, which generate a quantity G, which is proportional to p, and second devices, which generate a signal possessing a frequency f.sub.d, the ratio of f.sub.d and G assuming a predetermined, adjustable ratio, Q. The second chain is formed by a coupler which is connected to a variable attenuator. The SSB beats substractively between the two signals which it receives. [A2039]

"Target range sensing apparatus"

A carrier frequency is frequency modulated with a triangular wave and transmitted from a sensor to a target having relative motion to the sensor. The reflection from the target is received and mixed with a portion of the transmitted signal. At least two harmonics of the modulating frequency are filtered from the output of the mixer. Each harmonic is synchronously detected with an harmonic of the same frequency to obtain a doppler signal that is detected and fed to a comparator. Each harmonic, and its corresponding doppler envelope, amplitude peaks at a respective range to the target. When the doppler of one harmonic exceeds the doppler of another harmonic in amplitude, a predetermined range to the target is signaled by the comparator. [A2040]

"Microwave apparatus and method of operation to determine position and/or speed of a movable body or discontinuity or change in a material"

This method of constructing microwave systems and processing the signal by correlation is applicable notably to tachometric, telemetric, directional and tracking control systems, to the detection of heterogeneousness and discontinuity in materials by using sensors of the direct-contact or contactless type. The method, based on microwave radiation and utilizing microwave receiving aerials and at least one correlator, comprises the steps of emitting through a radiating aerial a single microwave radiation from a microwave source having predetermined characteristics, receiving the transmitted microwave by means of receiving aerials disposed at different locations, directing the signal thus received towards one or a plurality of correlators, and analyzing the frequency spectrum of the output signal of the correlator or correlators by using Fourier's transformed curve circuits or any other means capable of extracting the fundamental of the output signal or measuring the time elapsing between two passages through zero of the output signal. [A2041]

"Warning device for golf carts"

A warning device for indicating a position of a golf cart on a golf course with respect to a restricted area includes a transmitter of an energy wave and a receiver of the energy wave. In one embodiment, the receiver is mounted on the golf cart and the transmitter is located at the restricted area. In another embodiment, both the transmitter and receiver are mounted on the golf cart and a reflector for the energy wave is mounted at the restricted area. The energy wave contains information about the position of the golf cart with respect to the restricted area such that an indication of the position can be generated by lighting a lamp, or by generating a sound, or by generating a digital visual display. [A2042]

"Radiation level reporting system"

A remote sensing transponder system is disclosed including apparatus for sensing gamma radiation levels proximate thereto, generating a signal indicative of the sensed radiation level, and transmitting an RF Signal modulated with the generated signal to a remote receiver in response to an interrogation signal from the receiver. The transponder further includes a pressure sensing device for sensing overpressure shockwaves such as caused by a nuclear blast and further modulating the transmitted RF Signal to indicate the detection of such a shockwave. [A2043]

"DME morse code identity decoder"

A multichannel DME ranging circuit is described which is capable of simultaneous multistation operation. A microprocessor is coupled to control associated peripheral devices and the receiver/transmitter of a DME to produce a multiplexing for receiving frequency data input from up to three DME ground stations. The data received from each of the three DME stations is used to generate timing and interface signals to control the DME receiver/transmitter and associated video processing circuitry. The video processing circuitry is in turn used to provide signals to the ranging circuit to independently determine range, velocity, time-to-station, and the identity of each of the stations providing input to the DME. Each of the three channels is constructed so that it may operate independently of the others to produce rapid acquisition, search, track and identification of each of the particular ground stations to be monitored. [A2044]

"Airborne set for a two-way distance-ranging system"

In the standard DME system, an airborne station having transmitted a pair of interrogation pulses receives a plurality of pairs of space-coded reply pulses from which the pulse pairs intended for the airborne station are selected by a decoder (DK) and a correlator (KR) . The invention uses the first pulse of the selected pulse pair for the distance measurement. A measuring counter (MZ) is provided whose count is transferred to a register file (SR) at the reception of every pulse. A reply signal intended for the airborne station stops the write operation, it being insured that the counts based on the two pulses of the reply signal intended for the airborne station are contained in the register file (SR) . Starting from the last count based on the second pulse, an evaluating circuit calculates back to the first pulse, taking account of the decoded pulse spacing. [A2045]

"Simple passive/active proximity warning system"

A simple active/passive proximity warning system for an Own station that uses differential time of arrival values, direct time of arrival values, and differential altitude values determined from 1030 MHz interrogations from ground-based SSRs and Own station and 1090 MHz transponder replies from Other stations to identify threats is disclosed. The invention combines a passive detection system and an active detection system into an integrated system that overcomes the limitations present when either type of system is used by itself. Generally speaking, the passive system identifies threats and produces a threat alert when the differential altitude value and the largest time of arrival value associated with an Other station are below predetermined values. A preferred embodiment of the active system monitors the environment for SSR density, classifies the environment into a plurality of "cases", and automatically selects in response thereto one of a plurality of control modes. The control mode selected determines in whole or in part whether interrogations will be produced by an interrogator in the active system, and the rate at which they are produced. In one embodiment, the active system has three control modes, the first of which continuously produces sets of interrogations at a relatively low transmission rate, the second of which selectively produces a set of interrogations upon detection of a potential threat, and the third of which produces no interrogations. The integrated system includes a number of features which improve the performance and reliability of the system, minimize interference with other ATC systems, and minimize false alarms. [A2046]

"Multichannel DME ranging system"

A multichannel DME ranging circuit is described which is capable of simultaneous multistation operation. A microprocessor is coupled to control associated peripheral devices and the receiver/transmitter of a DME to produce a multiplexing for receiving frequency data input from up to three DME ground stations. The data received from each of the three DME stations is used to generate timing and interface signals to control the DME receiver/transmitter and associated video processing circuitry. The video processing circuitry is in turn used to provide signals to the ranging circuit to independently determine range, velocity, time-to-station, and the identity of each of the stations providing input to the DME. Each of the three channels is operated indpendently to produce a decoded identification of its respective ground station. The identity information can be obtained and monitored for each channel essentially simultaneously due to the fast cyclical time-multiplexed method of operation, relative to the slower identity coding scheme utilized in present distance measuring equipment. [A2047]

"RF pulse transmitter having incidental phase modulation (IPM) correction"

An RF pulse transmitter, for use in precision distance measuring equipment (DME/P) of a microwave landing system, includes appropriate circuitry to correct for incidental phase modulation (IPM) . The pulse transmitter includes a modulation circuit for generating an RF pulse having a pulse peak. A reference phase control circuit is provided to generate a reference signal. A phase detector receives the RF pulse and the reference signal and in response thereto generates a phase error signal. The reference phase control circuit includes appropriate circuitry for adjusting the phase of the reference signal applied to the phase detector to thereby drive the phase error signal to a predetermined value at the pulse peak. A pre-distortion circuit generates a pre-modeled correction signal pulse for use in correcting for incidental phase modulation (IPM) . A phase correction control circuit receives the phase error signal and in response thereto modulates the phase of the carrier signal to correct for the incidental phase modulation. [A2048]

"Rotor tip synthetic aperture radar"

A rotor tip synthetic aperture radar is described including a rotor operable to rotate, a radar receiver positioned in the rotor and for relaying received signals to a second position such as the cab of a helicopter. A radar transmitter and receiver located within the second location for transmitting radar signals towards a target and for receiving target reflected signals relayed from the rotor tip. The doppler frequency shift imposed on the relayed target reflected signals is cancelled by generating a pilot signal at a predetermined frequency and transmitting the pilot signal to the rotor tip which has a receiver for receiving the pilot signal and for relaying the pilot signal back to the second location and frequency multipliers and mixers for generating a first order doppler frequency shift signal appropriately scaled to cancel the doppler frequency shift signal of the target reflected signals when the two are subtracted in a mixer. [A2049]

"Circuit arrangement for post-detection suppression of spurious radar echoes"

A radar, e.g. as used for the surveillance of aerial navigation, has a receiver feeding incomimg echo signals to several Doppler filters in parallel, the output signal of each filter beign passed to a utilization stage through a respective attenuator connected to the filter output in parallel with an associated area processor. The latter comprises a pulse counter synchronized with the scanning motion of the radar antenna to register the number of echoes received in successive sweeps from different zones into which the surveyed space is divided in distance and azimuth. Upon the last sweep of a sector encompassing a group of such zones, the contents of respective cells of a sector memory loaded by the pulse counter are compared with a first threshold. If the number of echoes stored in such a cell exceeds that threshold, a count written in an assigned cell of a scan memory is incremented, if it does not, the count is decremented. A delayed reading of the scan memory, during a subsequent antenna rotation, determines the setting of the associated attenuator during the sweep of any zone. The attenuator includes a delay line from which the signal amplitudes appearing in the output of the corresponding Doppler filter during recurrent sweeps of the same zone are simultaneously recovered and averaged, the result is multiplied by a factor selected by comparison with a second threshold in the associated area processor on the basis of the numerical value read out from the corresponding cell of the scan memory. [A2050]

"Moving target indication system"

In order that it should respond satisfactorily to substantially all moving targets within range (without exhibiting "blind speeds") and ignore all stationary targets, a moving target indication system comprises an FM continuous wave radar system in the form of an oscillator (1) the output frequency of which is swept by the output signal of a triangular-wave generator (19) . The oscillator output signal is fed to an aerial (3) via a circulator (4) and also to a first input (6) of a mixer (7) a second input (8) of which is supplied with the return signal from the aerial. The respective output waveforms of the mixer occurring for sweeps of the oscillator frequency in the two directions are, in a further circuit (11) , subtracted one from the other after effectively time-reversing one of them, and the resulting difference waveform is analyzed in a Fast Fourier Transform calculating circuit (15) . The triangular-wave generator (19) may be replaced by a sawtooth-wave generator, in which case the effective time-reversal in the further circuit (11) should be omitted. [A2051]

"Flexible (multi-mode) waveform generator"

The generation waveforms is accomplished using: a computer, two random access memories (RAM) , a digital-to-analog converter (DAC) , two modulators, two oscillators, and a multiplier. The computer inputs a set of digital waveforms and a first control signal into the first RAM which, when directed, conducts them to the DAC. The DAC converts the digital waveform to an analog waveform, and conducts the analog waveform and the first control signal to the first modulator. The first modulator produces an output signal by single sideband (SSB) modulating an intermediate frequency carrier from the first oscillator with the analog waveform when directed to modulate by the first control signal, and outputs the analog waveform otherwise the multiplier increases the bandwidth of signals from the first modulator by multiplying its output signal. The output of the multiplier is received by the second modulator. The second modulator is a biphase modulator which produces an output signal by biphase modulating a radio frequency carrier signal from the second oscillator with the signal from the multiplier when directed to modulate by a second control signal received from the second RAM, and outputting the signal from the multiplier otherwise. The result is a waveform generator capable of producing three categories of waveforms: single sideband modulated waveforms, biphase modulated waveforms, and waveforms that are both SSB and biphase modulated. [A2052]

"Imaging doppler interferometer"

A system for simultaneously locating a plurality of targets and distinguishing the targets from noise which utilizes phase detector techniques to generate complex voltage signals and obtain phase information. Spectral analysis is performed on the complex voltage temporal functions to generate doppler frequency functions. Both spectral phase functions and spectral amplitude functions are generated from the doppler frequency functions. Spectral phase functions are analyzed using interferometry techniques to determine if a potential target has a common locational source from returns of a plurality of sensors. A zenith angle is also generated using interferometry techniques to provide locational information of the multiple targets. Range gating and two frequency range detection methods provide high resolution range information as to the location of the targets. High resolution range information and two dimensional zenith angle information are used to provide an image of the targets. [A2053]

"Decoding apparatus and method for a position coded pulse communication system"

Pulse position coding is used to transmit several channels of data from a ground radar transmitter to a receiver in an airborne, remotely-piloted vehicle. The system is designed to ignore interfering pulses, especially those which are synchronized with the transmitter's PRF, by combining a number of noise reduction devices. These include the redundant transmission of address and channel information, the transmission of true and complemented data, the tracking of channels transmitted in a predetermined order, developing an interference count to recognize synchronous pulses, comparing data received for a given channel with data subsequently received for that channel, the use of windows around the expected positions of pulses, and the use of parity. There is also a novel programming arrangement which enables several programs to be stored in a reduced amount of memory space. [A2054]

"Automatic motion compensation for residual motion in a synthetic aperture radar system"

In a SAR system (10) a method is provided for compensating for antenna AN residual motion relative to a motion sensor INS, wherein such residual motion causes phase corruption in a radar image produced by the SAR system. Residual motion compensation is provided by first correlating a received radar signal to a range line having a plurality of azimuth positions. Such signal is transformed into a frequency spectrum indicating the reflectivity of point reflectors at the various azimuth positions. Then, the range line is sampled for symmetric triplets of three sequential point reflectors positioned along the range line at a distance from each other corresponding to a specified frequency associated to a mode of residual vibration of the antenna. The amplitude and phase angle of said mode of the antenna residual motion may be obtained from such symmetric triplet (s) . [A2055]

"Method of reconstructing synthetic aperture radar image"

Azimuth compression processing is carried out by the steps of determining Doppler rate time change data a reconstructed scene from orbit data of a sattelite or aircraft, determining azimuth coordinates transformation data of an image after range compression, that is, resampling position designation data, from the Doppler rate time change data, resampling the image after range compression, in the azimuth direction using the azimuth coordinates transformation data, keeping unaltered the Doppler rate of a point image relating to the image after coordinates transformation irrespective to the position in the azimuth direction inside the scene, and thereafter using FFT. [A2056]

"Adaptive mutual interference suppression method"

A method is described which provides automatic self synchronization (in time) between multiple pulse repetition frequency (PRF) , pulse doppler radars. The synchronization technique time aligns data within a coherent look transmission (a group of pulses--typically milliseconds) . This technique substantially eliminates sensitivity losses associated with blanking false alarms or detection from interfering radars transmitting (in time) at pulse repetition intervals (PRI) different than the host radar. An implementation of this method for a 2 PRF radar waveform is described although the technique may be extended to more than 2 PRF's. The technique provides an alternative approach to pulse shaping or multiple (different) frequencies to control MI but may be used in conjunction with these techniques to minimize sensitivity losses due to interference blanking. for applications where wide angular antenna beams are required and/or multiple simultaneous radar operation is required (e.g., airborne close aircraft formations or closely spaced ground warning radars) , this technique is especially useful for MI control. This is especially true for a defensive radar system such as an active missile warning radar. [A2057]

"Method of satellite operation using synthetic aperture radar addition holography for imaging"

A method of satellite operation utilizing a paired-satellite configuration in which one satellite illuminates the imaged field of view and the other satellite receives the reflected energy using bistatic synthetic radar. This method enables the unambiguous detection of radar signals for imagery construction, improves stability for image quality, provides recording format linearity to minimize image reconstruction processing, provides orthogonal range-doppler pattern distribution at all points in the recording plane to minimize computer processing, provides a triangulated signal reference baseline to improve system calibratability, and enables conformal mapping and uniform sampling of zone plates to achieve three dimensional holography. [A2058]

"Nearest return tracking in an FMCW system"

An FMCW distance measuring device is disclosed which provides nearest return tracking for increased accuracy. A portion of the transmitted wave in an FMCW altimeter is mixed with a received signal indicating distance to a target to produce a beat frequency between the transmitted wave and the received wave. This beat frequency is input to a frequency discriminator. The discriminator output is controlled so that a predetermined point within the spectrum of the returned signal most nearly represents the nearest return. The frequency discriminator thus allows more accurate tracking of altitude in contrast to those conventional systems which track the average or centroid of the spectral return. The frequency discriminator may be used in two ways. In the first technique the transmitted wave is modulated to maintain a constant beat frequency by adjusting the slope of the modulation. The modulation slope is controlled in response to a signal derived from the frequency discriminator to provide nearest return tracking. The system maintains the beat frequency constant based on that nearest return through control of the modulation slope. Nearest return altitude is inversely proportional to modulation slope. In the second technique, modulation slope is held constant or at least is not directly controlled by the frequency discriminator. The frequency discriminator is used in a phase/frequency locked loop to provide an output signal from the VCO that is locked onto the predetermined point within the spectrum of the returned signal. Nearest return altitude is proportional to the frequency of the VCO output signal. [A2059]

"Radar fuze system"

A radar fuzing system for use in a guided missile wherein the system is tuned in accordance with the estimated intercept closing velocity to permit the use of narrower bandpass filters and thereby reduce the probability of detecting pulse repetition frequency lines and very low Doppler returns from chaff bundles. [A2060]

"Altitude determining radar using multipath discrimination"

A height-determining radar utilizing both direct and multipath signals coising a radar transmitter and receiver and means for measuring the variation of the pulse widths of the received radar signal, the variation being caused by fluctuating multipath contribution to the received signal, and further comprising means for calculating the target height h from the equation h=cR.tau..sub.B /4e, where c is the speed of light, R is the target range, .tau..sub.B is the pulse width variation and e is the radar height. The multipath variation may be enhanced by varying the linear polarization of the emitted radar signal. [A2061]

"Aircraft groundspeed measurement system and technique"

A system and technique is disclosed which enables the measurement and display of aircraft groundspeed using a modified FMCW radar altimeter. The system is constructed to have a conventional FMCW altimeter transmitter and receiver for transmitting and receiving vertical return signals, and a narrowbeam forward-looking antenna and associated receiver for detecting return signals from the forward angle. The transmitted signal is triangularly modulated to produce returns on both the upsweep and downsweep of the modulation and the difference between the frequencies of those returns, as detected by the forward looking antenna, is proportional to aircraft slant velocity. The system also detects slant range and altitude and combines them with slant velocity to produce an output representing the aircraft groundspeed. [A2062]

"Synthetic aperture radar image processing system"

In an SAR image processing system of the type wherein an image is reproduced from received data, the reproduced image is obtained on the basis of range compression, range curvature compensation and azimuth compression, the correlation coefficient between two look image signals is determined for each of predetermined relative shift amounts, the relative shift amount K.sub.max giving the maximum correlation coefficient is determined, and an azimuth reference function and range curvature compensation function are generated based on the shift amount K. [A2063]

"Automatic calibration system for distance measurement receivers"

A receiver time delay calibration device designed for low cost retrofitting of airborne equipment and more specifically DME equipment. In this system, the output of a VFO is applied to the RF input port of the receiver to be tested. The VFO is swept through a frequency range of the receiver until the receiver provides an output, which occurs at the operating frequency of the receiver, f.sub.t. The receiver's output at f.sub.t is used to stop the sweep of the VFO and maintain it at f.sub.t. The output of the VFO is then pulse modulated and the delay between the RF pulse applied to the input of the receiver and the corresponding video output pulse from the receiver is measured to determine the receiver delay time. [A2064]

"Radar tracking system and display"

Apparatus is provided in conjunction with a small radar unit, for providing an improved display and additional radar target information. A ball type compass has an optical switching circuit for providing azimuth signals indicating the azimuth orientation of the radar unit. An inclinometer has an optical switching circuit for providing a target inclination signal from which, knowing target range, target altitude is calculated. A radar display in the form of an array of LCD or LED elements is provided. [A2065]

"Accurate DME-based airborne navigation system"

The system described herein uses distance information from aircraft to multiple ground stations of the TACAN, VORTAC, VOR/DME or DME type to determine position of the aircraft to a high degree of accuracy exceeding the normal capabilities of these types of equipment. The present system uses a scanning type DME unit which is rapidly sequenced to interrogate said multiple ground stations successively and determine distance thereto for all stations within range, and a computer to validate and process these distance measurements in sequence to provide an accurate computation and display of aircraft position and wind information. [A2066]

"Radar seismograph improvement"

The technologies of radar, exploration seismology, and air or space transportation, are combined to provide a highly-mobile and economical system of geophysical exploration for petroleum and other mineral deposits. Use is made of the Seismo-electric (SE) and Electro-seismic (ES) effects to momentarily alter the reflection and scattering from, and absorption in, the earth's surface, of electromagnetic (radar) waves transmitted from, and received by, an aircraft or space vehicle, to thereby modulate seismic information on the reflected, scattered and received waves. In this improvement, the received waves, as represented by their transduced electric counterparts, are divided into two paths having different times of transmission, and synchronously re-combined to enhance systematic or meaningful information and remove non-systematic disturbances and random noise. [A2067]

"Radar altimeter nearest return tracking"

An FMCW distance measuring device is disclosed which enables increased accuracy by detecting the nearest return. A portion of the transmitted wave in an FMCW altimeter is mixed with the received signal indicating distance to ground to produce a beat frequency between the transmitted wave and the received wave. The beat frequency is a spectrum of frequencies, the lowest of which indicates the nearest return in a target area. The beat frequency spectrum is coupled for sampling by an analog-to-digital converter and then coupled to an apparatus for performing a Fast Fourier Transform to isolate the nearest return. In an altimeter, the Fast Fourier Transform of the return spectrum enables the FMCW radar to have an accuracy approaching that of pulsed radars without the associated disadvantages. [A2068]

"Radionavigation system having means for concealing distance and/or bearing information conveyed thereby"

A ground station of a radionavigation system, responding to interrogation pulses from aircraft passing within range, emits message pulses whose timing enables the on-board equipment of the interrogating aircraft to determine its distance from the ground station and/or its azimuthal position relative thereto. To prevent such information from being utilized by aircraft not entitled thereto, the emission of the message pulses is subjected to an artificial delay whose randomly varying magnitude is conveyed by a multibit code word subjected in a distorter to a predetermined series of transformations based upon selected bits thereof. The on-board equipment of privileged aircraft includes a decipherer complementary to the distorter which restores the original code word and derives from it an indication of the artificial delay to be deducted from the measured time interval. [A2069]

"Feature referenced error correction apparatus"

A feature referenced error correction apparatus utilizing the multiple images of the interstage level image format to compensate for positional displacement errors in the synthetic aperture radar imaging. Error compensation is accomplished through the registration of key features of sub-aperture images and by the generation of an error correction signal in response to the sub-frame registration errors. [A2070]

"Range/doppler ship imaging for ordnance control"

Distortions inherent in the formation of a range/doppler image by an airborne Synthetic Aperture Radar (SAR) of a ship under the influence of roll, pitch, and yaw motions characteristic of sea state conditions are removed in conjunction with a least squares linear regression solution to doppler processed interferometric azimuth angle data derived from ship radar reflections, resulting in a scaled high resolution range/doppler image representative of the true range/cross range (azimuth) distribution of the ship, so that continuous automatic tracking of a cursor imbedded in a single designated resolution cell of the ship's displayed image, essential to carrying out precision standoff command weapon guidance to that selected ship target cell, can be accomplished. [A2071]

"Imaging radar seeker"

An imaging radar seeker (8) for producing two-dimensional images of a target (2) is mounted on a missile (6) or other moving body, such as an automobile. A computer (40) directs the seeker (8) to operate sequentially in searching, tracking, and imaging modes. In the searching mode, a combination of circumferential rotation of antenna (12) of seeker (8) and frequency scanning of electromagnetic energy fed to antenna (12) enables seeker (8) to search for its target (2) over a conical field-of-view (16) or a wider, peripheral belt field-of-view (16) . In the imaging mode, circumferential rotation of antenna (12) is stopped, and the tilt angle (A) of the linear array (32) of antenna (12) is stepped or continuously moved to compensate for radial movement of the radiated beam (14) caused by frequency stepping imparted by a frequency synthesizer (20) . This keeps the beam (14) fixed in space and centered on target (2) . Inverse synthetic aperture imaging is used to create a two-dimensional image (4) of target (2) wherein the first dimension (range) is obtained by performing inverse Fourier transforms on the echo signals, and the second orthogonal dimension (cross-range or doppler frequency) is obtained by performing Fourier transforms. Array (32) can be a linear array of E-plane stacked linear waveguide antenna elements (38) operating in either the traveling wave mode or the standing wave mode. [A2072]

"Radar system operating by means of frequency modulated pulsed waves"

A radar system operating by means of frequency-modulated pulsed waves comprises an aerial system for directing such waves to at least one target located at a distance D and for receiving the waves reflected from said target, a mixer circuit having a first input for receiving a local signal, a second input for receiving the reflected signal received by the aerial system, and an output for producing information about the distance D, a frequency-modulated (FM) wave generator, a change-over device cooperating with a control circuit for temporarily connecting the FM wave aerial system to the generator, while the first input of the mixer circuit receives a signal derived from the output signal of the FM wave generator by means of a coupler. The control circuit comprises means for connecting the aerial system to the output of the FM wave generator during one of equal fixed time durations selected in a pseudo-random manner within a time interval of a fixed duration. [A2073]

"Range processor for DME"

A range processor for airborne distance measuring equipment in which coherency of reply signals from the ground based DME station is determined by incrementing the contents of storage locations of a random access memory device for each reply signal according to the time of reception of the reply signal and for decrementing the contents of the storage location if no reply signal is received. Whenever the contents of a storage location exceeds a threshold value a range gate is generated so that the next reply received within the range gate causes the time of reception of the reply to be stored as range data. [A2074]

"Method and apparatus for contour mapping using synthetic aperture radar"

By using two SAR antennas spaced a known distance, B, and oriented at substantially the same look angle to illuminate the same target area, pixel data from the two antennas may be compared in phase to determine a difference .DELTA..phi. from which a slant angle .theta. is determined for each pixel point from an equation .DELTA..phi.= (2.pi.B/.lambda.) sin (.theta.-.alpha.) , where .lambda. is the radar wavelength and .alpha. is the roll angle of the aircraft. The height, h, of each pixel point from the aircraft is determined from the equation h=R cos .theta., and from the known altitude, a, of the aircraft above sea level, the altitude (elevation) , a', of each point is determined from the difference a-h. This elevation data may be displayed with the SAR image by, for example, quantizing the elevation at increments of 100 feet starting at sea level, and color coding pixels of the same quantized elevation. The distance, d, of each pixel from the ground track of the aircraft used for the display may be determined more accurately from the equation d=R sin .theta.. [A2075]

"Moving target ordnance control"

In an airborne radar system, moving ground targets are identified on a cathode ray tube (CRT) display and their motion tracked to allow precise delivery of air-to-ground weapons. Target location errors, due to the effect of target motion upon the doppler frequency of the received signals, and consequent angle measurement ambiguities introduced by the presence of clutter are significantly reduced. The target's radial velocity with respect to the electrical boresight of the system antenna is determined and a corresponding frequency adjustment is made to the processed signal in order to accurately locate the target on the display to lie in precise correspondence to its displayed stationary surroundings. The determination of target radial velocity also provides the measurement of target radial velocity also provides a precise interferometer antenna referenced azimuth angle estimate to be used for relative range and azimuth weapon guidance, independent of usually large angle errors arising from clutter effects within the field of view of the antenna, and of other hardware and navigational error sources associated with absolute angle measurement systems. [A2076]

"Range/azimuth/elevation ship imaging for ordnance control"

Capability is provided for producing 3 scaled high resolution orthogonal image projections on a CRT of a ship under the influence of translational as well as rotational motions arising from sea state conditions, for the purpose of ship target identification and classification, and the subsequent carrying out of stand-off command weapon guidance to a designated resolution cell of the ship from an airborne platform. Doppler processed interferometric azimuth and elevation angle measurements of the ship scatterers derived from a coherent synthetic aperture radar are combined in a weighted multivariate regression fit using digital signal processing techniques to provide measures of ship translational and rotational motions essential to providing focussed high resolution imagery and precision standoff weapon delivery to the designated ship target resolution cell. The invention also provides a capability for scaling the cross-range (doppler) dimension of Inverse SAR Profile Imagery. [A2077]

"Range/azimuth ship imaging for ordnance control"

Distortions inherent in the formation of a range/doppler image by an airborne Synthetic Aperture Radar (SAR) of a ship under the influence of roll, pitch, and yaw motions characteristic of a sea state conditions, are removed by the formation of a scaled range/azimuth image generated with the use of an interferometer antenna in conjunction wth the SAR. A least squares linear regression solution to doppler processed interferometric azimuth angle data derived from ship radar reflections permits the determination of aircraft to ship relative rotational motion essential to the development of such an improved high resolution radar image, so that continuous automatic tracking of a cursor imbedded in a single designate resolution cell of the ship's displayed image essential to carrying out precision standoff command weapon guidance to that selected ship target cell, can be accomplished. [A2078]

"Video processor for air traffic control beacon system"

A circuit for use in a transponder located in an aircraft or the like for identifying a true side lobe suppression signal being transmitted by a ground located transmitted system. The true side lobe suppression signal includes at least pulses P1 and P2. The circuit causes the transponder to produce a reply signal upon the amplitude of the P1 pulse being a predetermined ratio to said P2 pulse. The circuit includes a pair of transistors with a capacitor connected to the output of the second transistor. The pulses P1 and P.sub.2 are supplied to the base electrode of the first transistor. Pulse P1 turns on the two transistors and charges the capacitor to a predetermined level so that when the second pulse P2 arrives, it does not turn on a transistor when it is equal to or less than the first pulse P1. [A2079]

"Surveillance radar system which is protected from anti-radar missiles"

A surveillance radar system comprising an omni-directional transmitter and a number of radar receivers located at different geographic locations from the transmitter which are capable of resolving the angular location of targets by using antenna lobe multiples over the range to be monitored so that anti-range missiles cannot destroy the receivers since their locations will be unknown. The transmitter transmits on a continuous basis rather than on pulsed basis to reduce the probability of location by anti-radar missiles. [A2080]

"On-board orientation device for aircraft"

A pulse radar device which can sweep in the azimuth direction with a two element direction finding antenna (1, 2) having a fan pattern and wherein the path differences and Doppler frequencies are ranged selective to determine at each azimuth from the echo signals received a mean aspect angle (.epsilon.) and the azimuth maximum Doppler frequency which can be calculated therefrom. The mean aspect angles (.epsilon.) are determined according to the values of the measured Doppler frequencies with the equation .epsilon.=arc cos (f.sub.d /f.sub.dmax.alpha.) . In this angle determination, smaller aspect angles are determined according to the measurement of the range selective determined path differences. Subsequently, an image point vertical deflection which is proportional to the aspect angle is utilized for perspective terrain display. The invention can be employed with pulsed radar devices on-board aircraft L for terrain display and for obtaining navigation data. [A2081]

"Monopulsed radar system for tracking ground targets"

This disclosure relates to an improved airborne monopulse radar system used for tracking ground targets. The system includes a null command generator designed to provide an error signal proportional to the angle between a preselected target azimuth and the monopulse antenna difference pattern null azimuth which error signal is unaffected by the presence of moving targets within the area under radar surveillance. The error signal is applied to the monopulse antenna drive servomechanism in order to physically reorient the antenna to have the difference pattern null and the preselected target aligned along the same azimuth. [A2082]

"Calibrator for distance measuring equipment"

In distance measuring equipment apparatus which includes an antenna, a transmitter/receiver coupled to the antenna to transmit interrogation pulses and receive responses from a ground station, the pulses being spaced apart, the ground station also transmitting other responses between the responses, and a data processor receiving video and gate signals from the transmitter/receiver and calculating therefrom the distance to the ground station in order to calibrate for receiver and installation delays. The receiving signal, other than when one of the responses is being received, is modulated. The phase of the resulting modulation on the video signal with respect to the phase of modulation at the modulator is detected to determine the receiver and installation delay. [A2083]

"Three-dimensional air space surveillance radar"

A three-dimensional air space surveillance radar in which the radar receiver is connected to a target tracking means which stores target data and does extrapolation of target data for target trace formations, including a panoramic antenna which illuminates the entire elevation range to be covered and has a reception lobe at the elevation level which can be electronically or mechanically controlled such that a line air space scanning occurs during the course of normally sequence scanning programs. The line-shaped beam of the antenna is briefly interrupted in the invention from the normal reception lobe elevation angle when the tracker determines that a target echo is expected from a different elevation angle than that being scanned. During such scanning interrupt, the reception lobe is switched to the expected elevation angle of the target and in the invention, the data acquisition rate for the tracker is increased relative to known prior art three-dimensional surveillance radars which function on a strictly time sequential manner. The precision of the invention is retained and the invention is utilized in a tracker-equipped three-dimentional air space surveillance radar of high trace quality such as used, for example, in air defense radar. [A2084]

"Test equipment for a synthetic aperture radar system"

The test equipment for a synthetic aperture radar (SAR) system is provided with an input and output connector (6) and is composed of a signal loop (3) arranged between the input and output connector (6) and electromagnetically reproduces these pulses or signals (4) emitted from a SAR system (2) in the absence of a SAR antenna (18) . The input connector (6) is electrically connected with a circulator (5) which is integrated into the signal loop (3) and which combines the incoming and outgoing pulses or signals (4) to and from the SAR system (2) . The signal loop (3) is composed of a forward branch (7) and a backward branch (10) , the forward branch (7) being composed of a multitap time-delay and reproducing different travel times of the pulses or signals (4) , while the backward branch (10) in the form of a bus (9) combines the delayed pulses or signals (4) . The ends of the forward and backward branches (7 and 10) are terminated by their wave impedances (11, 12) and between them is arranged a crossbar matrix (13) onto which can be set the point target modules (14) . [A2085]

"Device for the elimination of n.sup.th trace moving echoes and interference echoes in a radar"

A device for the elimination of n.sup.th trace moving echoes and radar interference echoes in a radar system operating by bursts and comprising a display device for moving targets. The device comprises means for detecting first and n.sup.th trace echoes of which the amplitudes exceed, respectively, two given thresholds S.sub.1 and S.sub.2, and means for comparing these echoes with each other. The device finds particular utilization in a surveillance radar or in a radar landing system operating by pulses. [A2086]

"TACAN data link system"

The instant invention permits a communication function to be performed by utilizing the transmitter/receiver portion of existing navigational equipment such as, for example, DME equipment, TACAN/DME equipment, and VOR/DME equipment. Rather than utilizing the same channel as the navigation function, the communication function utilizes another of the equipment's channels specifically assigned for communication purposes. Specifically, when it is desired to communicate with a communication or master station, the airborne or remote navigational equipment is momentarily turned from the navigational frequency channel to the frequency channel specifically assigned for the communication function. While momentarily tuned to the communication channel, it sends data to, and receives data from, the communication station. Having completed the communication process, the airborne or remote unit tunes back to the navigational channel and resumes its navigational function. Tuning from the navigational channel and the time spent on the communication channel is sufficiently short so that the navigational function is not impaired. [A2087]

"FMCW system for providing search-while-track functions and altitude rate determination"

An FMCW distance measuring system is disclosed which provides a search and track function for enabling searching for nearer returns during altitude tracking, and for more accurately determining altitude rate. A portion of the transmitted wave in an FMCW altimeter is mixed with the received signal indicating distance to target to produce a beat frequency between the transmitted wave and the received wave. The transmitted wave is triangularly modulated to produce separate upsweep and downsweep modulations which are maintained to produce a constant beat frequency from the return signal. The up and downsweep of the triangular modulation are independently operable so that tracking may be maintained on either or both of the sweeps or one sweep may track while the other sweep is searching for a nearer return. By comparing the difference in the modulation slopes during the up and downsweep, a reading can be provided which is indicative of the rate of change in altitude. The operation thus allows altitude searching during nearest return tracking along with a combined instantaneous reading of altitude rate without additional circuitry. [A2088]

"Method and apparatus for .DELTA.K synthetic aperture radar measurement of ocean current"

A synthetic aperture radar (10) is employed for .DELTA.k measurement of ocean current from a spacecraft (11) without the need for a narrow beam and long observation times. The SAR signal is compressed (12) to provide image data for different sections of the chirp bandwidth, equivalent to frequencies f.sub.1 (t.sub.a,t) , f.sub.2 (t.sub.a,t) . . . f.sub.n (t.sub.a,t) , and a common area for the separate image fields is selected (14) . The image for the selected area at each frequency is deconvolved (16) to obtain the image signals for the different frequencies (f.sub.1, f.sub.2 . . . f.sub.n) and the same area. A product of pairs of signals is formed (18, 20) , Fourier transformed (22) and squared (24) . The spectrum thus obtained from different areas for the same pair of frequencies f.sub.jk, f.sub.j+n,k are added (26) to provide an improved signal to noise ratio. The shift of the peak from the center of the spectrum is measured and compared (28) to the expected shift due to the phase velocity of the Bragg scattering wave. Any difference is a measure of current velocity v.sub.c (.DELTA.k) . [A2089]

"Narrow beam radar installation for turbine monitoring"

A millimeter wave radar mounted on a turbine installation for monitoring turbine blade vibration. The waveguide conducts signals from a millimeter wave radar unit outside of the turbine and directs the signal to the rotating blades and directs the reflected signals therefrom back to the radar unit. A sealing arrangement is provided where the waveguide passes through the turbine's outer casing and the waveguide itself within the turbine is positioned within a waveguide support member which extends from the aperture in the turbine casing to a point in the vicinity of the turbine blades where it is immovably supported. The waveguide additionally has an internal sealing arrangement transparent to the radar signals for maintaining pressure integrity. [A2090]

"Electromagnetic proximity fuse"

An electromagnetic proximity fuse system operating by transmitting an electromagnetic wave and which is reflected by an object. The reflected wave is combined with the transmitted wave to produce a doppler signal, which is used to trigger an ignition circuit. The doppler signal U.sub.1 is applied to an analog divider (12) together with a delayed version of the doppler signal U.sub.2. The analog divider (12) delivers an output signal of doppler frequency (f.sub.d) , the amplitude of which is equal to the quotient U.sub.1 /U.sub.2. This output signal is applied to a filter (15) , which has a frequency characteristic approximately equal to 1/ (f.sub.o +f) , where f.sub.o is a system parameter and f is the frequency (f.sub.d) . The output signal from the filter (15) is applied to an ignition circuit (17) via a threshold circuit (16) having a fixed threshold at which the ignition circuit (17) is to be triggered. The ignition circuit (17) will be triggered at a constant distance from the reflecting object independently of such unknown variables as the approaching speed, the reflection factor of the object and the gain factor of the system. [A2091]

"Wideband phase locked loop tracking oscillator for radio altimeter"

A wideband phase locked loop oscillator (PLLO) for tracking the frequency of an altitude signal in an FM/CW type radio altimeter. The phase locked loop oscillator conventionally includes a voltage controlled oscillator (VCO) , a phase comparator for comparing the phase of the altitude signal to be tracked with the phase of the VCO output and an error signal amplifier for applying the output of the phase comparator as control voltage to the VCO. The frequency range of the PLLO is extended by changing the natural frequency of the VCO in steps spanning the useful frequency range of the altitude signal. Selection of the proper value of VCO natural frequency is effected through microprocessor directed digital control. [A2092]

"Apparatus adapted for single pulse electromagnetic measurements of soil conductivity and dielectric constant"

A method and installation for ground illumination by means of electromagnetic radiation generated by an aerial simulator coupled to the ground and for calculation of the dielectric constant and conductivity of the ground from said radiation are described. Radiation is transmitted in form of an electromagnetic pulse having predetermined characteristics from an aerial simulator of the horn type, the characteristics of the pulse are sensed at a point in the illuminated area and the dielectric constant and the conductivity of the ground are calculated from the detected values. The apparatus constituting the simulator comprises at least two conductive layers e.g. of conductive wires, united on one side to form the horn, and ending up on the opposite side at the ground where they are extended by a buried structure and on that side where they are united, in a connector to provide connection with pulse generating and measurement means. [A2093]

"Radar tester"

A radar system testing apparatus for use in evaluating radar performance of terrain following, forward looking radars, generally installed in the nose of military aircraft. The operator inputs the antenna position and rotational arc limits desired which are converted into reference voltages and compared to the antenna's true position by a logic comparator network. When the true position is within the operator's selected window, and the radar system inputs a trigger signal to indicate transmitter firing, the logic network will respond with a spiked waveform. This waveform traverses two consecutive one shot multivibrators with appropriate controls to vary the width of the resultant output pulses. By controlling the size of the pulses, the operator effectively selects a variety of target ranges and target widths for testing purposes. These controlled pulses are fed back into the radar system where they generate a simulated target return for evaluating the performance of the radar system under known conditions. [A2094]

"Topographic data gathering method"

A system for gathering topographic data for use in computer generation of topographic maps of various forms. This system includes equipment mounted in an aircraft which can be flown over a terrain area which is to be surveyed. The equipment comprises a low frequency radar which is capable of penetrating foliage in the survey area for generating a signal representative of the distance from the aircraft to the terrain surface, a precision altimeter that produces a signal representative of the altitude of the aircraft with respect to a reference plane such as sea level, temperature and humidity sensors for producing signals representative of those quantities, a clock for producing a signal representative of a standard time, and a digital recorder for recording the previously named signals which are produced during over flight of a survey area. The recorder has a recording medium which can be removed from the aircraft and employed at a remote time and place as computer input for effecting generation of topographic maps showing various characteristics of the survey area. Concurrent with the gathering of data in the aircraft, data representative of temperature and humidity at the surface of the survey area are gathered and recorded on a second recording medium. The two recording media can be combined at a remote time and place as computer input to produce highly accurate topographic maps. The system can include a second radar operating at a different frequency from that at which the first mentioned radar operates. One of the radars can accurately penetrate the foliage and the other can measure the distance from the aircraft to the foliage surface so that information concerning the foliage can be generated. The system also includes circuitry for responding to surface water in the survey area so that accurate mapping of rivers, lakes, streams and swamps can be achieved. [A2095]

"Polarization controlled map matcher missile guidance system"

A reference grid for a map matching missile guidance system is generated from a vertically polarized radar map and a horizontally polarized radar map, both of which represent radar returns from a preselected ground area. In generating this reference grid, illuminating radar pulses are alternately fed to a horizontal aperture and vertical aperture of a mapping radar. Horizontal radar returns and vertical radar returns are processed in separate channels to form a radar map of the ground area containing the target to which the missile is to be directed. A pixel-by-pixel comparison of the data in each map is performed to create a polarization diverse map which is essentially those returns from man-made objects. This map is then used by the missile guidance system as a reference grid for a final fix by which the missile obtains its final course orientation enroute to the target. [A2096]

"Radar calibration using direct measurement equipment and oblique photometry"

A radar calibration apparatus for the metric measurement of ground position by airborne photogrametry using real time high precision imagery, the transformation of those measurements from camera coordinates to antenna coordinates, the conversion of transformed coordinates to direction cosines of a measured ground position, comparison to radar derived direction, and the calculation and automatic correction of bias errors in direction of the radar measurement. [A2097]

"Automatic direction finder"

This is an automatic direction finder comprising a separately located first and second sensor means for receiving a first and second representation signal from a remote electromagnetic signal source, an error correction loop means connected to the first and second sensor means for nulling the second representation signal in the second sensor means, and an indicator means responsive to the error correction loop means for computing and displaying an off-boresight direction of the electromagnetic signal when the second representation signal is substantially nulled at the second sensor means. [A2098]

"Tracking radar system"

A tracking radar system which includes a variable frequency oscillator for supplying to a vertical antenna array an oscillation frequency which is changed for each of a number of pulses transmitted from the antenna array. The antenna array transmits an electric wave toward a target at a low altitude and receives an echo from the target. An electronic computer estimates an elevation angle of the target from the echo received by the antenna array according to array aperture sampling technique for each pulse. An averaging circuit averages those estimated elevation angles of the target to provide its elevation angle. Alternatively, the oscillation frequency may change for each of finite time intervals. [A2099]

"Pipelined digital SAR azimuth correlator using hybrid FFT/transversal filter"

A synthetic aperture radar system (SAR) having a range correlator (10) is provided with a hybrid azimuth correlator (12) for correlation utilizing a block-pipelined Fast Fourier Transform (12a) having a predetermined FFT transform size with delay elements (Z) for so delaying SAR range correlated data as to embed in the Fourier transform operation a corner-turning function as the range correlated SAR data is converted from the time domain to a frequency domain. A transversal filter (12b) connected to receive the SAR data in the frequency domain, and from a generator (14b) a range migration compensation function, D, to a programmable shift register (30) for accurate range migration compensation, weights, W.sub.i, to multipliers (35-38) for interpolation, and an azimuth reference function, .phi..sub.j, in the frequency domain to a multiplier 42 for correlation of the SAR data. Following the transversal filter is a block-pipelined inverse FFT (12c) used to restore azimuth correlated data in the frequency domain to the time domain for imaging. The FFT transform size is selected to accommodate the different SAR azimuth aperture lengths, number of looks and prefiltering requirements. [A2100]

"Radar signal processing process and circuit"

Process for real time signal processing for side-looking synthetic aperture radar systems, the signal consisting of sample sequences corresponding to given spacing gates. for each spacing gate an operation corresponding to an auto-correlation is directly performed on the radar signal, this relating to a product signal of a sample by a phase term varying quadratically with the rank of the sample, which supplies an estimate of the Fourier components of the radar image for each gate. The invention also relates to a circuit for processing the radar signal in real time for performing the aforementioned process. [A2101]

"Frequency modulated continuous wave altimeter"

A frequency modulated continuous wave altimeter and method of detecting the presence of an object in a predetermined area. The altimeter is generally comprised of an antenna for receiving and radiating microwave energy, a transmitter for generating frequency modulated microwave energy, a mixer for generating a sinusoidal resulting signal from the communication of transmitted and reflected microwave energy, and a receiver for processing the resulting signal and generating an output signal indicative of distance. The transmitter includes a Gunn diode for generating a carrier signal, modulating means for varying the frequency of the carrier signal, and a high frequency oscillator for impressing a tone on the modulating means. The receiver includes multiple staged amplifiers tuned to the frequency of the tone for selectively amplifying the resulting signal, a detector for generating a signal responsive to the inflection points on the sinusoidal resulting signal, and a counter for generating an output indicative of distance from the number of inflection points detected. [A2102]

"Discrete address beacon, navigation and landing system (DABNLS)"

An aircraft surveillance, navigation, landing, guidance and collision avoidance system is provided which takes the form of a two-way data communication link between each of a plurality of controlled aircraft and a ground station, and appropriate measuring equipment at the ground station which provides three-dimensional position data on the ground for air traffic control purposes, and which also provides three-dimensional position data in the aircraft for navigation, landing guidance and collision avoidance purposes, as well as a two-way air/ground data link for miscellaneous data and control purposes. The system of the invention comprises the combination of a ground transmitter/receiver station and airborne transponders mounted in the aircraft. The ground transmitter broadcasts discrete aircraft addressed interrogation pulses which are coded to contain position and/or other data. The transponders in all aircraft receive and decode the interrogation pulses, and the discretely addressed aircraft transmits appropriately timed reply pulses to the ground receiver which contain altitude and other data. Other aircraft utilize the received position information for collision avoidance purposes. The ground receiver measures the incident angles of the reply signal pulses and their precise time delays with respect to the interrogation pulses, so as to provide aircraft position and other data to the ground station, and to provide additional data for transmission to the aircraft on the following interrogation pulses. [A2103]

"Means for eliminating step error in FM/CW radio altimeters"

A radio altimeter of the FM/CW type which is linearly frequency modulated by a triangular wave exhibits step error in the output indication at times near the peaks of the modulating wave. Step error is eliminated by gating the data which is processed to produce the altimeter output indication to inhibit processing during times the modulation wave is near peak values and to enable processing at other times. Accuracy is further improved by adjusting the duration of the time during which data processing is enabled so as to equal an integral number of cycles of processed data. [A2104]

"Ground proximity warning system with time and altitude based mode switching"

To increase the effectivity of warnings and to decrease nuisance warnings in a ground proximity warning system having several modes of operation, the switching from one mode to another is done as a function of radio altitude and time. In addition, in a ground proximity warning system where a warning signal is generated in accordance with a predetermined relationship between flight parameters, one or more of these parameters can be varied as a function of radio altitude and time in order to, for example, increase the altitude above ground as a function of radio altitude and time from take-off that a terrain clearance warning is generated or to decrease as a function of radio altitude and time, the radio altitude below which a negative climb after take-off warning is generated. [A2105]

"Combined radar/barometric altimeter"

An altitude sensing arrangement which combines the advantages of a barometric altimeter with a radar altimeter. The apparatus monitors the radar altimeter's associated radar validity signal and selects the radar altimeter's reading when the validity signal indicates a valid condition. Alternately, when the validity signal does not indicate a valid condition, the invention computes the difference in barometric altitude since the last valid radar altimeter reading and sums this difference with the last valid reading from the radar altimeter to produce a combined altitude reading. [A2106]

"Independent landing monitoring system"

An independent landing monitoring system (ILM) for guiding airborne vehicles on final approach to a landing using a ground-based beacon which transmits a sequence of pulse signals including an omnidirectional signal coded to identify its location and used for initial approach, followed by time spaced directionally radiated right/left and up/down signals used for precision guidance along the final approach path. The time spacing of the various beacon signals and their order of succession in the sequence identify the signals, and the relative intensities of paired precision guidance signals as received by the aircraft is used to provide precision indications of the location of the aircraft on the path. The beacon can be either triggered by the weather radar in the aircraft which then receives the beacon signals on its beacon mode receiver, and/or it can be triggered randomly by a noise jittered oscillator in the beacon for use by approaching aircraft equipped only with a beacon receiver but no weather radar. [A2107]

"Random binary waveform encoded ranging apparatus"

A ranging apparatus is provided having an encoded waveform signal which is generated by completely random sequence generator without second order statistics so that the waveform signal has a remote statistical probability of being analyzed. The modulated radio frequency waveform is transmitted to an object and the reflected signal is received by the ranging apparatus which comprises a digital solid state read-write memory arranged to have information written into the memory at a fixed frequency and arranged to have the information read out of the solid state read-write memory at a variable frequency to provide the equivalent of a rotating memory. The digital logic employed in the ranging apparatus is extremely accurate and not subject to drift and changes which could occur in analog type systems. The implementation of the ranging apparatus is accomplished with economical commercially available components thus providing an improved digital ranging apparatus. [A2108]

"Tracking filter for radio altimeter"

A filter for tracking the ground signal return in an FM/CW radio altimeter. The filter has a variable band pass frequency response which is adjusted as a function of the altitude measured by the altimeter. The control means of the filter respond to altitude measurements in digital format. [A2109]

"Radar arrangement for measuring velocity of an object"

44A radar arrangement (1) suitable for measuring the horizontal velocity v of an aircraft relative to the ground (2) comprises an high-frequency signal generator (10) including a transmitting aerial (9) , a receiver including two aerials (12, 11) spaced a distance d apart along a line in the direction of the velocity to be measured and respective mixers (30, 31) and filters (32, 33) , and a correlator (15) which determines the value (.tau.=d/v) of the delay of the signals received at the rearmost aerial (11) relative to those received at the foremost (12) for which the correlation is a maximum. The signal generator (10) generates two linearly frequency-modulated waves (E2, E1) and is controlled by the correlator (15) so that the interval between E2 and E1 equals .tau.. The height H of the aircraft can also easily be determined, being directly proportional to the beat frequency at the output of the filters (32, 33) . [A2110]

"Airport surveillance system"

Located adjacent to runways, taxiways, and approach ramps are secondary radar interrogators which radiate the P1 and P3 pulses and the P2 pulse via different directional patterns into sectors to be monitored which are individually assigned to each interrogator. Direction finders at different locations determine the directions of arrival of SSR reply signals radiated by an airborne SSR transponder in a sector to be monitored. From the directions of arrival and the locations of the direction finders, the respective transponder position is determined. The interrogators require no central control. Alternatively, the arrival times of the SSR reply signals are measured at several points, an evaluating device forms the differences in arrival time, and the intersection of the hyperbolic lines of position determined in the evaluating device is the position of the transponder. [A2111]

"Turbine blade vibration detection apparatus"

Turbine blade vibration detection apparatus having two or more extremely narrow beam radar sensors positioned to direct their radar signals towards predetermined blade row or rows. A blade identification circuit is provided for each blade row having an associated radar sensor for providing an output count indicative of which blade is being examined by a particular radar sensor. The gating of the blade count and radar sensor signals is governed by a computer which performs a frequency analysis of the radar signals and compares the result with predetermined threshold values. [A2112]

"Collision prevention system"

Apparatus for controlling movement of a heavy vehicle used in the mining and construction industries comprises a radar scanner (30) and an infra red detector (31) mounted at the rear of the vehicle for detecting a hazard in the path of the vehicle while reversing and a control system (10) responsive to the detection devices (30, 31) for controlling supply of air in a pneumatic supply system (11) of a retarder of the vehicle when a hazard is detected by the detection means (30, 31) . The control system (10) includes driver operable apparatus (19, 23 and 40) for releasing the retarder. [A2113]

"GSP/Doppler sensor velocity derived attitude reference system"

An accurate and constantly updated attitude instrument is provided for aiaft. The pitch and roll angles are calculated from two sets of velocity measurements, one set being derived from signals received from orbiting navigational satellites and the other set from on-board equipment which determines the aircraft's axial velocities. The on-board equipment may be a Doppler ground-speed sensor or an inertial system using accelerometers, the outputs of which are integrated to derive the axial velocities. [A2114]

"Hybrid velocity derived heading reference system"

An accurate and constantly updated heading reference is provided for movee vehicles, particularly aircraft. The heading is calculated from four velocity measurements, two of which are obtained from signals received from orbiting satellites, and two from on-board equipment which determines the vehicle's along-track and cross-track velocities. The on-board equipment may be a Doppler ground-speed sensor or an inertial velocity sensor using accelerometers, the outputs of which are integrated. [A2115]

"Method of and apparatus for guiding agricultural aircraft"

A microprocessor controls a radar trilateralization system, used on board an aircraft to provide pattern flying. A suitable hard wired board may be added to the microprocessor to enable it to read out any suitable flight pattern. A plurality of transponders are set up at known positions to establish a baseline. Then, by using known radar techniques, the system feeds radar derived, distance information into the microprocessor. The microprocessor calculates the airplane's position from these radar signals, relates that position to the X, Y grid locations in a desired flight pattern, and then gives an instrument readout. The pilot keeps a display of the instrument over an appropriate index, and the airplane flies over the entire predetermined flight pattern. [A2116]

"Doppler discrimination of aircraft targets"

Two discriminator circuits are used with Doppler radars to indicate the t of aircraft in the radar beam based on the modulating effect of the aircraft rotor or propeller on the Doppler return signal. The increase in the Doppler signal when a rotor or propeller becomes orthogonal to the incident radar beam causes a spike in the detected Doppler signal. The frequency of such spikes is an indication of the make and model aircraft being observed and the circuitry comprises means for sensing such frequency and operating one of a plurality of indicators if such frequency corresponds to that of a known rotor or propeller frequency of a particular make and model aircraft corresponding to that indicator. [A2117]

"Synthetic monopulse radar"

A synthetic aperture radar in which echo returns received at sampling points over the length of the synthetic aperture are stored and correlated to form an image of the reflecting surface. The echo returns taken at sampling points over the first half of the synthetic aperture length are integrated to form a first synthetic monopulse beam, the echo returns taken from sampling points over the second half of the synthetic aperture length are integrated to form a second synthetic monopulse beam, and the first and second synthetic monopulse beams are linearly combined to provide synthetic monopulse sum and difference signals suitable for performing various beam sharpening functions in accordance with techniques in use with sum and difference signals provided by conventional monopulse antennas. [A2118]

"System for determining the location of an airborne vehicle to the earth using a satellite-base signal source"

A satellite in geosynchronous orbit includes a source of signal illumination which is directed toward the earth, covering a given area thereof. An airborne vehicle, such as a missile, traveling over the area covered by the signal illumination from the satellite, includes a first antenna for receiving an incident set of signals from the satellite directly, and a second antenna for receiving the same signals from the satellite after they have been reflected from the earth's surface, referred to as a reflected set of signals. The altitude of the airborne vehicle may be ascertained by comparing the relative times at which the two sets of signals are received at the airborne vehicle, while the remaining location information, referred to as ground map information, may be ascertained by first determining range and angle data from the reflected signals and then comparing that data with ground map data stored aboard the airborne vehicle. [A2119]

"Proximity sensing"

A system for use in a gas-turbine engine, for controlling the clearance between the tips of the blades and a surrounding shroud, has a probe mounted in the shroud. A microwave oscillator supplies microwave energy to the probe which propagates energy towards the blades and receives energy reflected from the blades. A mixer is mounted remote from the probe and mixes the energy reflected from the blades with a reference signal derived either from energy transmitted by the oscillator or from the energy reflected by the tip of the probe. This produces interference dependent upon the phase difference between the energy reflected by the blades and the reference signal. From this phase difference, the system derives an indication of the separation of the blades from the probe and uses this to displace the shroud along its length, thereby altering the clearance between the tips of the blades and the shroud. [A2120]

"Airborne interrogation system"

The system according to the invention utilizes a transmission--reception radar antenna protected by a radome and an interrogation antenna having at least one set of two networks engaged laterally on the outer wall of the radome. The networks are arranged symmetrically to an axis of revolution of the radome. Supply means supply the interrogation antenna with an ultra-high frequency interrogation signal and the switching and phase-displacement means and the networks constitute an electronic scanning antenna. [A2121]

"Airborne frequency-modulation radar and its application to a missile homing head"

In an airborne frequency-modulation radar designed for the homing head of a guided missile, enhanced resolution both in distance and in velocity is obtained by making use of a solid-state transmitter in conjunction with a frequency-modulating oscillator and by means of a receiver comprising a controlled frequency-shift oscillator. [A2122]

"Process and apparatus for geotechnic exploration"

A process for geotechnic exploration comprising the steps of: (a) Emitting one or more brief electromagnetic pulses or waves from an airborne platform at regular intervals based on the airspeed of the platform and the area being surveyed, (b) The wavelengths, frequencies and cyclicity of the waves being selected to provide, upon reflection, satisfactory indicia of the physical characteristics of the area being measured, (c) Receiving the reflections of said waves at said platform, (d) Amplifying said reflected waves to a readily processable level, (e) Processing said waves to enhance the spatial resolution of images produced therefrom, (f) Further processing said waves by selecting those variables represented by the waves that are deemed relevant, (g) Displaying said waves in visual form representing a cross-section of an area, (h) If desired, storing in recoverable form the signals representing said variables, and (i) Repeating said process as often as desired. The invention includes the aircraft-mounted radar apparatus for performing the process. [A2123]

"Radar systems"

A target tracking airborne active radar system in which a reduction in transmitter power is achieved by using individual amplifiers in the aerial quadrant channels. The amplifiers provide gain on transmission and negligible loss on reception and are realized by Impatt diode/hybrid junction modules. [A2124]

"Aircraft location and collision avoidance system"

A location system and method whereby the azimuth and range information of an aircraft with respect to a reference ground station is made available to other aircraft by transmission of a pulse at a time uniquely associated with the aircraft's location. A synthetic azimuth function and a synthetic range function provide a periodic mapping of an area. The synthetic azimuth function is a slowed, time-expanded representation of a conventional azimuth function. Each azimuth increment is allocated a time slot in the synthetic azimuth function. The synthetic azimuth function is synchronized by counting a number of synchronizing pulses from the conventional azimuth function, and a synthetic azimuth reference pulse is periodically transmitted from a reference ground station to synchronize all aircraft using the synthetic azimuth function. During the particular synthetic azimuth function time slot corresponding to an aircraft's azimuth, a pulse is transmitted and the aircraft's range is encoded as the time-delay of that pulse with respect to the most recent conventional azimuth synchronizing pulse, providing a synthetic range function which is embedded in one of the synthetic azimuth degree increments. Display and collision warning devices are also synchronized and operated by this location system. [A2125]

"Servomechanism for doppler shift compensation in optical correlator for synthetic aperture radar"

A method and apparatus for correcting doppler shifts in synthetic aperture radar data. More particularly, in an optical correlator (10) for synthetic aperture radar data having a means for directing a laser beam (22) at a signal film (12) having radar return pulse intensity information recorded thereon, a resultant laser beam (32) then passing through a range telescope (34) , an azimuth telescope (38) , and a Fourier transform filter (36) located between the range and azimuth telescopes, thereby forming an image for recordation on an image film (40) , a compensation means for doppler shift in the radar return pulse intensity information includes a beam splitter (46) for reflecting the modulated laser beam, after having passed through the Fourier transform filter (36) , to a detection screen (48) having two photodiodes (66 and 68) mounted thereon. The photodiodes are positioned on each side of the Gaussian distribution of the Fourier transform spectrum reflected by the beam splitter (46) . Doppler shifts in the synthetic aperture radar data are detected by a shifting of the Gaussian distribution curve in one direction or the other, thus resulting in unequal light level intensities at the two photodetectors (66 and 68) . Control electronics (52) are disclosed for processing this unequal light level intensity and controlling appropriate optical elements in the optical correlator in order to compensate for the doppler shift. Control is effected until the light level intensities at the two photodetectors are again equal. [A2126]

"Clutter free synthetic aperture radar correlator"

A synthetic aperture radar correlation system including a moving diffuser located at the image plane of a radar processor. The output of the moving diffuser is supplied to a lens whose impulse response is at least as wide as that of the overall processing system. A significant reduction in clutter results. [A2127]

"Use of bistatic radar system for determining distance between airborne aircraft"

A bistatic passive radar system and method for airborne use in a first aircraft in conjunction with a host transmitter located in a second aircraft that may be at a different altitude than the first aircraft, characterized by a system and method for determining the distance between the aircraft. The system for determining the distance between the aircraft includes a system for receiving radar signals from the host transmitter directly and via reflection from a selected ground target located between the two aircraft, a system coupled to the receiver for determining the apparent range R.sub.a from the host transmitter on the second aircraft to the receiver on the first aircraft in response to receipt of the radar signals, a device on the first aircraft for determining the altitude H of the first aircraft, a device on the first aircraft for determining the angle .theta. with respect to vertical at which the radar signals are received directly from the host transmitter, a device on the first aircraft for determining the angle .phi. with respect to vertical at which the reflected radar signals from the ground are received, and a computer system on the first aircraft for computing the distance D between the two aircraft from the determined values of R.sub.a, H, .theta. and .phi.. The system further includes an alphanumeric display device coupled to the computer system for providing an alphanumeric readout of the computer value of the distance D between the aircraft. [A2128]

"Satellite-based vehicle position determining system"

A system for determining the positions of a plurality of vehicles traveling on or above a defined sector of the earth's surface comprises a transponder carried by each vehicle for transmitting a uniquely coded beacon signal in response to a general interrogation signal, at least three repeater-carrying satellites at spaced orbital locations above the earth for receiving and retransmitting the beacon signals produced by the vehicles, and a ground station for periodically transmitting the general interrogation signal and for receiving and processing the beacon signals retransmitted by the three satellites in order to determine vehicle position. In order to avoid signal overlap and equipment saturation at the ground station, each vehicle transponder includes means responsive to the general interrogation signal for inhibiting the transmission of further beacon signals by the transponder for a predetermined time interval following the response of the transponder to the general interrogation signal. In a preferred embodiment of the invention, the inhibited interval of the vehicle transponders may be varied automatically in response to a command signal transmitted by the ground station. [A2129]

"Topographical mapping radar"

1. In a terrain contour mapping system in an aircraft, the combination of a dipole radar antenna consisting of two vertically spaced fan beam antenna poles mounted on the aircraft, means to transmit radar signals at a depressed angle from the antenna in directions normal to the flight path of the aircraft, means to measure and record the phase difference in the radar signals received at the two poles of the antenna when the signals are reflected from the earth, an inertial system to measure and record airborne platform orientation and position, means to combine

the orientation and position information with the recorded radar information, and ground stationed means adapted to receive the combined information to provide a three coordinate output signal which determines points on a map representing the contour of the terrain flown over by the aircraft. [A2130]

"Microwave interferometer"

A microwave interferometer comprising a source of microwave energy the output of which is equally divided between an antenna and a short circuit. The antenna is adapted for the transmission of microwave energy to and the subsequent reception of reflected microwave energy from an object in close proximity to the antenna. The phase difference between the microwave radiation reflected from the short circuit and the object is directly proportional to the distance between the antenna and the object. [A2131]

"Apparatus for producing a single side band"

An apparatus for producing a single side band at systems where a signal of a certain frequency is received, frequency-shifted and reflected. The apparatus comprises a modulator (b 26) , which includes only one diode (44) . To the diode are applied a series of different voltage levels generated in a commutator circuit (41) , which voltage levels are at least three in number. A tuning circuit (45) is provided between the diode and an aerial (25) . The tuning circuit (45) is adjusted to act upon the amplitude and phase variations occurring at the diode (44) at the different voltage levels applied, so that the reflection coefficients of the diode (44) and the characteristics of the tuning circuit (45) together satisfy the condition for a single side band to be formed and transmitted from the aerial (25) . [A2132]

"Continuous-wave radar responder having two-position switches"

The invention relates to C-W radar responders, having a carrier of some gigahertz whose amplitude is modulated between some dozens and some hundreds of kilohertz. Such a responder comprises means for sampling the signal it receives in such a manner that the sampling theorem is satisfied with respect to the amplitude-modulation frequency. The responder comprises at least an aerial, a radio-frequency amplifier, a delay line, a clock generator, an input, an output and two switches connected to the input and to the output, respectively, of the amplifier. The operating sequence of the switches, controlled by the clock generator, is such that each sample of the received signal passes through the amplifier more than once before it is re-transmitted. [A2133]

"Waveform encoded altitude sensor"

The present invention provides a spread spectrum waveform encoded altimeter. Spread spectrum carrier wave signals which are transmitted and later received are processed in a novel edge detecting apparatus which includes a plurality of individual detectors. A pair of detectors are provided to detect an early chip or signal. Another pair of detectors are provided to detect a late chip or signal. There is also provided a pair of edge chip detectors for detecting the center or locked on chip signal. Logic circuits are employed to sum the voltage signals from the detectors and to provide a control signal capable of adjusting a tracking generator to enable it to lock on to the received signal. An altimeter counter is provided which is started by a unique chip in the transmitted signal and stopped when the same unique chip is detected in the receiving and tracking loop. [A2134]

"Noncoherent two way ranging apparatus"

An accurate radio frequency ranging system is provided for measuring the time of transmission of a signal from a first station to a second station and back to the first station without coherent turn-around of the signal. Each of the two stations is provided with its own range measuring means and its own reference clock. The first station range measuring device is started by the first station reference marker and is stopped by the second station reference marker start signal transmitted from the second station to provide a first range measurement. The second station range measuring device is started by the second station reference marker and is stopped by the reference marker start signal transmitted from the first station to provide a second range measurement. The sum of the two range measurements contains the data necessary to calculate the true range between stations and the difference between the two range measurements contains the data necessary to calculate the offset between the two reference clocks without the two reference clocks being synchronized or locked to each other. [A2135]

"Multibeam single frequency synthetic aperture radar processor for imaging separate range swaths"

A single-frequency multibeam synthetic aperture radar for large swath imaging is disclosed. Each beam illuminates a separate "footprint" (i.e., range and azimuth interval) . The distinct azimuth intervals for the separate beams produce a distinct Doppler frequency spectrum for each beam. After range correlation of raw data, an optical processor develops image data for the different beams by spatially separating the beams to place each beam of different Doppler frequency spectrum in a different location in the frequency plane as well as the imaging plane of the optical processor. Selection of a beam for imaging may be made in the frequency plane by adjusting the position of an aperture, or in the image plane by adjusting the position of a slit. The raw data may also be processed in digital form in an analogous manner. [A2136]

"Radio ranging"

A continuous wave frequency modulated ranging system for measuring the dince between the system and a reflecting body. The system generates certain functions of the Doppler signal envelope which have readily identifiable characteristics at specified ranges. This information is used with the amplitude of the received CW-FM signal to determine first by amplitude that the missile is at the approximate desired height, and then to determine by the generated functions the point of burst of the projectile. [A2137]

"Method and apparatus for remote measurement of wind direction and speed in the atmosphere"

An acoustic wave source and a radio wave source are installed close to each other on the ground. When an acoustic wave pulse is transmitted vertically into the atmosphere by the acoustic wave source, spherical wavefronts formed in the atmosphere by the acoustic wave are propagated upwardly at the velocity of sound. When a continuous radio wave is transmitted from the radio wave source toward the spherical wavefronts, it is reflected by the wavefronts and the reflected radio waves are converged to form a focusing spot on the ground. The position where the spot due to the convergence of the reflected radio waves is formed with the maximum intensity is detected by means of an antenna network formed of a multiplicity of receiving antennas laid out in the pattern of a lattice. The time-course change of such positions of the spots is traced to realize remote measurement of the height distribution of wind direction and speed in the atmosphere under surveillance. [A2138]

"Communications systems utilizing a retrodirective antenna having controllable reflectivity characteristics"

A communications system is described which utilizes an antenna having means for selectively controlling the amount of incident electromagnetic energy directionally reflected therefrom. The antenna is comprised of a spherically configured array of conductors which focus incident energy on a reflector whose electrical conductivity characteristics and thus reflectivity characteristics can be controllably varied. The reflector can comprise a gas tube whose conductivity and thus reflectivity characteristics are a function of the number of ionized gas molecules therein. Modulation of the reflector reflectivity characteristics permits identification information, for example, to be impressed on the energy reflected therefrom. [A2139]

"Checking the location of moving parts in a machine"

In order to monitor the clearance between turbine blades and the casing of a turbine engine millimetric microwave radiation of wavelength .lambda. is propagated along a waveguide and through an aperture to a turbine blade. The aperture is small in relation to the area of the blade facing the aperture, and the aperture has a spacing of .lambda./4 or less from the blade. A balanced mixer compares the phase of the wave reflected from the blade with a reference pulse to provide a measure of the clearance. Circuits may be provided for monitoring the spacings between blades, and to indicate blades which are damaged. [A2140]

"Synthetic array processor"

A synthetic array processor wherein radar data, received from an area to be mapped during a plurality of subarray flight path segments, is electronically focused in parallel processing channels to form a series of approximately rectangularly shaped low azimuth resolution maps, and signals associated with corresponding portions of each low resolution map are further processed by means of digital filtering techniques to provide, in a format readily adapted for display, a high azimuth resolution map. [A2141]

"Doppler signal processing circuit"

A signal processing circuit for producing a warhead firing pulse when the rhead is in a position to cause maximum target damage in a missile, target encounter. The received doppler signal is processed through filter circuits and a first band-pass amplifier. A second band-pass amplifier tuned to pass a narrow portion of the frequency spectrum above the doppler signal is connected in parallel with the first amplifier and its output signal is used to vary the threshold bias to compensate for the presence of extremely noisy signals. [A2142]

"Apparatus for synchronized reception in connection with system for recording objects"

An apparatus for synchronized signal reception wherein a first signal of frequency f.sub.o is transmitted by a first unit and is reflected by a second unit, which thus transmits the reflected second signal. The reflected signal is modulated by information which is supplied by a coding device 27 in said second unit, which coding device generates a coded pulse train 27p in the form consisting of pulses, i.e. information symbols. A pulse generator 28 is controlled by the pulse train to emit a signal with one of two frequencies k.sub.1 and k.sub.2, respectively, in dependence upon the binary state of the pulse train. The signal is divided in a frequency divider 29 to provide frequencies k.sub.1 /n and k.sub.2 /n, respectively, which are supplied to the coding device 27, causing the coding device to emit said pulses with lengths which are related to the cycle lengths of frequencies k.sub.1 /n and k.sub.2 /n, respectively. The signal generated in the pulse generator 28 with the frequencies k.sub.1 and k.sub.2, is applied as a modulating signal to the modulator 26, which generates a single sideband with the alternating frequencies f.sub.o +k.sub.1 and f.sub.o +k.sub.2, respectively, constituting said second signal. The receiver 23 of the first unit receives the reflected second signal and scans said information symbols by means of the duration of the signal in dependence of the frequency of the signal. [A2143]

"Unambiguous doppler radar"

A digital pulse compression radar system with interrupted, phase coded, high duty ratio transmissions which allow contiguous range resolution cells to be established in coverage space and provide adequate airframe impulse excitation recovery time to render high duty ratio, phase coded, radar feasible for airborne applications. Each pulse is subdivided into a predetermined number of subpulses or bits, which are phase coded with (in-phase or out-of-phase) reference to a master oscillator. In the preferred embodiment, the code is built up from a PRN code staggered over .sup.2 n-1 pulses, each containing m resolution elements, where n is an arbitrary number designating the degree of the code and where m is an arbitrary number or is equal to the number of bits per pulse. The correlation properties of the code are such that when all bits of the returned pulses representing a word align with the delayed transmitted word, all bits add. When the bits do not align precisely, the bits generally cancel each other. Because of this, partial pulse overlaps do not produce a noticeable effect and ambiguity of the range is no longer limited by the time separation of adjacent pulses. [A2144]

"Continuous wave adaptive signal processor system"

A spread spectrum carrier wave device, such as an altimeter, is provided having a transmitting antenna in close proximity to the receiving antenna. The reference signals being transmitted are electromagnetically coupled into the receiving system as undesirable signals. When the strength of the undesirable signals becomes stronger than the desired signals, they mask the desired signals and make them difficult to recover. The undesirable signals are removed from the receiving path by generating a replica of the undesired signals and applying them to an input of an adaptive processor with the signals in the receiving path. After the undesired signals are removed by the process of adaptive nulling, the desirable signals are recovered and processed. [A2145]

"Bistatic imaging radar processing for independent transmitter and receiver flightpaths"

A process for correcting data from a bistatic synthetic aperture radar to eliminate distortions and resolution limitations due to the relative positions and motions of the radar transmitter and receiver with respect to a target. [A2146]

"Echo tracker/range finder for radars and sonars"

An echo tracker/range finder or altimeter in which the pulse repetition frequency (PFR) of a predetermined plurality of transmitted pulses is adjusted so that echo pulses received from a reflecting object are positioned between transmitted pulses and divide their interpulse time interval into two time intervals having a predetermined ratio with respect to each other. The thus-adjusted PRF is related to the range of the reflecting object. More specifically, the invention provides a means whereby the arrival time of a plurality of echo pulses is defined as the time at which a composite echo pulse formed of a sum of the individual echo pulses has the highest amplitude. This arrival time is determined by dividing an interpulse time interval between adjacent transmitted pulses into a predetermined plurality of corresponding time increments. The sum of a plurality of echo pulse portions occurring within each corresponding time increment defines the composite echo pulses, the time increment containing the highest sum defining the arrival time for the plurality of echo pulses. Having determined the arrival time with respect to the interpulse time period, the transmitted PRF is automatically adjusted so that the arrival time divides the interpulse time interval in accordance with a predetermined ratio, this PRF then being related to the range or altitude of the reflecting object. The invention is applicable to radar systems, sonar systems, or any other kind of system in which pulses are transmitted and echoes received therefrom. [A2147]

"Airport-surveillance system"

An airport-surveillance system for determining the position and identification of aircraft (4) on the airfield which utilizes secondary radar and includes an interrogation station (1) installed on the airfield (3) and from which the interrogation signal is transmitted by way of a narrow sharply forcused beam of an antenna which scans the airfield and further includes transponding stations installed in the aircraft (4) . The present invention provides accurate identification and location of the aircraft by utilizing a receiver which has a sharply focused antenna beam and which is geographically located a distance away from the interrogation antenna and wherein the replies from the transponder of the aircraft are received by the receiving antenna only when the interrogation and receiving antenna beams (2, 22) intersect. By scanning all locations of the airport, the position and identification of all aircraft on the airport can be determined. A modification of the invention provides that instead of or in addition to the receiving station having a narrow beam antenna a number of receivers (5, 6 and 7) having omni-directional receiving antennas can be mounted at different locations on the airfield for determining the aircraft positions by using hyperbola locating techniques. The airport surveillance system of the invention is particularly suitable for large airports. [A2148]

"Intrusion detection system having look-up sensor instrumentation for intrusion range and altitude measurements"

Range and elevation measurement ambiguities in upward looking intruder detection systems are eliminated by look-up sensor instrumentation that utilizes monostatic and bistatic radar principles. Intruder detection systems that have the capability of monitoring the air space over the perimeter of an area to be protected and that employ radar ranging techniques and guided wave sensor generate only limited or ambiguous intrusion event information. That is, the r.f. signals that are transmitted and received travel from the transmitter-receiver-processor location through the sensor, up to the intrusion and back through the same path. The data developed is thus the same for high altitude close range intrusions as it is for low altitude distant intrusions. This ambiguity is eliminated by utilizing a transmitter and receiver at one end of the upward looking sensor and a second receiver at the other end. The transmitter and its associated receiver comprises a monostatic radar and the transmitter and the other receiver comprises a bistatic radar. The conventional monostatic radar measures total distance from the transmitter to an intrusion. The bistatic radar measures intrusion altitude only. The two radar outputs are differenced by a processor to determine range. [A2149]

"Stand alone collision avoidance system"

A stand alone collision avoidance system is disclosed for mounting to a large passenger jet especially to avoid the collision problem common to such large jets colliding with small propeller driven aircraft. A bistatic radar antenna system is disclosed having a frequency in the range of 40 Giga Hertz (hereafter GHz) . Paired bistatic antennas are used with each couplet of bistatic transmitting and receiving antennas searching one quadrant of a total forward hemisphere of search in the direction of plane travel. Paired transmitter antennas, one for each quadrant, are typically located above and below the nose located weather radar and are mechanically scanned side to side in the typical "beaver tail" scan with the beaver tail occupying 100.degree. of elevation and 0.71.degree. of beam width. Paired receiving antennas, again one for each quadrant, are located with one such antenna on the leading edge of the vertical stabilizer or tail and the other antenna on a special mast lowered in a position where landing gear shadow does not obscure forward view. Each receiving antenna is mechanically scanned side to side synchronously with its transmitter antenna and consists of a phased array with a vertical scan generated from about 500 discrete linearly disposed receiving elements for vertical resolution of up to 0.21.degree.. The antenna is responsive only to radar return signals approaching the antenna in a narrow vertical angular range, at some desired, and variable, vertical angle. [A2150]

"Secondary surveillance radar"

A secondary surveillance radar is provided with means for reducing the effect of undesirable reflections on the interrogation pulses transmitted by the radar and the replies received in response to the interrogations. In addition to a directional antenna a further omni-directional antenna is provided and the energy of certain of the interrogation pulses are shared between the two antennas in such a manner as to enhance suppression of replies from aircraft which are located at angles away from the boresight of the directional antenna. [A2151]

"Target locating and missile guidance system"

A target locating and missile guidance system comprising reconnaissance araft equipped with laser or radar range-measuring apparatus in conjunction with a plurality of selectively predetermined ground stations. Range and altitude of the aircraft relative to a detected surface target are obtained at two or more points on its flight path. The positions of the aircraft with respect to the ground stations are simultaneously determined by pulse-time-of-arrival technique. Using triangulation techniques the location of the target is determined with respect to a pulse grid coordinate system associated with the ground stations. At any time after the determination of the location of the target, properly timed signals from the ground stations or command signals based upon time-of-arrival data with respect to pulses from the missile are used to provide accurate guidance of the missile to the target. [A2152]

"Polyphase coded mixer"

A radar fuzing system for a guided missile is shown to include means for impressing a polyphase coded modulation on a transmitted signal and delayed replicas of such modulation on a bank of correlator/mixers, each one of the latter including dual gate field effect transistors as the active elements. [A2153]

"Polyphase coded fuzing system"

A radar fuzing system for a guided missile is shown to include means for impressing a polyphase coded modulation on a transmitted signal and delayed replicas of such modulation on a bank of correlator/mixers, each one of the latter including dual gate field effect transistors as the active elements. [A2154]

"Clock invariant synchronization for random binary sequences"

The present invention relates to method and apparatus for performing miss identification (MID) and decoding messages communicated to an identified missile without the use of a synchronous internal clock. [A2155]

"Collision avoidance warning system"

An aircraft collision-avoidance system utilizing a known-location navigational ground station to enable a primary aircraft to determine its own location and employing a known-location air surveillance radar including an interrogator to determine the location, velocity, course and altitude of a potentially conflicting other aircraft. The technique utilizes the time between the inception of an interrogating pulse and the reception of a transponder response from the target aircraft to compute the position and altitude of said target aircraft, and employs storage of repeated timed samplings of the data and subsequent replacement of the data as a series of dots on a display to establish a line showing the relative motion of the target aircraft with respect to the primary aircraft. An alarm device is provided to direct aircrew attention to potential conflicts predicted by a data processor carried by the primary aircraft and forming part of the system. [A2156]

"Real-time multiple-look synthetic aperture radar processor for spacecraft applications"

A spaceborne synthetic aperture radar having pipeline multiple-look data processing makes use of excessive azimuth bandwidth in radar echo signals to produce multiple-look images. Time multiplexed single-look image lines from an azimuth correlator go through an energy analyzer which analyzes the mean energy in each separate look to determine the radar antenna electric boresight for use in generating the correct reference functions for the production of high quality SAR images. The multiplexed single look image lines also go through a registration delay to produce multiple-look images. [A2157]

"Non-linear raster generator"

A display system utilizing a non-linear raster generator is disclosed. As is conventional in raster scan displays, the scanning is controlled by two electrical signals arbitrarily designated the X and Y deflection signals. In the preferred embodiment, two memories are used to store signals which provide constants to control the amount of the non-linearity of the raster. These constants are processed to generate X and Y deflection signals which are generally hyperbolic in nature. This type of display is particularly useful for displaying mapping signals produced from airborne doppler radar. [A2158]

"Acoustic detection of wind speed and direction at various altitudes"

An acoustic apparatus for ascertaining wind speed and direction at various altitudes which uses back scattered acoustic waves which are formed from acoustic pulses of predetermined frequencies, are transmitted on at least two planes and the frequency spectrum and power of back scattered signals are measured, the received signal is divided into a number of discrete frequency channels and these divided signals are used to provide a velocity indication at various altitudes at sequential time intervals. [A2159]

"In-flight aircraft weather radar calibration"

A weather radar calibration system, wherein one or more radar reflectors are located at a known position adjacent to an airport runway. Each of the reflectors are shaped to direct reflective patterns of known radar cross-section in response to radar signals transmitted from an aircraft following a known guidance path to the airport. The aircraft radar detects the radar return signals from the reflectors. Circuitry is responsive thereto for utilizing the radar returns for calibrating the weather radar for precipitation measurement and display purposes. The design of the reflectors is such as to minimize multipath reflections off the ground and prevent them from disturbing the reflective properties for aircraft following the guidance path. [A2160]

"Linear Bessel ranging radar"

A narrow band CW FM fixed height altimeter system utilizing linear Bessel function signal processing wherein a J.sub.0 and a J.sub.1 Bessel function signal component are compared in a biased comparator to yield an output signal at a predetermined, relatively low altitude. The system provides a very small, accurate, low cost solution to the problem of identifying a very low and predetermined altitude. [A2161]

"Range swath coverage method for synthetic aperture radar"

A synthetic aperture radar antenna, which is mechanically scanned through the squint mode, is operated to a selected roll angle to optimize the alignment of the antenna beam axis or isogain line, and the line of constant doppler frequency or isodop line. The roll angle is selected as a function of the angular position of the antenna in azimuth and elevation. [A2162]

"Range determining system"

A range finding method and system comprising an interrogator and a transponder. The interrogator generates a signal with a first portion comprising a carrier signal amplitude modulated by a first two-level iterative pseudo random sequence (PRS) whose level changes coincide with level changes of a first two-level tone of frequency f.sub.T, which phase modulates said first portion. A second portion of the signal is phase modulated by the product of the PRS and said first tone. The transponder tracks the received interrogation signal and then generates and transmits a responsive signal having first and second portions comprised of a carrier signal phase modulated by a second two-level tone phase synchronized with the received first tone. The first portion is further amplitude modulated by a second iterative PRS phase synchronized with the received PRS signal, and the second portion is further phase modulated by the second, phase synchronized PRS. In response to the responsive signal, the interrogator generates a tracking tone of frequency f.sub.T, precisely phase locked by means including an arithmetic synthesizer, with the received second tone. The phases of the received second PRS and the originally generated first PRS are compared to determine the round-trip signal propagation time and thus the range. [A2163]

"Remote sensing device"

A system for battlefield and enemy support area surveillance. An air-drop unit monitors and records on tape enemy activity, and plays back and transmits the monitored data at high speed when interrogated by a coded signal from friendly aircraft. [A2164]

"Helicopter rotating blade detection system"

An airborne pulse doppler radar set generally includes a moving target indicator (MTI) system for detecting moving aircraft within its scanning purview. To avoid processing undesirable clutter, the MTI system includes a clutter cancelling type filter for rejecting doppler shift frequency signals reflected from objects moving at velocities below a predetermined minimum velocity value. Unfortunately, the doppler shift frequencies representative of the body velocity of most helicopters fall within this clutter repetition band and may go undetected by the MTI system. To detect these helicopters, a helicopter detection system which operates on the specular flash energy of the doppler shift frequency signals reflected from the rotating blades of a helicopter is provided. The helicopter detection system passes substantially the received reflected radar signals that have doppler shift frequencies representative of the helicopter rotating blade velocities, derives a threshold value based on the values of the passed signals, and generates detection signals at times corresponding to the passed signal values which are at least that of the derived threshold value. In addition, the helicopter detection system is capable of inhibiting the generation of the detection signals at time corresponding to the reception of interference type radar signals by the radar set. Furthermore, an unambiguous range of each detected helicopter may be computed. Moreover, the helicopter detection system has the capability of distinguishing between detected targets having even and odd numbers rotating blades. [A2165]

"Aircraft proximity monitoring system"

An aircraft proximity monitoring method according to the invention comprises the steps of: continuously and repeatedly developing and transmitting signals corresponding to the positions relative to a first location of aircraft within a predetermined range of said first location receiving said transmitted signals at a given aircraft and transposing the signals corresponding to the positions of the others of said aircraft to said second signals corresponding to the positions of said other aircraft relative to the location of said given aircraft and producing an observable indication of the positions of said other aircraft relative to said location of said given aircraft. Apparatus according to the invention includes apparatus for performing each of the foregoing steps. [A2166]

"Digital data compression circuit"

An airborne weather radar system displays on a display screen a weather map in the form of a matrix of spots of intensity with N possible intensity levels ranging from a lowest level to a highest level where N>,2 and where the intensity levels correspond to respective data signals provided by the radar system. The intensity control on the weather radar system is operator controllable to cause data signals corresponding to all intensity levels except the lowest to be converted to signals corresponding to the highest level. Therefore, only the highest and lowest intensity levels are displayed. [A2167]

"Rolling dual mode missile"

In a rolling missile a seeker system which is responsive to two forms of energy emanating from a target. The system has the capability to switch between guidance modes during its path towards its intended target. [A2168]

"Homing system and technique for guiding a missile towards a metal target"

A homing system is provided for guiding a missile (10) towards a metal target. The metal target is illuminated by a radar unit (12) with a transmitted RADAR signal of predetermined frequency. The target reflects the RADAR signal and produces HARMONIC signals having frequencies that are harmonic with the predetermined frequency. An antenna (14) is mounted in the missile for receiving signals, including the HARMONIC signals produced by the target. A wave guide bandpass filter (18) receives signals from the antenna and passes selected HARMONIC signals to a filter output. A detector (34) is responsive to selected HARMONIC signals passed by the filter (18) to produce STRENGTH signals proportional to the signal strength of the selected HARMONIC signals. The STRENGTH signals are received by an error circuit (48) that produces ERROR signals indicating the direction of the target relative to the missile (10) . [A2169]

"Radar systems"

A synthetic aperture radar system is provided in which the receive beam is controlled as to its directivity so that it moves over a required swathe in accordance with the direction of reflection of an interrogating radar pulse over that swathe. In a specific example a receiving array of linear feeds has its outputs connected to respective variable phase shifters which are controlled in dependence upon the predicted relationship between the direction from which reflected energy due to a transmitted pulse will be received and the time elapsed from the transmission of said pulse. The outputs from the variable phase shifters are combined and applied to a receiver. [A2170]

"Independent landing monitor"

This invention comprises means for monitoring the operation of an aircraft landing guidance system which functions independently of the landing guidance system. The means include a radio altimeter aboard the aircraft, a reflector positioned on the ground at a predetermined location along the prescribed approach path to provide enhanced return of the altimeter signal and means for comparing the actual radio altitude with a predetermined altitude value to provide an indication of the location of the aircraft within a tolerable distance from a prescribed point on the approach path. [A2171]

"Aircraft weather radar system"

A low cost airborne weather radar system suitable for mounting in the wing of a single engine aircraft. The radar antenna is a truncated parabolic dish. The receiver/transmitter, relative to parameters used in a conventional receiver/transmitter operates at relatively small peak transmitter power with a relatively long transmitter pulsewidth which, in turn, is matched to the receiver bandwidth. The relatively small peak power allows for acceptable range performance due to the relatively larger pulse width. Further, the receiver/transmitter assembly is significantly reduced in size so as to facilitate location in an aircraft wing and be thereby directly connected to the antenna to eliminate range reducing intercabling losses. [A2172]

"Image processing for bistatic image radar"

A process for correcting data from a bistatic synthetic aperture radar to eliminate distortions and resolution limitations due to the relative positions and motions of the radar transmitter and receiver with respect to a target. [A2173]

"Electronic stabilization for displaced phase center systems"

In moving target indication or synthetic aperture systems, double pairs of measurements of returned energy are made from displaced spatial locations to enable computation of side and angular deviation from the flight path, without the requirement for inertial navigational measuring instruments. [A2174]

"Pulse radar altimeters"

The invention relates to pulse radar altimeters for aircraft wherein the altimeter includes a variable beam width receiver antenna for receiving radar ground echoes, a timer for measuring time intervals between transmitted pulses and received ground echoes thereof, and control means responsive to the output of the timer and arranged to vary the beam width of the antenna in accordance with the values of the measured time intervals. [A2175]

"FM Autocorrelation fuze system"

1. An FM doppler fuze system comprising means forcombining a periodic wave ith white noise, white noise being a random mixture of frequencies possessing a constant power spectral density, means for modulating a carrier frequency with said periodic wave plus noise and transmitting a signal in the direction of a target, means for mixing a portion of said transmitted signal and a return echo signal from a target, and means for passing the band of expected doppler frequencies from the output of said mixer to provide an output operable to actuate the detonation circuit of a fuze. [A2176]

"Tactical nagivation and communication system"

Method and apparatus are provided for the tactical nagivation and communiion of a community of aircraft. Each of the aircraft in the community is provided with an inertial navigation system capable of providing accurate short term navigational information and a time synchronized ranging system capable of providing accurate long term navigational information. One of the aircraft is designated as the airborne control unit and establishes a relative grid coordinate system within which the community of aircraft operate. The origin of the relative grid is established by the airborne control unit. When stationary ground time synchronized ranging system units are present, highly accurate georeferenced information may be supplied to the airborne control unit by operation of its time synchronized ranging system. When such ground units are not present, accurate georeferenced information may be obtained by the airborne controller from navigational systems such as satellite, Loran or Omega systems. The remaining or "user" aircraft in the community determine their position in the relative grid by interrogating the airborne control unit with their time synchronized ranging systems. A Kalman filter technique is employed to update the short term navigational information derived from the inertial navigation system in each user aircraft with the long term navigational information obtained from the time synchronized ranging system, so that the highly accurate georeferenced navigational information from the airborne control unit is provided to each member of the community of user aircraft. Novel computer programming permits each aircraft in the community to derive navigational information having the best characteristics of navigational information available from several sources, so that very accurate navigation in the area defined by the relative grid is made possible. The system of the invention may also perform communication and identification functions for the members of the tactical community. [A2177]

"Method of returning to a last point in a path after a temporary discontinuance of an operation"

In conjunction with an operation of flying a plurality of parallel paths in a predetermined pattern utilizing an electronic positioning apparatus including a radar for periodically measuring the distance of the apparatus from each of two spaced apart reference stations and for continuously computing the distance of the apparatus along any of the parallel paths, a method of returning to a last point in a path of the pattern after temporary discontinuance of the operation including resetting an original reference coordinate system so that the zero point thereof coincides with the last point and providing a distance indicator which indicates distance along an axis of the coordinate system so that the pilot can use the indicator to fly the airplane back to zero in the coordinate system. [A2178]

"System for tracking a moving target with respect to a frame of reference of unvarying orientation and fixed origin relative to earth"

A system for tracking a moving target from a moving carrier. The tracking system is provided with a device for measuring the position of the target in relation to the carrier and with a servocontrol unit for servo controlling the aiming of the device. The error between the position of the target and a position estimated for it is given by the measuring device in spherical coordinates. The tracking system is further provided with a converting unit, in which the spherical coordinates are converted into cartesian coordinates. A frame of reference changing unit and a trajectory simulator of the target allow the position of the target to be calculated in relation to a cartesian frame of reference of unvarying orientation and fixed in relation to the earth. A frame of reference changing unit in the opposite direction and a unit for controlling the position of the device for measuring the position of the target on the basis of the simulated position coordinates allow through the servo control unit the aiming of the device for measuring the position of the target to be controlled. [A2179]

"Apparatus for automatically measuring the vertical profile of the temperature in the atmosphere"

An apparatus for automatically measuring the vertical profile of the temperature in the atmosphere. The temperature of the air is obtained by the measurement of the propagation speed of sound wave pulses, to which it is directly related, by means of a continuous Doppler radar. The automation of the measurement is ensured by the automatic control of the radar emission frequency by the Doppler frequency which it receives, with reference to the frequency of the sonic emitter oscillator. The apparatus presents a major advantage with respect to known methods in use for measurements of the lower layers of the atmosphere such as the meteorological towers and the sounding balloons due to its automatic functioning. [A2180]

"Random FM autocorrelation fuze system"

1. An FM doppler fuze system comprising means for transmitting a signal hng a carrier frequency modulated by a band of random noise, means for mixing the transmitted signal with a return echo signal modified by the doppler effect of the relative movement between the fuze and a target, and means for deriving an output adapted to actuate the fuze from the low frequency doppler portion of the output from said mixing means. [A2181]

"Bullet hit indicator scoring system"

In a target to be towed by a vehicle, such as an airplane or the like, a radar transmitter and receiver each having separate antennas mounted in spaced apart relation at the front and back of the target, said transmitter being periodically pulsed and said receiver being turned on periodically at a given time after each pulse to produce a generally ellipsoidally shaped, shell-like sensitive volume around the target in which the radar will sense bullets, and the receiver being further constructed to sense only positive Doppler signals so that only bullets entering the sensitive volume will be scored. [A2182]

"Synthetic array autofocus system"

A system for automatically focusing a synthetic array through derivation of focus error signals which may be used such as by summing a priori data so that the synthetic array data may be optimally focused. Focus error data is derived by forming the synthetic array in three sub-array. The resultant outputs of these three sub-arrays are further processed together to extract data corresponding to the degree of total array defocus. for purposes of imagery generation, the phase and amplitudes of these three sub-array resultants are vectorially summed together and the resultant is magnitude detected to yield imagery output corresponding to the full synthetic array. for derivation of focus error data, the mean (bisector of the relative phase angle between the two end sub-array resultant vectors is measured. This derived bisector's phase angle is compared to the phase angle of the central sub-array resultant vector. The angle of the bisector relative to the central sub-array resultant is representative of the degree of defocus, and the sign of the angle is indicative of whether the array is over or under-defocused. for a properly focused array, the bisector of the two outer subarray resultants is in phase with the resultant vector of the center sub-array. [A2183]

"Doppler distance measuring system"

3. A missile fuzing system adapted to detonate the missile at a predetermd altitude regardless of the reflection coefficient of or the velocity of approach to the earth, said system comprising in combination: an antenna adapted to radiate radio frequency energy toward a target and receive reflected energy therefrom, an oscillating detector connected to said antenna, said oscillating detector mixing the transmitted and reflected energy to produce a doppler signal at its output representative of the relative velocity between the missile and the earth, first envelope detection means connected to the output of said oscillating detector for producing a negative signal corresponding to the envelope of said doppler signal, a network connected to the output of said oscillating detector for producing an output signal having a peak amplitude which is proportional to the product of a first and a second quantity, said first quantity being proportional to the peak amplitude of said doppler signal and said second quantity being proportional to doppler frequency, second envelope detection means connected to said network for producing a positive signal corresponding to the envelope of said output signal, a differentiating circuit comprising a first resistor having one end connected to circuit ground, a capacitor having one end connected to the other end of said first resistor and the other end of said capacitor connected to the output of said first envelope detection means so that a voltage is developed across said first resistor corresponding to the differentiation of the negative signal produced by said first envelope detection means, a variable resistor having one end connected to the point intermediate said first resistor and said capacitor and the other end of said variable resistor connected to the output of said second envelope detection means so that a second voltage is developed across said first resistor corresponding to the positive signal produced by said second envelope detection means, the amplitude of said second voltage being dependent on the adjustment of said variable resistor, an amplifier to which the junction point of said first resistor, said capacitor and said variable resistor is connected to apply the sum of said first and said second voltages across said resistor to said amplifier, a firing circuit to which the output of said amplifier is set, said firing circuit producing a firing pulse in response to the zero cross over of said sum of said first and second voltages, the altitude at which said sum appearing across said first resistor becomes zero being determined by the adjustment of said variable resistor, and a detonator connected to the output of said firing circuits for initiating detonation upon receipt of said firing pulse. [A2184]

"Coded coherent transponder"

A transponder including a receiver and transmitter for receiving an interrogation signal and transmitting a coherent response with circuitry for modulating the coherent response to include a predetermined coded complex phase and/or amplitude shift therein to convey information, such as the identity of the transponder. [A2185]

"Airborne or ground station for a radio navigation system and particularly a DME system"

With the increase in air traffic, it has become increasingly important to transmit more information (e.g. addresses, position data, altitude and angle values) between aircraft and ground. This is done by modulating the phase of the carrier wave of DME or TACAN signals, the phase modulation being so chosen in the invention that the predetermined bandwidth of a DME/TACAN channel is not exceeded as a result of the phase modulation. In this way, full compatibility with existing DME or TACAN systems is achieved. [A2186]

"High range resolution radar rate aided range tracker"

Means for enabling a high range resolution radar to maintain precise range nformation of a high velocity maneuvering aircraft or other target during radar operation. A voltage indicative of target motion is provided as an input to a voltage controlled oscillator that develops a waveform having a frequency that varies from the frequency of a stable reference oscillator by an amount commensurate with that voltage input. The frequency differential of the two oscillators is utilized to cause the tracking window to move in proportion to the range rate of the target. [A2187]

"Device for two-way information link"

This invention relates to a device for a two-way information link, where a first one of two units or both units are intended to transmit an interrogation signal to the second unit, and the second unit is capable to transmit a response to the first unit. [A2188]

"Gated pseudonoise semi-active missile guidance system with improved illuminator leakage rejection"

A system for elimination of transmitter (illuminator) leakage in a high duty cycle, pulsed, pseudonoise, semi-active missile guidance system. The missile has front and back receiving systems, and the illuminator signal extant at the rear receiver is used to develop a gating signal which turns the front receiver "off" during the time of arrival of the leakage signals at the front receiver. The receiver gating is automatically time adjusted as a function of missile range. Alternate reversal of the bi-phase transmitted code bits is offered as a means of reducing the "eclipsing" loss due to receiver gating out of useful signal return from the target being tracked. [A2189]

"Approach system with simulated display of runway lights and glide slope indicator"

An airborne image camera, its respective image scan plate and image Cathode Ray Tube (CRT) forms a display which simulates runway lights and Visual Approach Slope Indicator (VASI) for the pilot so that the display portrays what the pilot would see, were it not for limited visibility conditions. The on-board CRT continuously enacts and displays, according to position of the aircraft, what would otherwise be visible to him as the runway lights of an illuminated runway, were it not for obscured vision. This is obtainable by RF microwave signals from a plurality of emitters and reflectors which substitute RF energy for visible spectrum light, with the RF energy received and processed by instruments in the aircraft to create a continuous display on the CRT. [A2190]

"Method for decreasing minimum observable velocity of moving targets"

An airborne radar system and method for detecting and tracking slowly moving ground targets off the boresight of the antenna beam, is disclosed. [A2191]

"Method and apparatus for measuring slag foaming using microwave lever meter"

A method for continuously measuring slag foaming within a converter during blowing and an apparatus for practising the method are disclosed. In this method, the foaming slag level is determined by detecting and processing a beat signal developed between the frequency-modulated transmitted wave and the reflected wave of a microwave radar. The apparatus for practising this method comprises a microwave generator, an antenna and a waveguide, and signal processing circuitry. The microwave generator generates frequency-modulated microwaves and supplies them to the antenna which is provided with a waveguide for directing these microwaves into the converter. The antenna with the waveguide are provided with water-cooling means and air purge means to overcome the heat, dust and splash from the converter. The signal processor determines the foaming slag level by detecting and processing the beat signal between the microwaves reflected from the slag within the converter and the reflected waves from a reference reflector added to the antenna. [A2192]

"System for use in an aircraft for obstacle detection"

This detection system of the radar type transmits a sawtooth-shaped frequency-modulated centimeter wave. The wave reflected by an obstacle, if any, is received by two fixed receiving antennas, each of these receiving antennas being connected to a circuit for processing the received signal. The phase shift between the waves is a measure for the angle .theta. formed between the path of flight of the aircraft and the straight line which connects the aircraft with the obstacle. Said phase shift is analyzed in an output circuit of the detection device which also comprises a control loop for controlling the amplitude of the beat-frequency signal between the transmitted signal and the received signal, a synthesizing circuit for a signal fan creating a range window by demodulation of the beat-frequency signal by means of the synthesized signal, a Doppler effect tracking loop and a circuit for analyzing the leading edge of the Doppler effect in the demodulated and filtered signal. In the case of an obstacle which is substantially directly in the direction of flight, last-mentioned circuit produces an information which possibly evaluates the information with respect to the angle .theta. and which is already present in the output circuit, in response whereto an alarm circuit becomes operative. [A2193]

"Broadband interferometer and direction finding missile guidance system"

A wide bandwidth interferometer which may be employed in a guidance system or a rolling missile delays the radar signals detected by one of the antennas by a fixed amount and the signals detected by the other antenna by a variable amount prior to their multiplication in a device which first advances the phase of one of the signals by 90.degree.. The product signal, which is proportional to the sine of the angle between the rolling axis and the line-of-sight to the target, is integrated in a limited-integrator whose output is summed with a pick-off signal from an onboard gyroscope. The sum signal determines the amount of the variable delay, while the output of the integrator controls the gyroscope to align it with the radar signal direction and the missile steering apparatus to home it on target. [A2194]

"Synthetic array radar command air launched missile system"

A missile guidance system in which a synthetic array radar antenna control system correlates the phase and doppler frequency information contained in signals received by a four quadrant antenna from an illuminated section of terrain, so as to compute the velocity components of the antenna. The velocity components are utilized, in conjunction with the earth rate supplied from a terrestrial navigation system, to maintain the azimuth null plane of the antenna in alignment with a selected target designated by means of a synthetic array map of the illuminated terrain. A missile command system controls the flight path of missile along the azimuth null plane to the target. [A2195]

"Doppler compensated digital non-linear waveform generator apparatus"

A non-linear digital waveform generator apparatus utilizing a variable clock to produce a predistorted transmission signal which is opposite to the distortion that is produced by the target's velocity. [A2196]

"System for correlating electronic distance measurement and aerial photography for the extension of geodetic control"

A system for correlating electronic distance measurement and aerial photography where an airborne electronic location station is photographed as it passes over an area to be surveyed. The position of the airborne station is precisely measured as it moves and this information is included in the final image processing. [A2197]

"Pilot's traffic monitoring system"

A pictorial display system in which continuously updated images of `other ship` aircraft within a specified airspace envelope are superimposed on a map display along with the pilot's `own ship` position, whereby collision threats are avoided by taking corrective flight action. This information is displayed, independently of and without interfering with ground facilities operations and communications, as a response to a low-powered signal transmitted from an onboard FM transceiver-multiplexer unit in which the response in terms of positions and altitudes of other aircraft in electrical form, is received, demodulated and then transformed into digital form. Such digital information along with "own ship" position and altitude in digital form, are fed into an altitude discriminator synchronizer unit. The "own ship" altitude data from existing on-board equipment, is synchronized in digital form with other aircrafts' altitude data, and likewise, the "own ship" navigational data, obtained through existing navigational equipment, is also converted to digital form and is synchronized. All of this synchronized digital information is then applied to a function generator which formats it into a form compatible with the requirements of the pictorial display. This display presents the data to the pilot who is then able to properly manuever the aircraft to achieve safe control thereof in relation to other aircraft, or take the necessary collision avoidance action relative to another aircraft, as the case may be. [A2198]

"Airport surface identification and control system"

For aircraft equipped with ATCRBS and ILS, an identification and surface guidance system including a plurality of detection positions each including an interrogator and an auxiliary transponder located adjacent the runway and on opposite sides thereof, respectively. The interrogator is enabled through a signal cable from a remote location, such as a control tower, to produce the first of the discretely spaced pulse pair required to interrogate the ATCRBS equipment. The second interrogation pulse of the pair is generated by the transponder, which is activated by the radiated first pulse from the interrogator and includes an internal delay, such that this delay plus the transit time from the transponder serves to generate the second pulse of the pair if the aircraft to be interrogated is in the vicinity and on the pathway centerline or within a specified lateral tolerance therefrom. The ATCRBS reply may be received directly at the control tower or may be transmitted by cable from receiving equipment within the interrogator. ATCRBS decoding and display equipment may be employed at the control tower for discrete identification of a given aircraft. The identification points are distributed along a runway, taxiway or other surface area of an airport for continuing identification. Time discrimination apparatus compares the ATCRBS pulse train received by the transponder and retransmitted therefrom to the interrogator to that received directly by the interrogator to generate a signal representative of the aircraft deviation from pathway centerline, and this signal is transmitted on an unused ILS channel to the aircraft for presentation to the pilot on the localizer cross-pointer indicator within the aircraft. [A2199]

"Information display method and apparatus for air traffic control"

The invention relates to a method and apparatus for providing pilots of aircraft or the like with: information about the presence, identification and relative location of, and time to potential collision with, other aircraft, objects, and obstructions, i.e. pilot warning indicator (PWI) , instructions enabling pilots to avoid collisions, i.e. a collision avoidance system (CAS) , and, advisory messages such as altitude and heading changes. The information, instructions and messages are organized, in accordance with the invention, through the use of a novel program subroutine in a general-purpose digital computer serving as a central communications computer or a specially programmed computer dedicated to controlling the encoding and transmission of digital air traffic control messages to pilot and/or controller information display terminals. At such terminals, the received digital messages are converted into a format suitable for decoding, are decoded by digital logic switching circuitry, and, the information contained therein is displayed to the pilot or controller by a novel and versatile display apparatus incorporating color-coding and lighted characters and providing a very effective display of all critical information regarding potential collisions and how to avoid them, as well as other advisory messages. [A2200]

"Surveillance system for collision avoidance of aircrafts using radar beacon"

A collision avoidance system using on-board B-CAS equipment having an object to minimize interference with the ground SSR stations and to effect precise tracking or distance-altitude measurement when necessary. Normally passive surveillance is made to detect the presence of other aircraft in the B-CAS range. Active surveillance is added when required. In the active surveillance mode, initiated on locating an intruder aircraft, the power and interrogation signal are varied when the intruder aircraft becomes a threat aircraft to minimize interference with the ground SSR stations and aircraft outside the threat zone while maintaining accuracy of detection and tracking of the threat aircraft at a high level. [A2201]

"Angle sensing system"

A system for measuring, in conjunction with a GCA radar, the crab angle of n aircraft which is making its landing approach above a runway. A loop antenna mounted on the craft transmits an audio-frequency electromagnetic wave to two sets of crossed receiving loops, each set mounted at one side of the runway. A line joining the centers of the loops makes a 45.degree. angle with the plane of each loop. The outputs of the loops in each set are subtracted from each other, amplified, detected and rectified and then differentiated to provide a pulse output indicating the zero point of the subtraction, i.e., the time when the H-field vector is at an angle of 45.degree. to the plane of each of the loops in the set providing the zero-indicating pulse output. The zero-indicating pulse outputs are fed to a time interval counter which determines the time interval between them. With this information plus the ground speed of the craft (as determined by the GCA radar) and the distance between the receiving-loop sets, the crab angle of the aircraft can be calculated. [A2202]

"High resolution microwave seeker"

An active microwave seeker for missile guidance against ships or permanent and targets. Frequency agility and pulse time compression are employed as means to provide a capability for tracking small targets in heavy sea clutter, to reduce target angular scintillation, and to reduce susceptibility to enemy jamming. The seeker tracks a selected target in yaw and range, and keeps its antenna pointed toward the target in pitch by use of its own altitude control. [A2203]

"Method and apparatus for position determination"

An electronic ranging method and apparatus for determining and optionally displaying in real time the location (or relative position) of as many as one thousand geographically-separated stations or "users" within an operational zone by means of slant range measurement and trilateration. Each "user" is assigned a specific time slot which is precision-synchronized with those of all other users, and this time slot is utilized by the unit to which it is assigned for transmitting a signal which enables range measurements to be obtained with respect thereto by a plurality of other users in its area. The range data thus derived by each user is stored in a memory bank and subsequently transmitted in sequence to one or more master stations, where a computer resolves the received information to establish accurate positional locations of the individual units. Cyclic re-synchronization of the timing equipment of each user is also provided for, as well as an arrangement whereby each user unit may act in turn as a master station for re-synchronization purposes. [A2204]

"Ground proximity warning system with means for altering warning threshold in accordance with wind shear"

An aircraft air speed signal is differentiated to provide a signal related to rate of change of air speed. This signal is added to a signal related to aircraft barometric altitude change with the sum signal being compared against aircraft radio altitude to generate warning if the aircraft rate of descent is excessive for the conditions encountered. [A2205]

"Method of and system for avoiding collisions between aircraft"

To avoid collision between aircraft flying in the same general area, each aircraft has individually assigned to it a transmission interval or time slot for sending out data relating to its altitude, course and speed, successive time slots being distinguished by different carrier frequencies. From the received data, each aircraft determines the relative positions and speeds of other aircraft communicating with it. Upon finding itself on a collision or near-collision course with another aircraft, an aircraft initiates an accelerated exchange of information with that other aircraft to determine the passing distance thereof and, if necessary, to take collision-avoiding action. [A2206]

"Pseudo range and range rate device"

1. An electrical circuit for the simultaneous solution of three equations mprising: three ganged potentiometers coupled to receive a common first voltage signal and to be driven by a first angular driving means, a pair of ganged potentiometers coupled to receive a common second voltage signal and to be driven by a second angular driving means, summing networks coupled to the outputs of each of two of said three ganged potentiometers and an output of each of said pair of said ganged potentiometers, respectively, to produce first and second sum voltage signals on outputs thereof, and a summing network coupled to the output of one of said three ganged potentiometers and the output of one of said first and second summing networks to produce a third sum voltage signal on an output thereof, attenuating means coupled to attenuate said third sum voltage signal in accordance with a third angular driving means, the attenuated third sum voltage signal output of said attenuating means coupled to control said second angular driving means whereby the first, second, and third angular drive means and the various voltage signal inputs coupled and arranged aforesaid provide three simultaneous equations of analog

voltages in said three potentiometers and summing networks to produce said first and second sum voltage signal outputs as the solution in analog voltages. [A2207]

"System for identification of aircraft on airport surface pathways"

For aircraft equipped with ATCRBS, an interrogation system including an interrogator and an auxiliary transponder located adjacent the runway and on opposite sides thereof, respectively. The interrogator is enabled through a signal cable from a remote location, such as a control tower, to produce the first of the discretely spaced pulse pair required to interrogate the ATCRBS equipment. The second interrogation pulse of the pair is generated by the transponder, which is activated by the radiated first pulse from the interrogator and includes an internal delay, such that this delay plus the transit time from the transponder serves to generate the second pulse of the pair if the aircraft to be interrogated is in the vicinity and on the pathway centerline or within a specified lateral tolerance therefrom. The ATCRBS reply may be received directly at the control tower or may be transmitted by cable from receiving equipment within the interrogator. ATCRBS decoding and display equipment may be employed at the control tower for discrete identification of a given aircraft. The identification points may be distributed along a runway, taxiway or other surface area of an airport for continuing identification. [A2208]

"Radar altimeter tracking circuit apparatus"

A radar altimeter having a tracking circuit which includes a controllable reference signal generator which is adapted to selectively control the tracking circuit so that there will be no indication of an altitude change in the event of a momentary loss of a received video signal due to the fading of the video signal or other condition requiring the locking of the tracking circuit because of a lack of reliability of the received video signal. [A2209]

"Navigational system of high-speed aircraft"

Navigational system for the guidance of automatically piloted aircraft during high-speed (e.g. supersonic) overland flights, the predetermined course of the aircraft including a series of spaced-apart measuring zones registered on a progressively displaceable film strip or other recording medium in the form of two-dimensional arrays of prerecorded altitude markings representing the profile of the overflown terrain within each zone. Each array encompasses several regions of uncertainty defined as a range of possible horizontal deviation of the automatic pilot from the charted course, the markings, which may be in the form of identical asymmetrical figures indicating by their angular orientation the reference parameter (absolute or relative altitude) of the terrain within each elemental area of a region of uncertainty, are electro-optically compared with a bench mark indicating, by its own angular orientation in response to altitude soundings aboard the aircraft, the value of the reference parameter of the terrain actually overflown, the comparison yielding a projected contour line whereby, through a rapid succession of soundings and comparisons within each zone, the true position of the aircraft can be determined from the intersection of the several contour lines so obtained. [A2210]

"Radar altimeter for tropical areas"

A radar altimeter system for measuring, from an aircraft flying above tropical forest areas, the height of the ground and the height of the forest canopy above the ground comprising a transmitter, a receiver for detecting return pulses from the ground and forest canopy, timing means for measuring the time of arrival at the beginning and end of each received pulse and averaging the said times, means for examining the received pulse duration and preventing pulses with a shorter time duration than a predetermined time from passing further in the system, and means for examining a selected number of pulses and coupling the voltage derived from the received pulse having the longest time of arrival to an output to give an indication of the ground level and the voltage derived from the received pulse having the shortest time of arrival to an output to give an indication of the forest canopy level. [A2211]

"Method for the improved utilization of response signals in a _secondary radar system and a secondary radar system for implementing the method"

The time interval between the pulses of an interrogation signals transmitted to aircraft in the vicinity of an airport is varied at will in accordance with air traffic conditions. The time interval under heavy traffic conditions may be varied from its nominal value as a function of the rate of response signals, the garbling rate thereof, or the decoding rate. The time interval may be controlled manually as a function of air traffic conditions displayed on a screen associated with the interrogator and receiver. By varying the time interval the percentage of responses to interrogation may be varied to optimize overall reception conditions and utilization of potentially available information. [A2212]

"Precision approach sensor system for aircraft"

A microwave interrogation-transponder system for controlling the airborne rendezvous and closure of two aircraft for aerial refueling and the like. The system of the invention includes a microwave interrogator mounted on the aft underfuselage of a tanker aircraft, for example, for interrogating and receiving a reply from a small microwave transponder mounted on the receiver aircraft near the aerial refueling receptacle. The angle of the received signal relative to the tanker is obtained from the angle sensing receiver portion of the microwave interrogator, whereas range is obtained from the phase of the returned modulation tone (i.e., a range tone) relative to that which was transmitted by the interrogator. The transponder sends back to the interrogator a signal which is shifted in frequency with respect to the transmitted signal and operates in an active mode with gain at long ranges and in a passive mode with no gain at shorter ranges to achieve extremely accurate guidance characteristics. [A2213]

"Radar speed measurement from range determined by focus"

In a forward-looking coherent pulse doppler synthetic aperture radar, focus adjusted only as a function of speed is applied in an identical fashion to each range channel, whereby data representative of a radar reflectivity map, stored as a matrix of range and doppler frequency, provides maximum contrast only for ranges corresponding to the focus applied to each range channel. Determination of maximum contrast determines the range to which the focus is related, which range may be utilized in a speed computation. In one embodiment, the range for which maximum contrast is calculated is utilized as the range for speed computation, in another embodiment, known curve fitting techniques are utilized so as to determine a maximum in a curve of contrast versus range. [A2214]

"Synchronous digital delay line pulse spacing decoder"

An air traffic control transponder includes a synchronous digital delay line decoder for providing mode selection signals in response to pulse space coded transmissions from the ground station. The decoder comprises a shift register delay line having a plurality of delay taps along which a first received pulse is shifted. A continuously running high frequency clock pulse generator via a frequency divider provides the shifting clock to the delay line. The first received pulse synchronizes the shifting clock via the frequency divider. A plurality of monostable multivibrators connected to selected taps of the delay line provide pulse detection windows in response to the first received pulse being shifted through the stages of the shift register to which the window generating monostable multivibrators are connected. The outputs from the window generators are applied as inputs to respective pulse coincidence detection devices, the second inputs thereof being connected to receive the incoming pulses. The coded pulse spacing of the received pulses is determined by coincidence between the window pulses generated in response to the delayed first pulse and the receipt of the second pulse. The decoder is utilized in the air traffic control transponder to perform both the decoding function as well as to transmit appropriate data in accordance with the detected mode represented by the transmitted pulse spacing. [A2215]

"Fluid flow measurement"

A dielectric aerial is disposed in contact with a dielectric liquid, and projects microwave radiation thereinto. The reflected radiation is received by the aerial, and the flow rate of the liquid given by the Doppler frequency shift between the projected and the reflected radiation. A control circuit is arranged to vary the flow rate in response to the Doppler signal. [A2216]

"Aircraft orientation determining means"

A system for measuring, in conjunction with a GCA radar, the crab angle of n aircraft which is making its landing approach above a runway just prior to touch-down. Two doppler radars are placed, one on each side of the runway at equal spacings from the center line of the runway, with their antennas facing each other. The doppler radars function at very nearly the same frequency. The average doppler frequency of the echo received by each radar is determined and the frequencies are subtracted from each other. The difference in doppler frequency and the ground velocity of the aircraft are coupled to a computer which solves an equation to provide the value of the crab angle of the aircraft. The result can be radioed to the aircraft so that an adjustment in yaw can be made to zero the crab angle before touch-down. [A2217]

"Collision avoidance system of aircraft"

A collision avoidance system for aircraft using an on-board beacon interrogator. If altitude information is not included in a response signal from a transponder of an other aircraft or the response signal is garbled because a plurality of other aircraft are responding to the same interrogation signal, the system automatically switches to a beacon based proximity warning system and indicates the distance or other indication to the detected aircraft. [A2218]

"Synthetic aperture using image scanner"

In a system for generating a synthetic aperture, a lens or antenna for focusing the radiation from an object scene onto an image sensor which is shifted by a clock at the rate of motion of objects in the object scene and thereby to produce the real tire imaging of the object scene with high resolution. A system for reconnaissance, surveillance and ground mapping. A system for high speed data imaging, medical patient scanning, label scanning, and image correlation. [A2219]

"Method of measuring the altitude of a target maneuvering at a very low elevation, and a tracking radar using same"

A method of measuring the altitude of a target maneuvering at very low elevations is used to determine the instantaneous deviation of the target at various operating frequencies of a monopulse tracking radar. The quadrature component of the difference signal is evaluated at these frequencies, the mean values of the instantaneous deviation and of the quadrature component are determined for a certain number of frequency samples, and an extreme value of the mean value of the quadrature component is found to allow the corresponding mean value of deviation to be validated. [A2220]

"Satellite system"

An antenna for radio frequency signals including a two flat faced phased arrays and ground plane system therebetween where transmission lines join the antenna planes to electronic control packages such that there is provided proper phase shift, final amplification and timing for retransmission by one of the antenna planes in a preselected direction, and where the signals are space fed to the other antenna plane by a feed system. [A2221]

"Dual mode microwave mixer"

A four-port dual mode microwave mixer which operates without IF or RF switches and which provides both a passive mode of operation wherein the mixer operates as a lossy frequency translator when driven by a offset signal generator, and an active mode of operation wherein the mixer is used to convert a modulated received signal to an intermediate frequency which is mixed with the offset signal in a phase detector to detect the modulation which is used through a phase-locked loop to slave the local oscillator for retransmission of a translated signal with gain. [A2222]

"Radar mapping technique"

A radar mapping technique employing a synthetic aperture radar in conjunction with a correlator for directing an object moving in mid air to a desired point on the ground, which point is determined by correlating direct and indirect return signals from the ground and through the moving object respectively. [A2223]

"Updating an en-route Tacan navigation system to a precision landing aid"

High accuracy distance measurements are achieved with a low accuracy Tacan set by utilizing signals available within the Tacan set at a point of sufficient accuracy to provide accurate distance measurements to be made and thus upgrade an en-route navigation aid to higher accuracy for use in a precision landing system. [A2224]

"Beacon add-on subsystem for collision avoidance system"

By adding an indicator control panel to the cockpit and a small receiver-decoder unit between the transponder and the antenna of aircraft having a conventional air traffic control radar beacon system transponder, mid-air collision avoidance capability is obtained. The BACAS (Beacon Add-on Subsystem for Collision Avoidance System) receiver-decoder unit in an aircraft interrogates the associated ATC (Air Traffic Control) transponder to obtain and store the ATCRBS Mode C reply altitude information. The 1090 MHz transponder Mode C reply is given 5 MHz on-off amplitude modulation by the receiver-decoder unit and is radiated into space through the ATC antenna. Identical BASCAS hardware in aircraft within range sense the specially-modulated (5 MHz) , Mode C reply and immediately act to trigger their respective ATC transponders into emitting Mode C replies with essentially the same special modulation characteristics except for a different modulation frequency (10 MHz) . The replies emitted by other aircraft are sensed by the BASCAS receiver in the initial aircraft, and the Mode C altitude information from each aircraft is compared to the initially stored Mode C data. Any aircraft within a relatively small radius having an altitude separation of 500 feet or less will cause a BASCAS unit to alert the pilot. The BASCAS unit will also illuminate a "CLIMB" or "DIVE" light when the relative altitude orientation can be determined from the altitude data comparison. [A2225]

"Target sensing and homing system"

A low cost system using passive radiometry or active radar for the detection of a target and providing discrimination between desired targets and false targets. The device may be mounted on a drone aircraft or other vehicle and comprises a detecting sensor having a fixed antenna system whose function is to detect the presence and direction to a target in airframe coordinates. The sensor provides means for generating a broad fan beam containing a plurality of closely spaced interference lobes spaced so as to encompass a predetermined target size. The interference lobes are continuously swept across the line of travel and the receiving circuitry provides means for detecting a desired target within the interference lobes. The system also provides a pre-programmed means, initiated by the target sensor, designed to aim the aircraft at the target and a target tracker or homing means having a fixed antenna directed along the heading axis of the drone aircraft and used to "home" the aircraft into the target. [A2226]

"Active radar missile launch envelope computation system"

A launch envelope computation system adapted to be mounted on a missile including a radar for providing signals indicative of range, range rate, target angle and target angle rate of change, a memory for storing a maximum and minimum missile envelope, a computer connected to receive signals from the radar and additional signals from a launch vehicle including velocity and altitude, for updating the missile envelopes, and a computer connected to the memory means and the radar for determining whether a target is within the missile envelope and providing launch or no launch signals, as well as indication of what altitude changes, if any, are required in the launch vehicle to allow a launch. [A2227]

"Fast Fourier Transform processor using serial processing and decoder arithmetic and control section"

A signal processor for use in a small, lightweight radar-guided missile to provide a discrete Fast Fourier Transform (FFT) on received radar return signals. The radar return signal are converted into a sequence of binary digits enabling a simple decoder to perform complex addition and subtraction processing, thereby minimizing the space and complexity of the signal processor. [A2228]

"Clutterlock with displaced phase antenna"

This invention relates to a clutterlock with displaced phase antenna, and more particularly to a means to provide a control signal generated from radar signals which may be used to maintain alignment between the physical and synthetic beams of a coherent doppler aperture radar or to maintain alignment between the antenna and the direction of cancellation of fixed scatterers of an airborne-doppler-moving-target-indication radar. [A2229]

"Base band speed sensor"

A base band radio speed sensor, for use with the path of travel of the craft whose speed is to be sensed advantageously disposed at right angles to the antenna patterns, utilizes a transmitter flanked by equally spaced receivers for determining the times of passage of the craft with respect to symmetrically disposed receiver antennas. [A2230]

"Radio-electric system for locating a given object"

The disclosed system is intended to supply angular and range data regarding the position of an object to be located in a reference system. The system comprises an interrogator which transmits a linearly frequency-modulated signal to a transponder disposed on the object. The transponder is provided with means for shifting the frequency of the received signal in one direction by a predetermined amount characteristic of that transponder and means for retransmitting the received signal. The interrogator further includes a pair of receiving antennas whose signals are used for forming beat signals with the transmitted signal. The interrogator is also provided with means for shifting the frequency of the beat signals in the other direction by the same amount. At least one of the shifted beat signals is applied to a frequency discriminator whose output signal is utilized for controlling the slope of the modulation signal in order to keep the frequency of the shifted beat signal constant. [A2231]

"Ranging system for guiding moving objects over equidistant tracks"

A ranging system for guiding moving objects over equidistant tracks comprises a ground station and airborne equipment. The ground station includes a receiver and a transmitter connected to each other and to an aerial. The airborne equipment includes a reference-frequency oscillator, a frequency divider for obtaining meander-shaped signals of the modulation frequency connected to the reference-frequency oscillator, a transmitter connected to the frequency divider an airborne aerial coupled to the transmitter, a receiver connected to the airborne aerial, a digital filter, for producing a reference pulse when the modulation frequency signal derived at the output of the receiver crosses zero, connected to the receiver and to the reference-frequency oscillator, a variable delay unit, to shift the reference pulse within the pulse period of the reference-frequency oscillator, connected to the digital filter, a processing unit, for statistical processing of reliable signals to produce an error signal proportional to the deviation of the moving object from a prescribed track, the polarity of the error signal defining the direction of said deviation, coupled to the variable delay unit and to the reference-frequency oscillator, a deviation indicator, for indicating the deviation of the moving object from a prescribed track, connected to the processing unit, a control unit, to control the magnitude of the shift of the reference pulse in the variable delay unit for indicating prescribed equidistant tracks by zero reading of the deviation indicator, coupled to the processing unit, having two command inputs for manual input of commands, and connected to the variable delay unit. [A2232]

"Ciphering device improving the secrecy of the encoded replies of a secondary radar"

A secondary radar system in which the transponder and central station possess for enciphering and deciphering complementary dispersive filters having expansion/compression factors of .theta..DELTA.F.sub.1, where .DELTA.F.sub.1 = 1/.DELTA..mu. is a measure of the spectral width of each reply pulse having a temporal width of .mu., .theta. being at least s .mu./.DELTA..mu., such that at least two adjacent pulses spaced s apart in the initial reply train are completely overlapped in the expanded reply. The application to secondary radar systems, especially of the IFF type, in order to improve considerably the secrecy of the link between an airborne transponder and the ground station. [A2233]

"Method for sampling Tacan signal envelope"

This invention relates to a method for supplying samples of the received signal envelope in airborne Tacan equipment to the airborne bearing circuitry. During the DME search phase, the airborne DME equipment searches for only those replies which have been received in response to the airborne equipment's own interrogations. After locking onto its own replies, said replies form the samples of the received signal envelope which are applied to a phase locked oscillator, the output of which is coupled to the bearing circuitry both before and after phase shifting. As a result, the airborne receiver duty cycle for Tacan functions is greatly reduced. [A2234]

"Aircraft proximity warning indicator"

An aircraft proximity warning indicator incorporating an RF receiver, optical sensor, and display is described which may receive an RF signal followed by an optical radiation pulse from another aircraft where the received RF signal is used to control the optical sensor and display so that it senses and displays the optical radiation pulse. [A2235]

"Radar selective interrogation system"

An aircraft ground movement monitoring system is provided similar to that described in co-pending U.S. patent application Ser. No. 608,214, now U.S. Pat. No. 4,109,248, that makes use of an aircraft's existing SSR transponder in a hyperbolic selective interrogation technique to monitor an aircraft's position on an airfield in which, in order to overcome the problems particularly involving spurious mode C (height) interrogations that arise in long base-line systems, it is arranged that transponders that would be spuriously interrogated are interrogated first and that the required transponder is interrogated before the already interrogated transponders have finished replying. [A2236]

"Golf yardage indicator system"

A golf distance indicator system provides a measurement of the distance between a golfer and the green which he is approaching. The system comprises a base unit mounted at or near the pin on the green and a remote unit carried by the golfer. Upon command, the remote unit transmits a radio pulse to the base unit. The base unit immediately returns an acoustic or sonic signal, preferably an ultrasonic signal, in response to the received radio pulse. The remote unit includes internal logic for determining the distance from the base unit to the remote unit from the time interval between the transmission of the radio pulse and the reception of the ultrasonic signal based upon the speed of sound waves through air. The remote unit also receives input wind conditions and determines range and direction corrections to the actual distance based upon these wind conditions. From the wind corrected distance, the remote unit automatically selects the proper club for the next shot. [A2237]

"Multiple source tracking system"

A monopulse radio direction finding and tracking system having the capacity of detecting the presence of multiple radiating sources within the effective beamwidth of the monopulse antenna and causing the monopulse antenna to move toward and align its boresight with one of the multiple sources. Signal processing is provided that implements an algorithm based on the amplitudes and absolute magnitudes of signals from a receiver sum channel, elevation and azimuth difference channels, and elevation and azimuth angular error channels. The algorithm utilizes the differences in the ratio of signals present in these channels when a single radiating source is present and when multiple sources are present. Steering control circuits are provided that bias the azimuth and elevation antenna steering servo system to cause the antenna to align its boresight with one of such multiple sources. The improved monopulse tracking system is applicable to a missile guidance system providing terminal guidance to cause the missile to intercept one of multiple radiating targets. Means are provided to accommodate multiple sources or targets in any orientation with respect to the monopulse antenna azimuthal and elevation planes. [A2238]

"Aircraft altitude annunciator"

There is disclosed an annunciator for verbalizing altitude-related messages during the descent of an aircraft. Announcements such as "nine hundred," "eight hundred," etc. are made as the aircraft descends through respective "hundreds" levels, such announcements are not made during an ascent. In addition, the word "terrain" is heard when the aircraft descends through the 2,000-foot and 1,000-foot levels, and the word "minimum" is heard when the aircraft drops below a "decision height" selected by the pilot. Lastly, the word "glideslope" is out-putted in response to the detection of a glideslope deviation, the frequency of this announcement as well as its volume being a function of the magnitude of the deviation. [A2239]

"Monopulse motion compensation for a synthetic aperture radar"

A synthetic aperture radar in which radial motion compensation is provided by a monopulse null tracking loop which tracks the null position of a stabilized monopulse antenna, and in which tangential motion compensation is provided by a tangential velocity measurement loop which tracks the cross-over angle of the monopulse antenna pattern. Since the motion compensation for the synthetic aperture radar is made in relation to a stabilized monopulse antenna, the imaging process for the synthetic aperture radar may be controlled in response to the angular scan rate of the antenna. [A2240]

"Azimuth correlator for real-time synthetic aperture radar image processing"

An azimuth correlator architecture is defined wherein a number of serial range-line buffer memories are cascaded such that the output stages of all azimuthal dimension at any given time. A range bin is automatically read out of the last stages of the registers in parallel on a range line sample-by-sample basis for subsequent range migration correction and correlation. Range migration correction is performed on the range bins by effectively varying the length of a delay register at the output of each range-line buffer memory. The corrected range bin output from the delay registers is then correlated with a Doppler reference function to form an image element on a real-time basis. [A2241]

"Method of scanning a radar antenna to effect improved radar operation"

In one implementation of the inventive method an aircraft with an antenna mounted thereon is compelled to follow a sinuous path. The antenna normally provide 120.degree. coverage on either side of the aircraft. Full 360.degree. coverage is provided by the same antenna as the aircraft traverses the predetermined sinuous path. [A2242]

"Means for accumulating aircraft position data for a beacon based collision avoidance system and other purposes"

A protected aircraft having a discrete address beacon transponder includes a ground base air traffic control radar beacon system (ATCRBS) interrogator, a collocated discrete address beacon system (DABS) transponder and a directional antenna on the protected aircraft. The protected aircraft synchronizes a local clock with the pulse repetition frequency (PRF) and scan rate of the ATCRBS interrogating his field of interest from which information the protected aircraft can calculate the azimuth angle of responding intruder aircraft with respect to the ground station. By means of his directional antenna the protected aircraft also determines the azimuth of the intruder with respect to itself. Interrogation by the protected aircraft of a collocated ground DABS transponder or a DME or other suitable means of measuring range provides a data base which together with the aforementioned azimuth angles permits the protected aircraft to calculate instantaneous position of the intruder relative to his own. [A2243]

"Method and apparatus for measuring distance between an aircraft and a ground station"

A distance measuring system is provided including a ground station transponder continuously transmitting a repeating pseudorandom coded bit pattern, and at least one aircraft interrogator receiving and locking onto the ground station signal. The aircraft interrogator transmits a coded interrogation signal in precise synchronism with an arbitrarily selected any one of the repetitive code words (bit patterns) that comprise the repeating pseudorandom coded bit pattern which are coded identically with the interrogation signal and waits for a reply. If the ground station receives the coded interrogation signal in synchronism with an identically coded word in its continuous transmission, it transmits a reply signal to the aircraft interrogator optionally encoded with synchronism error or interrogation steering information. If no reply is received by the aircraft interrogator, it transmits its next coded interrogation signal shifted by one or more bits relative to the arbitrarily selected received code word from the ground station. Successive interrogation signals are each shifted an additional predetermined number of bits until synchronism is attained and a reply signal is received. The number of bits of shifting performed by the aircraft needed for synchronization when combined with the number of bits representing the whole code word intervals elapsing between transmission of an interrogation and receipt of a reply represents the distance between the ground station and aircraft. The optionally encoded synchronism error and steering information is respectively utilized by the aircraft to more precisely calculate distance and alter its time of interrogation. [A2244]

"Video processor for distance measuring equipment"

A video processor for Distance Measuring Equipment in which all timing functions including fixed delays are performed by digital counters counting clock pulses from a highly stable source. Search and track operations are conducted by starting a memory counter by a reply from a responser and stopping the memory counter at a time corresponding to maximum range. On a succeeding interrogation cycle the memory counter is started prior to the time a reply at zero range would be received. In this cycle the memory counter begins count with the count it contained when stopped during the previous cycle, the memory counter counts until it reaches a number corresponding to maximum range, stops and initiates a range gate. A reply within the range gate causes the range gate to be repeated at the same time in the following interrogation cycle. A sufficient number of replies within the range gate cause tracking operation to begin. A velocity memory provides continuing tracking during temporary loss of reply signals. [A2245]

"Alarm filtering in a ground proximity warning system"

A ground proximity warning system used by aircraft when unsafe flight configurations defined by specified flight warning mode envelopes are detected. The invention provides that alarm generation signals are not immediately given, but instead the continuing flight of the aircraft is monitored by an alarm filtering system. The filtering system uses independently variable maximum and minimum threshold levels, and filtering constants which can be incremented and or decremented as functions of the flight location of the aircraft and the specific warning mode envelope for suppressing false or unnecessary alarm generation. The filtering parameters may be varied independently for each flight warning mode. In addition, a priority-ordered series of audio warnings are provided so that warnings once started are completed in the absence of higher priority warnings, even if the warning conditions cease to exist. Low priority warnings which are interrupted by higher priority warnings are regenerated when the higher priority warnings have been completed. [A2246]

"Radar altimeter simulator"

An altitude simulator for checking the range accuracy of a radar altimeter is disclosed. Typical altimeters include a transmitter and a receiver. The simulator receives a multipulse trigger signal from the altimeter to be checked. The trigger signal is synchronized with the output pulses of the transmitter. This trigger signal forms an input to a phased locked loop to generate at the output of the phased locked loop a multipulse signal which is synchronized with and phase displaced from the trigger signal by an amount equal to the inherent time delays in the simulator. The output signal of the phase locked loop is coupled to the input of a pulse generator which is programmable to generate a multipulse output signal synchronized with and phase displaced from the output signal of the phase locked loop by a selected fixed amount. A modulator receives an RF input from a signal generator and the ouput signal of the pulse generator to produce at the output of the modulator a pulse modulated RF signal. This pulse modulated RF signal is coupled to the receiver as an input signal and is used to test and calibrate the altimeter. [A2247]

"Two dimensional MIPS"

A two dimensional velocity sensor mountable on an aircraft employs a CW radar which illuminates the ground with radar energy. Two transmitters which are alternately activated cause the speckle pattern to move as a whole in the opposite direction at the same speed. Two receivers mounted parallel to the heading axis of the aircraft sense the same power of the backscattered pattern except for a delay. By means of a time-shared processor and computer, this sensed delay provides heading velocity as well as cross-heading velocity. [A2248]

"Two-axis motion compensation for AMTI"

A displaced-phase-center antenna technique which compensates accurately for he motion of an airborne radar system in both the boresight direction of the antenna and in the direction normal to the boresight. An antenna system comprising a broadside array of endfire arrays forms four receive beams which are displaced from each other in both the boresight direction and in the direction normal to the boresight. These four beams are used to produce signals which correspond to signals from two receive beams with phase centers having a separation equal in magnitude and direction to the aircraft's motion during the interpulse period. A signal scattered from a fixed object on a first transmitted pulse and received in one of the two receive beams will have the same phase characteristic as a signal scattered from the same fixed object on a subsequent pulse and received in the other receive beam. Upon proper delay of the first received signal, the returns from the fixed object may be cancelled. [A2249]

"Pseudo-noise radar system"

A pseudo-noise radar system in which a maximal length binary pulse code of amplitude zero or A amplitude modulates a carrier wave and reverses the phase thereof 180 degrees in synchronism. Either one of the amplitude modulated or phase reversed waves is transmitted. The received wave is then passed through a multiplicative mixer that receives the other wave as an input. The mixer output is then effectively (L + 1) /2 when correlated and effectively zero when phase shifted one bit to one bit less than a word, where L is the word length. Signals not correlated are thus attenuated to an extreme degree. The above-described pseudo-noise radar system may be used with any other conventional equipment for fire control, missile range and/or velocity tracking or otherwise. [A2250]

"Radar systems"

A secondary radar system for establishing the position and identity of aircraft etc. on airfields, particularly for controlling their ground movements during bad visibility, comprises a pair of spaced aerials each arranged to successively transmit a particular one of two interrogate pulses, the time relationship between the two pulses being varied such that a predetermined time relationship between the two interrogate pulses obtains at varying distances from said spaced aerials to afford selective interrogation of a transponder receiving the two interrogate pulses, and a third aerial spaced from the pair of spaced aerials for transmitting a further pulse in a second predetermined time relationship with one of the interrogate pulses whereby a selected transponder or transponders receiving said two interrogation pulses in said predetermined time relationship is caused to be suppressed. [A2251]

"Frequency plane filters for an optical processor for synthetic aperture radar"

An air-borne radar system for terrain-imaging employs a sidelooking synthetic-aperture radar that records reflected signals on photographic film. Range data has a constant focal length whereas data in an azimuth direction has a focal length that varies as a function of range and therefore requires optical correction. A known processor system brings the various focal planes into coincidence using a complex lens structure that includes a computer generated spatial filter. A novel method and apparatus is disclosed for interferometrically generating a two-dimensional spatial filter which is more simple and economical to produce. Means are provided for diffracting a source beam of coherent light into a beam having a predetermined amplitude distribution. The resulting beam is imaged through a lens system onto a light responsive recording medium together with direct illumination from a reference source of coherent light to obtain a predetermined intensity distribution. The intensity of the exposing light is determined by both a magnification and a Fourier transformation of the diffracted beam. After development, the recording medium has an amplitude transmittance necessary for the desired spatial filter and may be used directly in the known processor system. [A2252]

"Method and apparatus for automatically adjusting the resolution of a radio altimeter over its operating altitude range"

Method and apparatus for automatically adjusting the resolution of a CWFM radio altimeter includes a counter for counting a signal produced by the altimeter having a period relatable to the altitude desired to be measured. Another counter counts the number of pulses of a time reference signal occurring over a predetermined number of periods of the altitude related signal. The number of periods of the altitude related signal over which the time-reference-signal pulses are counted is automatically determined by a circuit responsive to the fullness of the time-reference-signal pulse counter to produce a signal after the counter has reached a predetermined count. The next occurring multiple of the altitude related signal is then determined, and the number of time-reference-signal pulses then counted is divided by the number of the multiple found. In a particular embodiment, the counters are binary counters, and the multiples determined are powers of 2, whereby the division is achieved by shifting the data in shift registers a number of places corresponding to the number of multiples of 2.sup.N found. [A2253]

"Collision avoidance system for aircrafts"

A collision avoidance system for aircraft in which one aircraft is equipped ith an interrogation station having a secondary surveillance radar. Coarse distance measurement is effected either by passive or active distance measurement or by both of them. If the detected distance lies within a certain limit, the output power and/or period of the interrogation signal of the secondary surveillance radar of the subject aircraft is altered so as to effect fine distance measurement. This system can be applied without increasing interference against the existing secondary surveillance radar system by keeping the output power and period of interrogation signal in a minimum required extent. By the same reason the system can keep the interference at a small extent between proximate aircraft, each mounting this collision avoidance system. [A2254]

"Navigation aid system"

An apparatus or method, for characterizing carrier waves according to the direction in which the carrier waves are transmitted or received, comprises radiating or receiving from a position which is moved repetitively along a line of motion having a predetermined, fixed location in a frame of reference. The radiating or receiving position may be moved so that at least one of the speed and direction of motion is abruptly changed. The radiating or receiving position may be moved back and forth along two non-parallel, straight lines of motion, whereby elevational and aximuthal angles of propagation are determinable solely responsively to the amplitude of the frequency shift induced by the changes in direction of the motion along the lines of motion. [A2255]

"Method and apparatus for reducing interference between plural radio altimeters"

A method and apparatus for independently controlling a CWFM radio altimeter to reduce interference from another nearby altimeter employs a high-Q filter outside the bandpass of the signals which are developed and decoded for altitude indication to detect an approaching interference signal received from the other altimeter and produce an output to a threshold detector. When the output of the filter exceeds a predetermined level, the threshold detector causes the transmitted frequency of the altimeter to be stepped. In one embodiment, a digital counter is provided to cyclically count up and down at a desired sawtooth modulation frequency. The output of the counter is applied to a digital-to-analog converter to produce an output used to control the frequency of the transmitted signal. Additionally, the output of the counter is conducted to inputs of an adder having a preset add number therein. When the output from the threshold detector is produced, it loads the counter immediately with the sum of the present counter output with the preset add number. The counter then begins its count at the totalled count, thereby immediately stepping the transmitter frequency. In redundant systems, each transmitter frequency can be shifted a different amount in an individual preset direction. [A2256]

"System for sensing velocity through the use of altimetry signals"

A system for determining the relative velocity of two objects in a direction substantially transverse to a line between them wherein a first of the objects, for example an aircraft, transmits a continuous sequence of radar pulses from a broad beam antenna directed toward the ground and a receiver, also mounted on the aircraft, receives the echo returns of the pulses through an antenna which has a pair of phase center locations spaced apart in the direction of the relative velocity. The two receiving phase centers follow substantially the same ground track. Reflected pulses received at the separated phase center locations are non-coherently detected and a computing system performs a time-amplitude comparison of the pulse amplitude values detected at the aft phase center location against the pulse amplitude values detected at the forward phase center location N pulse repetition intervals earlier in time. Each set of pulse comparisons is performed according to the general relationship (F.sub.i - A.sub.N+i) (F.sub.i-2 - F.sub.i+2) and the sequence of resulting values constitutes a correlation output signal representing the error in alignment between the spatial position of the aft phase center location and the spatial position of the forward phase center location N pulse repetition intervals earlier in time. The sign of the correlation output signal represents the direction of the error. A feedback control system is provided for adjusting the repetition frequency of the transmitted pulses until the correlation output indicates minimum error. In the condition of minimum error the system operates such that each pulse received at the aft phase center location is reflected from substantially the identical area of ground terrain from which the pulse received at the forward phase center location was reflected N pulse repetition intervals earlier in time. The relative velocity between the aircraft and the ground is calculated as a function of the pulse repetition frequency. A system is also disclosed wherein the forward and aft phase center locations are alternately displaced laterally of the direction of relative velocity to enable additional detection of drift velocity. [A2257]

"Line scan area signature detection method"

An area signature detection system arranged to receive an output from a sensor operative in the electromagnetic spectrum, where the output from the sensor is an amplitude varying electrical signal representing the field-of-view beheld by the sensor, and to utilize this high frequency information in such a manner that low frequency scene content, necessary for area correlation processing, can be extracted and effectively utilized. Our invention involves certain highly advantageous techniques for generating area signatures from line scan sensors, and may be applied to cartesian, circular or polar scan formats. In one particular embodiment of our invention, we describe how orthogonally disposed area signatures can be used to generate area correlation tracking signals that can be used in the derivation of appropriate missile guidance commands. Our teachings are also useful in providing line-of-sight stablization for fire control systems, alignment and position errors for landing and hovering control systems, as well as intrusion detecting systems. In the case of a system using a television camera as the sensor, this invention provides a way of obtaining an operator display and system control signals despite the fact that only a single such sensor is used. [A2258]

"Velocity and drift angle tracking system using altimetry signals"

A system for determining the magnitude and direction of the relative velocity of two objects wherein a first of the objects, for example an aircraft, transmits a continuous sequence of radar pulses from a broad beam antenna directed toward the second object, e.g., the ground, and a receiver, also mounted on the aircraft, receives the echo returns of the pulses through an antenna which has a pair of phase center locations spaced apart along the axis of the aircraft. The two receiving phase centers are electrically displaceable in directions lateral to the aircraft axis (heading) and are controlled to follow substantially the same ground track. The positions of the phase centers are also "dithered" laterally to enable automatic tracking of aircraft drift angle. Reflected pulses received at the forward and aft phase center locations are non-coherently detected and a computing system performs a time-amplitude comparison of the pulse amplitude values detected at the aft phase center location against the pulse amplitude values detected at the forward phase center location N pulse repetition intervals earlier in time. The relative velocity between the aircraft and the ground is calculated as a function of the pulse repetition frequency. [A2259]

"Air navigation and landing aid system"

An air navigation and landing aid system wherein a pair of transponder beacons are located at known positions adjacent an airport runway. The aircraft carries a weather pulse radar system and an antenna for furnishing information affording a navigation aid during the flight stage. Switching means are inserted between the antenna and the weather radar for switching, during the landing stage, the received pulses relating to each beacon, in response to the interrogation of the weather radar, to a special receiver and a processing circuit which furnishes information affording a landing aid. [A2260]

"Geographic gain time control"

Apparatus is provided for modifying a conventional target locating system in which targets respond to an interrogation signal by transmitting a reply, and the target location is deduced from the azimuth from which a reply is received and the delay between the interrogation signal and the reply. The improvement includes a controllable attenuator coupling the receiving antenna to the target locating system which is controlled to selectively discriminate against selected range cells at selected azimuths. In a preferred embodiment, digital circuitry is relied upon to control the attenuator, and the identication of the range cells to be discriminated against is stored in a digital memory. [A2261]

"Combined keyed AGC and pulse amplitude comparator circuit"

Combined keyed AGC and pulse amplitude comparison circuit for use in pulse pair communications system such as DME wherein AGC keying signal is constituted by the second pulse having a predetermined spacing from a first pulse of a pair and wherein said second pulse also provides a reference against which the amplitude of succeeding pulses is compared. Pulses with amplitudes above said reference level are passed to a decoder for determining pulse spacing. The decoder determines which pulse pairs are properly spaced so that the second pulse of a pair can serve as a keying signal. [A2262]

"Solid state pulse generator for an air navigational system"

Solid state apparatus for transmitting signals in an air communication, navigational or identification system wherein a signal generator produces pulses of a desired character and repetition rate. In a normal mode of operation, Gaussian-shape pulses are formed by subjecting a linear phase or Gaussian filter to impulse signals. A responsive amplifier produces pulse signals for driving an RF transmitter which broadcasts air communication, navigational or identification signals. The signal generator and amplifier receive operating voltages from a power supply having an output characteristic such that the amplitude of the signal generator and amplifier output signals are reduced relative to increased pulse repetition rate in order to prevent overdriving the transmitter and to maintain optimum system efficiency. [A2263]

"Method and apparatus for improving the slowly moving target detection capability of an AMTI synthetic aperture radar"

Detection of slowly moving and stationary targets that are normally obscured by ground clutter is accomplished by an AMTI synthetic aperture radar system that utilizes multiple receiving antennas mounted along the flight velocity vector of the radar bearing aircraft. Each antenna is separated by a distance d from each other. Synthetic arrays are formed by processing the radar returns from each antenna terminal. The radar PRF is controlled so that the aircraft flies a distance d during the interpulse period. The synthetic array outputs of adjacent pairs of antennas are subtracted to provide clutter cancellation. The resulting outputs from adjacent terminals can be used in a monopulse mode for angular discrimination. [A2264]

"Method of operating synthetic aperture radar"

A method, and apparatus for performing the method, of compensating for the effects of Doppler accelerations due to the orientation of the beam in a squinted synthetic aperture radar used for mapping terrain underlying an aircraft are described. According to the disclosed method, compensation is achieved by calculating the Doppler frequency shifts to be experienced by echo signals from points on the terrain to be mapped and then, in accordance with such calculations, varying the pulse repetition frequency of the squinted synthetic aperture radar to eliminate the effects of Doppler acceleration from the echo signals. [A2265]

"Digital radar control system and method"

A digital system for processing return energy in a aircraft pulsed doppler radar system which includes a wave energy transmitter and a receiver for detecting the wave energy returned to the receiver by reflection. A digital signal processor develops target and noise information from the return energy and the return energy related information is supplied to a digital computer. The computer determines the range from which the return energy is reflected and provides digital range data. The width of the return energy in the time domain and the amplitude of the return energy are evaluated to provide digital width and digital amplitude data. The return energy is designated as clutter and clutter AGC and blanking signals are generated to control the receiver in response to an evaluated width and amplitude of the return energy above predetermined minimum values. The return energy is designated as an altitude line and the altitude line designated return energy is tracked in response to a predetermined number of detections of the return energy at about the same range over a predetermined period of time. The altitude line designating and tracking loop has a tracking loop response sufficient to account for changes in terrain beneath the aircraft and for sudden range changes of short duration so that the altitude line is not lost due to changes in the terrain beneath the aircraft. The return energy is designated as a target and the target designated return energy is tracked in response to the range determination, the amplitude determination and an evaluated width of the return energy below the predetermined value. [A2266]

"Interrogation, and detection system"

The specification relates to a telemetering apparatus comprising a generator which generates at least a single frequency rf signal, a transponder for receiving that signal and for amplitude modulating it in accordance with information selected for transmission, an antenna on the transponder for reflecting the amplitude modulated signal, and a receiver which is preferably located at the generator. The receiver processes the signal to determine the information carried thereby. [A2267]

"System for identifying objects equipped with an automatic transponder"

There is described a system for interrogating objects equipped with an automatic transponder in which a fixed station transmits an interrogation signal formed by at least two characteristic pulses and the transponder returns a coded response consisting of a plurality of reply pulses. The time interval between two successively transmitted characteristic pulses or pulse trains represents an item of information which determines which set of addresses is to be selected from a number of such sets stored in a memory, these addresses controlling an address input of a parallel-input, series-output multiplexing circuit which supplies a response code wherein the relative positions of the reply change from one code to the next. [A2268]

"Signal processor"

A signal processor for use in a small, lightweight radar-guided missile to provide a discrete Fast Fourier Transform (FFT) on received radar return signals. The radar return signals are converted into a sequence of binary digits enabling a simple decoder to perform complex addition and subtraction processing, thereby minimizing the space and complexity of the signal processor. [A2269]

"Multi-target tracker"

A digital tracker in a cooperative collision avoidance system utilizing time division techniques, which is capable of generating track gates and determining critical values of tau (time to collision) for at least 16 targets during the same time frame, the maximum number of targets being limited essentially by the size of the logic memory elements used and the maximum range desired. [A2270]

"Doppler heading attitude reference system"

A doppler radar/inertial system is provided for producing navigational and fire control information for an aircraft, and which includes means for developing vertical reference signals accurately at one location and for then transferring the signals to a second location without incurring errors due to aircraft flexure. The system includes high quality accelerometers and gyroscopes mounted at one location in the aircraft for developing accurate vertical reference signals, and a high quality accelerometer and low cost gyroscope at a second location where accurate vertical reference information is required. The system includes circuitry for comparing the output of the high quality accelerometer at the second location with the accelerometer outputs at the first location, the difference of which is a function of the error in the vertical reference at the second location, as indicated by the low cost gyroscope. The system includes further circuitry which is responsive to the output differential of the accelerometers to correct the error in the reading of the low cost gyroscope at the second location. [A2271]

"Circuit for inhibition of autogenetic false alarms in a collision avoidance system"

In a cooperative collision avoidance system, probe signals are inhibited for a predetermined time period to prevent autogenetic false alarms, that is, false replies to one's own interrogation probes. [A2272]

"Beam focused synthetic aperture"

A beam focused synthetic aperture having a lens or antenna for receiving radiation in a receiving beam from an object of interest, a detector for receiving radiation from the lens or antenna, and an output and display circuit for using and viewing the detector output, with delay means internal or external to the lens or antenna and between the object and detector and for producing the matched spatial filtering of signals from objects crossing the receiving beam, and with the detector producing a pulse for each object crossing the receiving beam. [A2273]

"High repetition frequency side-looking pulse radar system"

The invention relates to side-looking radar systems and more especially to high altitude airborne radar systems functioning at a high repetition frequency. In order to avoid ambiguities in regard to distance, the antenna comprises an additional channel which has a radiation pattern which has an odd symmetry about its axis and means are connected to said antenna for deriving the angular interval relative to the axis of the antenna of the direction of the obstacle corresponding to the received echoes. Gating means select the angular interval signal at the middle of the recurrence, for controlling the recurrence frequency of the radar and maintaining the ambiguous areas outside the selected observed area. [A2274]

"Integrated terminal area surveillance system"

An integrated airport terminal area surveillance system, including a plurality of spaced apart interrogating and receiving stations and central equipment for controlling the stations operates in search and track modes by transmitting interrogation messages and receiving resulting replies. In the search mode the stations interrogate by directional beams all aircraft operating within the entire terminal area and enrolling the position and identification of replying aircraft into a system memory. In the track mode those aircraft enrolled in the system memory are individually interrogated. A system map is divided into memory cells corresponding to predetermined geographical cells. The means by which an aircraft is interrogated is determined by the geographical cell in which the aircraft is located. [A2275]

"MTI system and method"

An airborne early warning moving target indicator radar in which targets in the main beam having reflective characteristics sufficient to override side lobe attenuation are tracked relative to the side lobes and the residual doppler frequency for such targets resulting from side lobe detection calculated. Based on this calculation, the appropriate ones of a bank of doppler filters are inhibited at the appropriate range bin to prevent a false target indication without inhibiting the display of moving targets in the main beam at the same range but having different doppler frequencies. In addition to side lobe blanking, an automatic gain control circuit is provided in which the interpulse period is divided into a large number of equal time intervals on the order of 0.4 microseconds each to thereby separate the return signal from each radar pulse into a large number of range bins. The gain of a wide band return signal amplifier is separately adjusted for each range bin on the basis of the sampled amplitude of the return signal from the preceding radar pulse in the corresponding range bin to thereby provide optimum gain without saturating the return signal processor. A novel amplifier and method of digitally controlling the gain thereof is disclosed as is the superimposition of the gain adjustment transients of each stage of the amplifier. [A2276]

"Multi-PRF signal processor system"

A multi PRF doppler radar processor system for airborne target search radar preferably using five PRF's. The received signal is processed through a bank of doppler filters, and the filter number and PRF of every target indication in a single range band is memorized. When indications have been made at two different PRF's, the first and second data sets are processed. The first data set is used to determine a doppler band shift value, .DELTA.f, required to bring the center of a velocity band, A.sub.1, to the center of the filter band, and this same .DELTA.f is applied to the second data set, from which the corresponding velocity band, A.sub.2 is determined. The velocity bands A.sub.1 and A.sub.2 are converted by use of the Chinese Ramainder Theorem to an unambiguous velocity band Au. The original frequency shift .DELTA.f is applied to the center frequency of Au to determine the unambiguous doppler frequency of the target. [A2277]

"Keying apparatus"

A keying apparatus utilizing a plurality of key pins arranged in a predetermined configuration which may be preset to accept a coded pattern that may be used to set keyguns. [A2278]

"Multi-target tracker for tracking near co-range targets"

A digital tracker in a cooperative collision avoidance system capable of generating track gates and determining critical values of tau (time to collision) for at least 16 targets and to determine the presence of two targets of substantially similar ranges and to track two such co-range targets. [A2279]

"Programmable microwave modulator"

A programmable microwave modulator for controlling the amplitude of a micave signal versus time. A programmed driver generates a linear analog signal that has a predetermined amplitude pattern and time period. The linear analog signal from the programmable driver passes through a linearized current driver before inputting a PIN attenuator. The linearized current driver takes the antilogarithm of the linear analog signal, thus compensating for the logarithmic nonlinearity of the PIN attenuator. A radio frequency signal from a receiving antenna inputs the PIN attenuator and is attenuated as a function of the amplitude pattern of the linear analog signal. The PIN attenuator outputs the attenuated radio frequency signal. [A2280]

"Transponder based landing system"

An air traffic control system wherein a ground based interrogator/receiver nterrogates an aircraft transponder which, in addition to responding to the interrogation, also transmits automatic encoded altitude information. The interrogator/receiver unit processes the received signal to derive relative azimuth and range information of the interrogated aircraft and to decode the altitude information to provide the aircraft reported altitude signal. The aircraft reported altitude signal is compared to the selected glide path height which is a function of the range that the approaching aircraft is from the runway touchdown point. The difference is noted on a glide scope meter. By observing the azimuth and range readings, and also the deflection from zero on the glide scope meter, the controller will be able to inform the aircraft pilot of the approaching aircraft position relative to runway center line, glide path and distance from touchdown. [A2281]

"Augmented tracking system"

An augmented tracking apparatus utilizing an optical tracker in conjunction with a radar sensor to lock on to and track a moving target aircraft. [A2282]

"Airborne microwave path modeling system"

An airborne geophysical measurement and recording system and apparatus in which radar signals are focused onto terrain below an aircraft flying in a straight line between microwave tower sites. The echo signals are detected and signals produced and recorded on a strip chart recorder indicating path profile and terrain reflectivity. In addition, atmospheric pressure, temperature and humidity data are recorded as functions of aircraft altitude, so that atmospheric refractivity gradients can be calculated, either by an on-board computer or later, and this factor taken into account during path design or performance simulation. [A2283]

"Radar system for detecting slowly moving targets"

A bistatic radar system for detecting the presence of a slowly moving target by the use of an arrangement which provides a reduction in the frequency spread of the reflected clutter energy. A radar transmitter and a radar receiver are located aboard separate aircraft which fly with a predetermined speed and direction about the target area. The speed and direction of the two aircraft are such that the angular velocities of the aircraft about the target area are substantially equal and opposite. This arrangement reduces the spread of the reflected clutter energy caused by motion of the radar transmitter and receiver relative to the target area. The radar return signals are filtered and processed to determine when a signal is present which has been shifted in frequency due to the motion of the moving target. In one embodiment, the two aircraft fly directly toward each other at the same speed. In another embodiment, the two aircraft fly directly away from each other at the same speed. Apparatus is included which determines the position of the moving target both with respect to the two aircraft and with respect to the ground. [A2284]

"IFF antenna arrangement"

An improved IFF antenna arrangement is shown to comprise two linear arrays, each one of the arrays being made up of a plurality of similar cavity-backed radiating slots fed by a stripline feed. The impedance of each radiating slot is matched, at two different operating frequencies, to the impedance of a combination of the impedances of the corresponding cavity and stripline feed. [A2285]

"Radio locating unit for persons in distress"

Radio locating unit for persons in distress which unit is provided with a directional antenna whereby it can be used as active search unit by a rescuer and which is further provided with an omni-directional antenna and automatic switching means for energizing the transmitter part whereby it is used as passive unit by a person to be rescued e.g. a person buried by an avalanche. [A2286]

"Charge-coupled device data processor for an airborne imaging radar system"

Processing of raw analog echo data from a side-looking synthetic aperture radar receiver into images on board an airborne radar platform is made feasible by utilizing charge-coupled device (CCD) semiconductor technology. CCD circuits are utilized to perform input sampling, presumming, range correlation and azimuth correlation in the analog domain. These radar data processing functions are implemented for "single-look" or "multiple-look" imaging radar systems. [A2287]

"Method and apparatus for determining the altitude of a signal propagation path"

A method and apparatus for determining the altitude of a transmitted signal by adding the altitude of the transmitting antenna to accumulated changes in altitude, determined in relation to the sine function of the elevation angle of the propagation path. The elevation angle of the propagation path is determined in relation to the elevation angle of the transmitting antenna and the local elevation angle change in the propagation path accumulated over the propagation range. The local elevation angle change in the propagation path is determined in relation to a dynamic, vertically dependent refractive index gradient model and in relation to a vertically dependent curvature model. [A2288]

"Pulse stream identification circuit"

An aircraft DME is receptive of a series of pulses the nature of which alternates between a series of random time spaced pulses and a series of uniform time spaced pulses, where the latter serve to identify the source of the pulses. A set-reset type of counter triggered by the decoded series of random pulses or by the decoded series of uniform time spaced pulses is thereafter continually advanced to a known count producing a gate signal which searches and locks onto the decoded series of uniform time spaced pulses by repeating the process. After a preselected number of repeats corresponding to successive uniformly spaced pulses, audio signals are produced so long as the uniform spaced pulses continue. [A2289]

"Doppler-radar terrain-clearance warning system"

A pulsed doppler-radar system is utilized to determine if the terrain clearance of an aircraft drops below a predetermined aircraft safety clearance. The system includes a maximum-range doppler-frequency counter which counts the highest doppler frequency received for a maximum range and a range gate which receives and passes doppler frequencies from within a predetermined slant range. A reference-frequency generator generates a reference frequency related to the highest doppler frequency and cooperates with a frequency synthesizer to synthesize a frequency related to the computed doppler frequency for the aircraft safety clearance. The slant-range doppler frequencies are summed with the synthesizer frequency and a critical-frequency detector detects the sum frequency to determine if terrain clearance drops below the predetermined aircraft safety clearance. [A2290]

"Moving target speed and direction determining radar system"

A radar is mounted on an airplane with a pair of antennas affixed to the airplane and directed to one side thereof for providing a relatively narrow radar beam squinted approximately 20.degree. ahead of a line transverse to the direction of motion and approximately 20.degree. behind the line, respectively. The radar is constructed to alternately energize the antennas and a visual display system provides individually identifiable visual indications of targets interrupting the beams. The amount a target moves on the visual display between the interruptions of the forward and rearward directed beams provides a direct indication of the direction and speed of the target. [A2291]

"Velocity gate hand-off system"

A system for programming the radar return signal from an airborne target carrier to gradually increase its frequency and attenuate its amplitude timed with respect to the launching of a target from the carrier, the target having its own fixed radar return, so that the velocity gate of the doppler tracking radar of a missle fired at the carrier will be smoothly handed off from the carrier to the target when the target is launched from the carrier. The programming equipment comprises timed serrodyne modulation of a traveling wave tube phase shifter to control the frequency change, and a controlled attenuator to reduce the amplitude of the returned "reflected" signal, together with necessary timing controls, the operation of the system being initiated by a command signal to launch the target. [A2292]

"Second order motion compensator for high resolution radar"

A method and apparatus for providing motion compensation that allows dynamically changing flight paths during high resolution, squinted, synthetic aperture mapping by making use of a second order motion compensation by means of a two-stage correlator configuration utilizing digital signal processing techniques. [A2293]

"Terrain clearance warning system for aircraft"

By utilizing a radio altimeter in conjunction with a measure of the aircraft speed, landing gear position and flap position, an aircraft terrain warning system is made possible which provides a voice warning indicating that the aircraft is too low with respect to the terrain when the aircraft is above a predetermined speed. for aircraft speeds below the predetermined speed, a voice warning is provided when the aircraft is below a predetermined altitude with the landing gear up indicating that the aircraft is too low with the gear up and when the gear is down and the flaps are not in a landing position and the aircraft descends below a second predetermined altitude a voice warning is generated indicating that the aircraft is too low with flaps up. [A2294]

"DME apparatus and method"

A DME apparatus and method for determining the distance of an aircraft from a ground station and the groundspeed thereof. Replies to the transmitting aircraft are distinguishd from replies to other aircraft and squitter by digitally storing information indicative of the times of receipt of all replies received during a first cycle and determining whether any of the stored times are identical to the times of receipt of replies received during the cycles following the first cycle for a predetermined number of successive cycles. If this criterion is met distance information is derived and displayed and a range gate is generated and combined with incoming replies. If replies fall within the range gate for at least a predetermined percentage of cycles then the apparatus is switched into the track state in which all replies are ANDed with the range gate before storage and the coincidence determination is effected. Also, in track the predetermined number of successive cycles necessary for distance information to be derived is reduced. An apparatus for detecting groundspeed from DME distance signals having an initialization capability. [A2295]

"Method and apparatus for flight path control"

Signals from a source of flight path data, normally a memory device which stores forward-looking radar data, for example, are sampled in "reverse-time". That is, the data points along the flight path are taken in reverse order relative to the direction of flight. By simple circuits, the signals from the flight path data source are modified to conform with the basic criteria of the desired flight and with other desired parameters such as vertical acceleration and velocity limits so that a reverse-time flight simulation is made. The special "inside-out" form of indicia is a pair of bands which are fence-like in appearance and form the vertical sides of a tunnel-like outline, along the vertical center of which is the desired flight path. By generating these bands on a cathode ray oscilloscope with vertical displacements in accordance with the desired flight path and relative vertical widths in perspective with the range, the curved center line is easily followed. [A2296]

"Doppler-radar, projected terrain-clearance system"

A doppler-radar system for computing terrain clearance of the projected flight path of an aircraft from a maximum-range doppler frequency and a doppler frequency for a known slant range. The apparatus includes a transmitter/receiver, a maximum-range doppler-frequency counter, a slant-range doppler-frequency counter, and a terrain-clearance computer which receives the outputs of the maximum-range and slant-range doppler-frequency counters to compute a depression angle and terrain clearance and provide an output of the terrain clearance to an indicator. [A2297]

"Microwave velocity sensor using altimeter echo"

A velocity sensor system comprising a receiver capable of processing the narrow pulse speckle pattern return from a transmitting source in order to determine the velocity of the vehicle in which the velocity sensor is mounted. Three channels, each one connected to a receiving horn, receive the speckle pattern return signal equal in power but separated in space due to the spatial arrangement of the horns. A first local oscillator is connected to each channel and is controlled as part of an Automatic Frequency Control (AFC) loop. A carrier frequency from the first local oscillator along with the received signal is applied to the first mixer stage to produce a first IF signal which is applied to a wide band IF amplifier. The wideband IF amplifier is designed to blank the receiver during the transmitter pulse in order to prevent overloading of the receiver or overpowering of the echo. The output from the wide band IF amplifier in each channel is combined with the carrier frequency from a second oscillator and is applied to a second mixer. The output from the second mixer is applied to a narrow band IF amplifier which has the funnction of stretching returns in time so as to insure overlap of the total return energy. The signal from the narrow band IF amplifier is applied to the detector where the intelligence signal is removed from the carrier. From the detectors the signals are applied to frequency trackers which ultimately compute the ground speed and drift angle data of the vehicle by measuring the time it takes the speckle pattern to traverse the distance between receiving antennas. [A2298]

"Radar altimeter"

Following an emergency ejection from an aircraft, a radar altimeteris used to sense when a pilot or crewman, descending by parachute, is within 100 to 500 feet of the underlying terrain. When the predetermined altitude range is reached, the radar altimeter actuates a release mechanism and deploys a survival kit which remains connected to the parachutist via a strap or lanyard. The device can also be modified to measure and indicate the altitude above the terrain to function as a normal radar altimeter. [A2299]

"Proximity sensing apparatus"

This invention relates to a proximity sensing apparatus for energizing a control circuit whenever the distance between two objects moving relative to one another at an angle other than 180.degree. becomes a minimum, and more particularly, relates to a proximity sensing apparatus operating on the zero doppler principle for energizing a detonation circuit in a missile whenever said missile passes closest to a target. [A2300]

"Collision avoidance system"

A collision-predictive CAS at a protected station or vehicle that produces TAU data relating to differential azimuth and/or TOA from standard ATCRBS interrogations and replies, and selects the largest closing TAU signal of a threatening Other station to provide reliable warning while minimizing false alarms. Similarly processed differential altitude information provides a further criterion. Multiple radar environments enable production of additional sets of TAU values and increased discrimination against false alarms. [A2301]

"Single bit doppler processor for guidance missile system"

Hybrid digital processor of a missile guidance system in which the input spectrum is mixed, limited, sampled, and fed to a recirculating shift register. Sampled values of the shift register, with the same oscillator controlling the sampling rate of the limiter and the shift register, are mixed with a signal from a voltage controlled oscillator and fed to a threshold pulse generator which is connected to a sampling logic circuit that feeds a series of counters. [A2302]

"Phase modulation apparatus"

Phase modulation apparatus particularly suitable for coherent radar applications wherein an interrupted carrier-wave is phase modulated according to a predetermined coded sequence. Apparatus comprises a carrier wave generator having an output for connection to an aerial, a delay line suitably coupled at one end to the output of the generator, and a modulation signal generator for controlling the reflecting actions of a reflector at the other end of the delay line so that signals travelling in the delay line are reflected with a phase-shift dependent on the signal produced by the modulation signal generator. The carrier-wave generator is switched on and off for transmit and receive periods respectively and when switched on its output signal will build up from noise levels injection-phase-locked to a delayed version of the previous transmitted signal, thus preserving phase coherence between successive transmitted signals. [A2303]

"Method of locating persons in distress"

A method for locating any person in distress in a selected area on the surface of the earth who has deployed passive radio frequency (RF) reflectors in a predetermined arrangement. A first transparency is made in the spatial frequency domain of an image of said predetermined arrangement of said RF reflectors. The said selected area of the surface of the earth is scanned by means of a side-looking radar, on board a satellite or aircraft, to produce radar images. Second transparencies in the conventional image domain are produced from the radar images. It is then determined from the first and second transparencies, by means of complex spatial filtering, if RF reflectors in said predetermined arrangement were deployed in said selected area when scanned by said radar. [A2304]

"Aircraft ground closure rate filtering method and means"

Ground closure rate between an aircraft and underlying terrain is obtained by differentially combining a radio altimeter derived rate signal and a barometric altitude rate signal to obtain a rate of change of ground profile signal. The ground profile rate is filtered on an autocorrelation basis to obtain a profile rate signal devoid of amplitude pulses introduced by sharp or discontinuous terrain features and recombined with barometric rate to obtain ground closure rate. The filtering technique imposes no rate limitation on the radio rate signal. [A2305]

"Missile post-multiple-target resolution guidance"

A feedback loop for use in the guidance system of a guided missile being wn against multiple targets. The feedback loop modifies a transient signal present in the system by introducing a time lag sufficient to cause the missile relative heading change command signal subsequent to target resolution to be equal to the change in the missile antenna-to-target pointing vector that occurs at resolution. [A2306]

"Channel encoding for distance measurement equipment"

An adapter is provided for insertion between a conventional DME airborne interrogator and antenna. The adpater converts conventional interrogations into phase-coded or amplitude coded signals which are received by new Microwave Landing System (MLS) transponders. Each transponder will process interrogations having the correct code and frequency and will respond with precision reply signals. The precision replies are then received by the airborne equipment, converted back to standard reply pulses and processed to provide distance measurement. Also provided is a new transponder for use at MLS sites. [A2307]

"Passive ranging system"

A passive ranging system for determining the range of a target radar by uizing the scan characteristics of the target radar. Receivers are placed on each of two aircraft flying in a specified formation. One aircraft relays detected pulse amplitude envelopes to the other aircraft. The second aircraft measures time delay between impacts of the main beam of the target radar on the two aircraft and a computer determines range according to equation R=D/K.DELTA.t where .DELTA.t is the measured time difference, D is the distance between aircraft and K is a constant depending on the type of target radar. [A2308]

"Synthetic aperture radar utilizing a low-speed analog-to-digital converter"

A radar receiver employing digital signal processing utilizes high-speed ut buffers in the form of charge coupled devices that lower the data rate to the analog-to-digital converters so as to reduce their response requirements and, thereby, their cost while still permitting the system to achieve a high degree of range resolution. [A2309]

"DME timing apparatus and methods"

A ranging timer allows decoded data pulses to toggle a flip flop, thereby initiating a transmission cycle. In a specific embodiment, the data pulses condition a second flip flop to energize the DME transceiver. During the next negative excursion of a 96 microsecond reference clock, the second flip flop is toggled, and during the next period of the reference clock, the decoder is disabled, the transmitter-modulator is energized, the ranging timer is enabled, and the first flip flop is reset. Since the time between the decoded data pulses is variable, jitter is built into the commencement of each transmission cycle. [A2310]

"Apparatus and method for detecting a digital change in data"

In a DME system, the least significant decade of the present aircraft to ground station distance is maintained encoded in a memory, and an up-down counter maintains a variable count. The complement of the present distance is compared with the present count, and when a difference is detected, a logical pulse increments the counter and also indicates passage of the aircraft through another distance interval. The sense of the difference between the present distance and the count also is monitored, responsive to which the direction of the count is controlled. [A2311]

"Channeling method and apparatus"

This relates to a channeling scheme for introducing a new service in the TACAN frequency band which can operate independently of the conventional TACAN system or in conjunction with it. Specifically, the new service is that of providing precision DME for a microwave landing system and for allowing existing TACAN airborne sets, when equipped with an adapter, to utilize new MLS ground beacons. In one channeling scheme, interrogations occur in frequency bands adjacent the standard TACAN interrogation band, and ground transmissions occur in frequency bands presently occupied by X mode reply signals. In a second scheme, which contemplates the use of standard airborne equipment provided with an adapter, interrogations occur within the conventional TACAN interrogation band, and replies occur in the bands now occupied by X mode reply signals. [A2312]

"Method and apparatus for automatically detecting and tracking moving objects and similar applications"

This invention relates to an improvement in the art of navigating, detecting and tracking moving objects, position finding, mapping and such subjects employing a plurality of stations and variational measurements. [A2313]

"Monopulse radar system"

Structure, such as a variable coupler, is employed to effectively rotate monopulse beam components through any given angle about the monopulse antenna axis. Useful in an airborne velocity measuring doppler radar, where servo means control the value of the given angle so that the rotated beam components are maintained properly aligned with an isodop, despite aircraft drift. [A2314]

"Augmented perspective radar display"

Control circuits are provided in a perspective radar display to modify the vertical sweep wave form voltage function on the display cathode ray tube to correspond to the sweep function which would be provided if the observer and radar antenna were at a different position from the actual position. This different position may constitute a different altitude or a different range or a combination of both. If the perspective display is used in an aircraft flying at, for example, 100 feet, the pilot can modify the display to provide a perspective radar image as would appear if the aircraft were at an altitude, for example, of 500 feet or 5,000 feet thereby rendering more easily distinguishable distant objects close to the horizon. Alternatively or in combination with a simulated or augmented altitude, the pilot can effectively modify the display to effectively provide a display which would occur at an increased range from targets so that close in targets are rendered visible. The same principles are applicable to boats and ships. [A2315]

"Ground speed calculation for digital DME"

A voltage controlled oscillator provides a pulse signal which, when frequency scaled, is representative of aircraft velocity. Pulses representative of passage of the aircraft over distance intervals are coupled to one input of a comparator-integrator, and the VCO output pulses are further divided and coupled to the other input terminal of the comparator-integrator. The integration voltage controls the VCO. The VCO signal is frequency scaled and fed to a counter, the output count of which is strobed periodically and decoded to yield velocity. [A2316]

"Oblique scatter object detection and location system"

1. A method of locating an object capable of reflecting energy from five spaced transmitters to a point remote from said transmitters, which comprises producing at said remote point five signals as a function, respectively, of the relative value of the direct path length from each transmitter to said remote point and the corresponding reflected path length from each transmitter to said object and then to said remote point, and computing from said signals positional data with respect to said object. [A2317]

"Tracking gate servoed by relative range"

A tracker for an air borne or maritime collision avoidance system includes digital logic to servo a track gate pulse about the target pulse. The logic is arranged to utilize range change data during the interval from the track gate pulse to a moving target pulse. This arrangement eliminates the need for a range counter to measure the entire range from the interrogation pulse to the target pulse. Instead, the range counter measures the range from the leading edge of the track gate pulse to the target pulse and compares the range counter value with a predetermined fixed number representing the range interval from the leading edge of the track gate to the target pulse of a perfectly centered target pulse, or, simply, one half the desired resolution of the system. [A2318]

"Digital DME with compensation for ground station intermittencies"

Each bin of a one-thousand stage shift register represents a two-tenth mile aircraft to ground station interval, and the register is shifted a full cycle corresponding to a two-hundred mile spacing. During a first shifting epic, all pulses returned from the ground station are inserted into the bins in timed relationship to each other and to transmitted pulses. In subsequent epics, stored pulses from the register are reinstated therein if there is time coincidence with another received signal. Once the register contains one-and-only-one signal, corresponding to the aircraft to station distance, that signal is automatically reinserted for the next three epics, regardless of signal receipt. Further coincidence of a receive signal, however, resets the automatic regeneration for three more periods, and so on. After three periods without a coincidence, all signals are passed to the register during the next epic. [A2319]

"Tracking and determining orientation of object using coordinate transformation means, system and process"

An electromagnetic field which nutates about a pointing vector is used to both track or locate a remote object in addition to determining the relative orientation of the object. Apparatus for generating such a field includes mutually orthogonal dipole radiators, defining a reference coordinate frame, and circuitry for supplying excitations, such that the maximum intensity vector of a vector field produced by these excitations in the radiators nutates about a mean axis or axis of nutation which is called the pointing vector direction of the field. A pointing coordinate frame has the x-axis coincident with the pointing vector and the y-axis in the x-y plane of the reference frame. Mutually orthogonal sensors at the object sense the field and establish a sense coordinate frame, which can be coincident with the coordinate frame of the remote body. Coordinate transformer means, system and process are used in connection with determining the pointing and angular position of the sense frame with respect to the reference frame. A first error signal relating the sense frame to the pointing frame is transformed into a second error signal relating the sense frame to the reference frame. This second error signal is used to generate the three Euler angles defining the orientation of the sense frame relative to the reference frame and to generate the pointing angles defining the translation of the sense frame from the reference frame. Means, system and process are described, thus, capable of continuously measuring five independent angles through the use of one field generating means, one field sensing means at the remote object, and signal processing means. Two of the angles specify the direction to, or location of, the remote object and the remaining three angles define the angular orientation of the remote object, the angles defining the sense frame with respect to the fixed reference coordinate frame of the field generating means. [A2320]

"Airborne target recognition system"

In a radar target acquisition system means are provided for analyzing the video return including an automatic gate circuit causing the range gate to sweep out, and to sequentially sample the video return, a filter acquisition video processing circuit including means for discriminating between random and sinusoidal amplitude modulation appearing on the video return and having known frequency characteristics equal to the scan and pulse repetition frequencies of the radar within the pass band of the filter circuit, and means for comparing the discriminated amplitude modulated video return signal to at least one established threshold, and a track circuit which remains de-activated during the sweeping mode and is activated upon command from the filter acquisition circuit. Means are provided for manually initiating the gate circuit and for inhibiting the track circuit to await response from the filter acquisition circuit. [A2321]

"Synthetic aperture radars"

There is disclosed a synthetic aperture radar arranged to survey a region from a mobile location. The radar returns received from the region are first phase weighted by a series of predetermined factors. They are then stored and combined with later returns to give an output signal which has a maximum value when any target present in the region is in a predetermined direction from the location. [A2322]

"Synthetic aperture radars including moving target indication"

There is disclosed a synthetic aperture radar arranged to survey a region from a mobile location. Radar pulses are transmitted in sets, the pulses from each set being transmitted from congruent positions. The returned echoes of the pulses of each set are then compared to substantially remove signals relating to static targets. The signals relating to the doppler shifts of returns from moving targets are processed by a correlator covering a frequency band sufficient to include such signals or further signals indicative of them and produced as a result of the sampling nature of the pulsed radar. [A2323]

"Airborne positioning system"

An airborne positioning system for acquiring range information from at least three distance measuring equipment (DME) stations, including a computer controlled range gate and means for estimating and removing bias errors from range measurements and smoothing noise to accurately determined aircraft position to typically better than 100 feet circular error probable (C.E.P.) . [A2324]

"Radio altimeter rate linearizer"

A method and means for obtaining a linear rate of change signal from an input analog signal whose magnitude exhibits a logarithmic amplitude variation over at least a portion of the range of the independent variable defining said signal. The nonlinear rate of change of the input signal is obtained by differentiation, and the resulting nonlinear rate signal is multiplied by the nonlinear function of the dependent variable defining the input signal, which function is implemented in accordance with that defined from a mathematical differentiation of the expression defining the nonlinear characteristic of the input signal. [A2325]

"Line scan area signature detection system"

An area signature detection system arranged to receive an output from a sensor operative in the electromagnetic spectrum, where the output from the sensor is an amplitude varying electrical signal representing the field-of-view beheld by the sensor, and to utilize this high frequency information in such a manner that low frequency scene content, necessary for area correlation processing, can be extracted and effectively utilized. Our invention involves certain highly advantageous techniques for generating area signatures from line scan sensors, and may be applied to cartesian, circular or polar scan formats. In one particular embodiment of our invention, we describe how orthogonally disposed area signatures can be used to generate area correlation tracking signals that can be used in the derivation of appropriate missile guidance commands. Our teachings are also useful in providing line-of-sight stabilization for fire control systems, alignment and position errors for landing and hovering control systems, as well as intrusion detection systems. In the case of a system using a television camera as the sensor, this invention provides a way of obtaining an operator display and system control signals despite the fact that only a single such sensor is used. [A2326]

"Airport ground surveiliance system with aircraft taxi control feature"

A system for detecting, monitoring the movements of, and controlling the travel of aircraft and other vehicles on an airport surface. A series of small low-powered radar transmit-receive devices, each having a limited range, is disposed essentially in a line along alternate and opposite sides of a runway, ramp or taxiway. Control pulses at a system PRF travelling down the inter-connecting cables serve to cause the individual radars to "blink" in sequence in accordance with the inherent delay in the inter-connecting cable. Frequency separation is used to prevent false indications due to transmit-receive inter-action among the individual miniature radars. The system is adapted to data presentation in accordance with standard radar display techniques, or alternatively, a display is provided on a synthesized map of the airport. A pulse delay discriminator arrangement provides for discrete lateral position control. Means are also shown for televising the ground display to a vehicle on the surface and for providing discrete information such as a STOP order, etc. [A2327]

"Distance measuring equipment"

Disclosed is improved distance measuring equipment comprising an airborne FM coded, chirp, interrogator transmitter in combination with a weighted matched receiver in a ground transponder. The airborne transmitter produces a long low power frequency modulated output pulse. Detection in the transponder receiver is accomplished by pulse compression matched filter techniques. [A2328]

"Digital range computer systems for air navigation systems such as tacan"

A digital range computer which may be incorporated in a Tacan air navigation set is described. The computer includes a calculation unit which calculates the range from information as to the elapsed time between interrogation and reply signals. The signals are inputed to the calculation unit via the input control and range gate control unit. Another control unit is operated by the calculation unit and generates synthetic reply signals on the basis of the calculations previously made. The synthetic reply signals are used in the control unit so as to maintain the calculation unit operational on a continual basis, notwithstanding the absence of reply signals. The synthetic reply signals are also utilized by an acquisition control unit in order to condition the system, either in a search or tracking mode of operation. [A2329]

"Radar apparatus for detecting a coherent Doppler signal in cluttered environments"

1. Radar apparatus comprising means for generating a series of pulses of oscillation, scanning aerial means for transmitting said pulses as a beam narrow in azimuth in different directions sequentially, the repetition frequency of said pulses being sufficiently high in relation to the angular velocity of the aerial means and the angle of the beam that a plurality of successive transmitted pulses impinge on a point target, a coherent receiver for reflected energy, means for storing returns derived from said receiver in response to a plurality of successive pulses of oscillation from said transmitting means, means for selecting returns corresponding to a predetermined range stored in said storing means, and means for examining selected returns to detect a cyclic component of substantially constant periodicity indicating the presence of a target at said predetermined range having a radial velocity relative to the apparatus represented by said periodicity. [A2330]

"Airborne telemetering radar having variable width range gates"

The present invention concerns an airborne radar receiver for acquisition and tracking of a target providing two range-gates displaced during a search phase and comprising means for locking the range gates onto an echo receiver which is then tracked during a tracking phase. The receiver also comprises means for supplying a third gate accompanying the first two range gates and adjacent to the latter in the direction of the greater distances, and means for bringing all the gates back to zero when the third range gate encounters an echo the width of which is greater than a predetermined value corresponding to a target. [A2331]

"System for measuring the velocity of a moving object"

The invention relates to a system for measuring the velocity of a moving object with respect to the ground as projected onto an axis, using the Doppler effect. Two signals .SIGMA. + kj .DELTA. and .SIGMA. - kj .DELTA. are produced from received signals .SIGMA. and .DELTA., k being a coefficient which depends on the velocity of the moving object and on a predetermined duration T. Measuring the difference between the phase of signal .SIGMA. - kj .DELTA. and that of signal .SIGMA. + kj .DELTA. after the latter has been delayed by duration T produces a signal proportional to the velocity sought. The invention is applicable to aerial or marine navigation systems.

[A2332]

"Bearing measurement device for a portable attack warning radar"

An attack warning system for alerting ground troops or ships to the possiity of attack by enemy aircraft. The system establishes a detection shell at a range of 3 miles covering 360.degree. in azimuth and 60.degree. in elevation. The bearing measurement is obtained by a combination of antenna pattern shape and P-N Code modulation. A pair of oppositely facing receiving antennas and a pair of oppositely facing transmitting antennas located orthogonally with respect to the receiving antennas provide the 360.degree. coverage. The azimuth pattern of each antenna covers 180.degree.. The system provides target bearing information by applying different codes to each of the two opposed transmit antennas and multiply decoding the received signals. [A2333]

"Omnidirectional tracking weapon control system"

A rear looking radar antenna system with a look angle of .+-. 120.degree. installed on a missile launching aircraft which has a conventional front looking antenna with a look-angle of .+-. 60.degree.. This permits a full 360.degree. to be covered. The search and track circuitry of the existing weapon control system is shared between the back and front antennas. As a target passes beyond the look-angle of one of the antennas, the other antenna picks it up. The weapon control circuitry is switched from the one to the other antenna at this time. [A2334]

"Method and apparatus for mapping and similar applications"

This invention relates to an improvement in the art of position determination and in particular to the art of mapping, surveying, station keeping, and the like, employing moving craft and measuring quantities linearly related to the simultaneous variations of the simultaneous distances between the moving craft and a plurality of fixed or mobile station points. [A2335]

"Sonar target converter"

1. A sonar converter comprising in combination, radar means for echo-ranging on an aircraft target and producing a pair of output signals representing the range and bearing thereof, sonar means for echo-ranging on a submarine target and producing a pair of output signals representing the range and bearing thereof, means coupled to said radar means for displaying said aircraft range and bearing in response to the pair of output signals produced thereby, means coupled to said radar means and said sonar means for generating a signal having a time delay proportional to the range of said submarine target, means coupled to said radar and sonar means for generating a signal representing the bearing of said submarine target when same substantially coincides with the bearing display of said aircraft target, and means connected between the outputs of said time delayed signal generating means and said submarine target bearing signal generating means and the input of the aforesaid aircraft range and bearing display means for simultaneously supplying said submarine target range and bearing signals thereto for display thereof only when said displayed aircraft target bearing and said submarine target bearing are within a predetermined angular display sector. [A2336]

"CW Interference canceller (CWIC)"

An antijam device for use in radar and missile guidance systems which tra a doppler-shifted CW target echo by means of an automatic frequency control loop. Means are placed between the doppler filter and error detector portion of the automatic frequency loop to suppress the interference signal and generate an output signal which is essentially identical in frequency and amplitude to the target doppler signal which is tracked instead of the jamming signal. [A2337]

"Optical processing system for synthetic aperture radar"

An optical processing system for a synthetic aperture radar moving target indicator or otherwise in which a graduated light filter provides minimum to a maximum transmission over a laser beam width. The laser beam then shines through the filter, an exposed film containing a phase history and through one or more field stop slits or a spatial filter to an unexposed film. The filter compensates for the lack of an infinitely long laser beam required for a Fourier transform of the phase history into what is not but is mostly indistinguishable from a photographic image of stationary and/or moving targets. The filter suppresses false images sometimes called side-lobes. [A2338]

"Monopulse receiver circuit for an anti-radar missile tracking system"

1. In a monopulse radar receiver system for determining the angular co-orates of a pulsed RF radiation source, the combination comprising: An RF signal processing circuit adapted to convert a directional antenna input signals to inversely related pairs of computer input pulses, A pair of automatic gain control pre-amplifiers connected to said processing circuit adapted to simultaneously receive and amplify the pairs of input signals, A difference circuit connected between the outputs of each pair of pre-amplifiers for providing a difference signal pulse, Amplifying means connected with said difference circuit for amplifying said difference signal pulse, A leading-edge gate circuit connected with said amplifying means, adapted to be operatively triggered at the pulse-repetition rate of the pulses propagated by the RF radiation source for accepting only the leading edge of each amplified difference signal

pulse, Means for triggering the gate circuit, A pulse integrator circuit connected with the output of said gate circuit adapted to provide an output signal which is a function of the position of the source of radiation, Direct connecting means joining the output of said integrator with one pre-amplifier of said pair for directing the integrator output signal to the one pre-amplifier for dirving the gain thereof in a first direction, An inverter circuit connecting the output of said integrator with the other pre-amplifier of said pair, adapted to invert and combine a reference voltage with the output of said integrator circuit to provide an inverted gain control signal having a reference imposed thereon for driving the gain of the other pre-amplifier in a second direction opposed to said first direction, and A second difference circuit connected with the output of said integrator and the output of said inverter circuit for deriving a difference signal indicative of the angular co-ordinate of the source of pulsed RF radiation, relative to said system, when the difference signal is driven to a zero valve. [A2339]

"Altitude coding for collision avoidance system"

In a cooperative collision avoidance system for aircraft, an altitude encoding system serves as a discriminant to insure orderly sequence of data exchange between cooperative aircraft, particularly, in a dense traffic environment. The system includes means for generating pairs of pulse-interval coded signals spaced to represent altitude addresses from interrogator to responder aircraft. Responder aircraft reply with a single pulse to such an altitude address only if the responder aircraft is at the altitude corresponding to the address. [A2340]

"Missile guidance by radar signals using surface acoustic wave correlator"

A system for controlling the flight of a missile by the use of coded radar signals. A ground level radar transmits coded signals in the form of a phase modulated radar signal. Each coded signal represents a particular guidance command which is received by the missile and "filtered" out of the radar signal by a surface acoustic wave correlator. The correlator detects the code in the signal and in turn energizes a control circuit which operates a control surface on the missile. [A2341]

"Electronic proximity fuse having multiple Doppler frequency channels"

1. A Doppler frequency responsive electronic proximity fuse comprising, in combination: A. means for transmitting signals at at least two different frequencies and for receiving Doppler frequency signals which are reflected by a target, B. means forming a first amplifier channel for amplifying only those Doppler frequency signals which are received when said transmitting-receiving means transmit at one of said two different frequencies, C. means forming a second amplifier channel for amplifying only those Doppler frequency signals which are received when said transmitting-receiving means transmit at the other of said two different frequencies, D. each of said amplifier channel means including an integrating stage and a threshold stage connected to the output of said integrating stage, so that each amplifier channel means produces an output signal only when the integrated Doppler frequency signal being amplified by the respective channel means exceeds a predetermined minimum amplitude, the integrating stage of at least one of said amplifier channel means being constituted by a filter circuit, E. switch-over means connected to said transmitting-receiving means and to said first and second amplifier channel means for alternately causing (1) said transmitting-receiving means to transmit said one frequency and connecting said first amplifier channel means to the output of said transmitting-receiving means, and (2) said transmitting-receiving means to transmit said other frequency and connecting said second amplifier channel means to the output of said transmitting-receiving means, and F. coincidence circuit means connected to the outputs of said two amplifier channel means for producing a triggering signal only when both of said amplifier channel means apply an amplified signal to said coincidence circuit means. [A2342]

"Radar systems"

A within-pulse radar having an array of aerial elements each of which feeds signals to a storage filter via a frequency changing stage, in which the outputs from alternate filters are combined in one channel and the outputs from the remaining filters are combined in another channel which includes a switchable phase shifter which introduces a phase shift of 0.degree. or 180.degree. and which is switched during each pulse length, results in improved separation of scanning and grating lobes. The outputs from the two channels are combined for utilization. [A2343]

"Electronic roll compensation system for a radar antenna"

A simplified and reliable system for electronically controlling the angular position relative to an antenna axis of the ground areas from which radar signals are received and processed so that air-to-ground range may be measured accurately regardless of the roll angle of the aircraft in which the radar is mounted. In a radar silent lobing system in which lobing is done on reception of the transmitted signals, the roll compensation system provides direct current signals which are proportional to the sine and cosine of one-half the roll angle and which are selectively applied to the pole pairs of the azimuth and elevation poles of the ferrite modulator that is utilized in the lobing system. During range determining operations, first and second pole pairs each of an azimuth and elevation pole, or group of azimuth and elevation poles, are energized or selected during alternate lobing or pulse repetition frequency intervals. The system functions at any roll angle .alpha. by positioning the magnetic field of the modulator at .alpha./2 degrees so as to shift the components of the modulator input so that the vector sum at the output will be vertical, resulting in a constant output being provided to the radar receiver regardless of the roll angle of the aircraft. [A2344]

"Pulse pair recognition and relative time of arrival circuit"

A circuit arrangement for recognising two pulses in a series by their mutual separation and indicating the time of arrival of one of the pulses comprising a counter gated by the input signals which counts clock signals until a predetermined reference instant in time, a multiple shaft register which stores the binary count when the counter is inhibited and a serial shift register connected to receive the input signal and having along its length tappings spaced by an interval corresponding to a desired separation between the two input pulses, the tappings being connected to a coincidence gate which provides recognition pulses. [A2345]

"Automatic frequency control system"

An automatic frequency control system that is particularly suited for use th an aircraft launched radar controlled guided missile. The missile automatic frequency control system is made entirely of solid state devices including a voltage tuned solid state oscillator. The system employs a search mode of operation and two lock modes of operation. The search mode of operation occurs prior to missile launch when the aircraft radar and the missile control system are both scanning for a target and the reflected signal from the target has not been received by the missile control system. The two lock modes of operation are false lock and real lock. False lock occurs when the missile receives a false signal from the doppler radar of a nearby aircraft, for example. Real lock occurs during missile free flight when the missile receives a reflected radar signal from the target. [A2346]

"Frequency modulated doppler distance measuring system"

4. A single antenna missile fuzing system adapted to function at a predetined distance from a target, said system comprising in combination: a microwave oscillator, a frequency modulator for modulating said oscillator at a frequency which is considerably lower than the doppler frequency occurring when the missile is falling at terminal velocity, a magic tee having first and second side arms, an H-arm and an E-arm, the output of said microwave oscillator being fed to said H-arm, an antenna connected to said first side arm and adapted to radiate energy towards a target and receive energy reflected therefrom, a load connected to said second side arm, a crystal detector disposed in said E-arm, said load being chosen so that only a relatively small portion of the energy from said microwave oscillator passes to said crystal detector to mix with the received energy passing to said detector from said first side arm, the output of said detector comprising a frequency modulated wave having a carrier frequency equal to the doppler frequency and sidebands equal, respectively, to the sum and differences of said carrier frequency and said modulation frequency and its harmonics, said frequency modulated wave having a frequency deviation which is dependent upon target distance, an amplifier to which said detected signal is fed, said amplifier being tuned to the doppler frequency and having a bandwidth which is equal to at least twice said modulation frequency, a limiter to which the output of said amplifier is fed for producing an essentially constant amplitude signal, a frequency discriminator to which the output of said limiter is fed, said discriminator producing an output voltage which is substantially proportional to target distance, and means connected to the output of said discriminator for functioning said fuze when the output of said discriminator is a predetermined value corresponding to said predetermined distance. [A2347]

"Radar-barometric altitude indicator"

An aircraft instrumentation having inherent self-checking features. Radar and barometric altitude information are displayed on the dial face of a single instrument. A cooperating dial and first pointer displays barometric altitude. A manually settable indicator "bug" cooperates with the dial to provide a presentation of the height of the airstrip relative to sea level. A second indicator "bug" of a different shape from the landing field bug is servo-driven from both radar and barometric altitude signal inputs to provide a presentation of aircraft altitude relative to the terrain beneath the aircraft. The angle between the barometric altitude pointer and servoed radar altitude "bug," measured counterclockwise, constitutes the distance of the aircraft above the airstrip or other terrain which the aircraft is passing over. Upon touchdown both "bugs" should be in exact coincidence, thereby serving as a self-check upon accuracy of the instrumentation. [A2348]

"Automatic t.sub.0 control for use in airborne DME system"

In distance measuring equipment (DME) for use in aircraft an interrogation is transmitted from a local airborne DME, generally to a ground station. The transmitted signal is also sampled and transformed by a local oscillator means to the frequency of the expected response and applied to the front end of the DME receiver. The sampled and transformed signal thereafter traverses the receiver circuits and is applied to start a range clock at the rear end of the receiver. Simultaneously, the signal traversing the receiver circuits is sampled and memorized in a sample and hold circuit. A response to the interrogation, when received, is also applied to the front end of the receiver and traverses the receiver circuits and applied to stop the range clock, the resulting change of state of the range clock being related to the range between the interrogating and responding stations. The response signal traversing the receiver circuits is sampled and memorized in a second sample and hold circuit, with the contents of both sample and hold circuits being compared against one another. The results of the comparison are applied to the local oscillator means to control the amplitude of the output signal thereof. [A2349]

"Helicopter blind landing and hover system"

A precision hover and landing system for use in a helicopter is provided. A elevision camera system, an infra-red scanner and a passive radar antenna array are located on a three-axis gimbal mounted on the helicopter. An airborne radar angle tracking receiver and a ground-based transponder provide azimuth and elevation angle error signals for pointing the gimbal along the true line-of-sight to the desired landing area. A ranger unit provides range and range rate of change information. [A2350]

"Voice-modulated transponder system"

A voice-modulated transponder system comprising an interrogator and a light-weight transponder. In the described embodiment, the interrogator is airborne and the transponder is located on the ground. The interrogator can locate the position of the transponder and simultaneously therewith two-way voice communication between the interrogator and transponder is possible. [A2351]

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A2128. Пат. 4370656 США, МПК G01S13/00, G01S11/04, G01S11/00, G01S5/12, G01S005/10. Use of bistatic radar system for determining distance between airborne aircraft / L. M. Frazier, B. G. Lewis. - № 06/200660; Заявлено 27.10.1980; Опубл. 25.01.1983. - 6 с.↑

A2129. Пат. 4359733 США, МПК G01S13/78, G01S13/00, G01S5/14, G01S13/87, G01S013/78. Satellite-based vehicle position determining system / G. K. O'Neill. - № 06/189744; Заявлено 23.09.1980; Опубл. 16.11.1982. - 57 с.↑

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A2132. Пат. 4358765 США, МПК G01S13/78, G01S13/00, G01S013/78. Apparatus for producing a single side band / B. Henoch, E. Berglind. - № 06/067124; Заявлено 16.08.1979; Опубл. 09.11.1982. - 10 с.↑

A2133. Пат. 4358763 США, МПК G01S13/00, G01S13/82, G01S013/80. Continuous-wave radar responder having two-position switches / R. Strauch. - № 06/148116; Заявлено 09.05.1980; Опубл. 09.11.1982. - 9 с.↑

A2134. Пат. 4357610 США, МПК G01S13/32, G01S13/00, G01S13/88, G01S7/40, G01S013/08. Waveform encoded altitude sensor / S. C. Kingston, V. A. Ehresman. - № 06/191872; Заявлено 29.09.1980; Опубл. 02.11.1982. - 7 с.↑

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A2136. Пат. 4355311 США, МПК G01S13/90, G01S13/00, G01S013/00, G01S013/90. Multibeam single frequency synthetic aperture radar processor for imaging separate range swaths / R. A. A. N. A. S. Frosch, N./A.A. Jain. - № 06/165910; Заявлено 03.07.1980; Опубл. 19.10.1982. - 10 с.↑

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A2140. Пат. 4346383 США, МПК G01S13/88, G01S13/00, G01S013/08, G01R027/04. Checking the location of moving parts in a machine / S. C. Woolcock, E. G. Brown. - № 06/174581; Заявлено 01.08.1980; Опубл. 24.08.1982. - 11 с.↑

A2141. Пат. 4339752 США, МПК G01S13/90, G01S13/00, G01S013/90. Synthetic array processor / F. C. Williams, W. W. Clements. - № 05/154238; Заявлено 15.06.1971; Опубл. 13.07.1982. - 16 с.↑

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A2153. Пат. 4308473 США, МПК F42C13/00, F42C13/04, G01S13/00, G01S13/28, H03D7/14 и др. Polyphase coded mixer / I. S. Carnes. - № 06/129456; Заявлено 21.02.1980; Опубл. 29.12.1981. - 6 с.↑

A2154. Пат. 4297702 США, МПК F42C13/00, F42C13/04, G01S13/00, G01S13/28, G01S013/26. Polyphase coded fuzing system / I. S. Carnes. - № 05/909098; Заявлено 24.05.1978; Опубл. 27.10.1981. - 6 с.↑

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A2179. Пат. 4224507 США, МПК G01S13/66, G01S13/00, G01S13/44, G05D003/00, G06G007/80 и др. System for tracking a moving target with respect to a frame of reference of unvarying orientation and fixed origin relative to earth / R. Gendreu. - № 05/952127; Заявлено 17.10.1978; Опубл. 23.09.1980. - 20 с.

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A2273. Пат. 4067009 США, МПК G01S13/90, G01S13/00, G01S13/44, G01S009/02. Beam focused synthetic aperture / J. N. Constant. - № 05/601392; Заявлено 01.08.1975; Опубл. 03.01.1978. - 14 с.↑

A2274. Пат. 4064510 США, МПК G01S13/90, G01S13/00, G01S009/10, G01S009/22, G01S009/52. High repetition frequency side-looking pulse radar system / M. Chabah. - № 05/697738; Заявлено 18.06.1976; Опубл. 20.12.1977. - 8 с.↑

A2275. Пат. 4060805 США, МПК G01S13/02, G01S13/78, G01S13/00, G01S5/02, G08G5/00 и др. Integrated terminal area surveillance system / A. D. McComas. - № 05/700433; Заявлено 28.06.1976; Опубл. 29.11.1977. - 14 с.↑

A2276. Пат. 4058809 США, МПК G01S13/524, G01S13/526, G01S13/00, G01S009/42. MTI system and method / W. H. Chudleigh, J. - № 05/278478; Заявлено 26.06.1972; Опубл. 15.11.1977. - 22 с.↑

A2277. Пат. 4057800 США, МПК G01S13/22, G01S13/60, G01S13/00, G01S13/64, G01S009/44. Multi-PRF signal processor system / F. M. Ganz. - № 05/691884; Заявлено 01.06.1976; Опубл. 08.11.1977. - 11 с.↑

A2278. Пат. 4053880 США, МПК G01S13/78, G01S13/00, G08C009/08. Keying apparatus / J. P. Harmon. - № 05/638212; Заявлено 05.12.1975; Опубл. 11.10.1977. - 5 с.

A2279. Пат. 4052721 США, МПК G01S13/93, G01S13/68, G01S13/79, G01S13/00, G01S009/56. Multi-target tracker for tracking near co-range targets / W. L. Ross. - № 05/643478; Заявлено 22.12.1975; Опубл. 04.10.1977. - 12 с.

A2280. Пат. 4050070 США, МПК G01S13/82, G01S7/40, G01S13/00, H03C1/06, H03C1/00 и др. Programmable microwave modulator / L. A. Beno, K. Doi. - № 05/691923; Заявлено 01.06.1976; Опубл. 20.09.1977. - 8 с.

A2281. Пат. 4050069 США, МПК G01S13/76, G01S13/91, G01S13/00, G01S009/56. Transponder based landing system / H. Schlussler. - № 05/719790; Заявлено 02.09.1976; Опубл. 20.09.1977. - 6 с.

A2282. Пат. 4050068 США, МПК G01S13/86, G01S13/00, G01S009/02. Augmented tracking system / R. L. Berg, W. J. Murphy, D. E. Simmons, J. - № 05/667041; Заявлено 15.03.1976; Опубл. 20.09.1977. - 5 с.

A2283. Пат. 4050067 США, МПК G01S13/02, G01S13/00, G01S009/00, G01D009/08. Airborne microwave path modeling system / E. P. Elmore, J. - № 05/679082; Заявлено 21.04.1976; Опубл. 20.09.1977. - 5 с.

A2284. Пат. 4048637 США, МПК G01S13/52, G01S13/00, G01S009/42. Radar system for detecting slowly moving targets / O. J. Jacomini. - № 05/669550; Заявлено 23.03.1976; Опубл. 13.09.1977. - 8 с.

A2285. Пат. 4047179 США, МПК G01S13/76, G01S13/00, H01Q21/00, H01Q21/28, H01Q13/18 и др. IFF antenna arrangement / A. J. Appelbaum, M. J. Collins, J. D. Hanfling. - № 05/682428; Заявлено 03.05.1976; Опубл. 06.09.1977. - 7 с.

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A2288. Пат. 4041491 США, МПК G01S13/02, G01S13/00, G01R029/08. Method and apparatus for determining the altitude of a signal propagation path / J. W. Taylor, J.C. A. McGrew. - № 05/631976; Заявлено 14.11.1975; Опубл. 09.08.1977. - 21 с.

A2289. Пат. 4041486 США, МПК G01S13/00, G01S13/78, G01S009/02. Pulse stream identification circuit / M. I. Hussain. - № 05/630730; Заявлено 10.11.1975; Опубл. 09.08.1977. - 6 с.

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A2291. Пат. 4038658 США, МПК G01S13/58, G01S13/00, G01S13/90, G01S009/42. Moving target speed and direction determining radar system / J. L. Nelson, D. G. Trego. - № 05/314881; Заявлено 13.12.1972; Опубл. 26.07.1977. - 6 с.

A2292. Пат. 4034372 США, МПК G01S13/58, F41G7/00, G01S13/76, G01S13/00, G01S009/56 и др. Velocity gate hand-off system / D. L. Margerum. - № 05/704645; Заявлено 12.07.1976; Опубл. 05.07.1977. - 9 с.

A2293. Пат. 4034370 США, МПК G01S13/90, G01S13/00, G01S009/02. Second order motion compensator for high resolution radar / J. H. Mims. - № 05/674181; Заявлено 06.04.1976; Опубл. 05.07.1977. - 9 с.

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A2296. Пат. 4024539 США, МПК G01S7/04, G01S13/94, G01S7/10, G01S13/00, G01S009/02. Method and apparatus for flight path control / R. P. Quinlivan, H. H. Westerholt. - № 04/448373; Заявлено 15.04.1966; Опубл. 17.05.1977. - 9 с.↑

A2297. Пат. 4024537 США, МПК G01S13/94, G01S13/00, G01S13/53, G01S009/22. Doppler-radar, projected terrain-clearance system / G. E. Hart. - № 05/689694; Заявлено 24.05.1976; Опубл. 17.05.1977. - 11 с.↑

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A2305. Пат. 4016565 США, МПК G01C5/00, G01S13/94, G01S13/00, G01S009/04, G06F015/50. Aircraft ground closure rate filtering method and means / F. L. Walker. - № 05/613380; Заявлено 15.09.1975; Опубл. 05.04.1977. - 11 с.↑

A2306. Пат. 4010467 США, МПК F41G7/22, G01S13/66, F41G7/20, G01S13/00, F42B015/02 и др. Missile post-multiple-target resolution guidance / L. P. Slivka. - № 05/231430; Заявлено 02.03.1972; Опубл. 01.03.1977. - 4 с.↑

A2307. Пат. 4010465 США, МПК G01S13/78, G01S13/00, G01S009/56. Channel encoding for distance measurement equipment / S. H. Dodington, J. S. LeGrand. - № 05/565311; Заявлено 04.04.1975; Опубл. 01.03.1977. - 24 с.↑

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A2312. Пат. 3997898 США, МПК G01S13/84, G01S13/00, G01S009/56. Channeling method and apparatus / J. S. LeGrand. - № 05/574223; Заявлено 05.05.1975; Опубл. 14.12.1976. - 9 с.↑

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A2314. Пат. 3996589 США, МПК G01S13/60, G01S13/44, G01S13/00, G01S009/48, G01S009/22. Monopulse radar system / M. E. Breese. - № 05/497702; Заявлено 15.08.1974; Опубл. 07.12.1976. - 14 с.↑

A2315. Пат. 3988731 США, МПК G01S13/75, G01S13/00, H01Q15/00, G01S009/02. Augmented perspective radar display / D. W. Young. - № 05/581638; Заявлено 28.05.1975; Опубл. 26.10.1976. - 18 с.↑

A2316. Пат. 3987988 США, МПК G01S13/60, G01S13/78, G01S13/00, G05D1/00, G05D1/06 и др. Ground speed calculation for digital DME / R. L. Powell, F. P. Smith, 2. - № 05/571845; Заявлено 28.04.1975; Опубл. 26.10.1976. - 5 с.↑

A2317. Пат. 3987445 США, МПК G01S11/02, G01S13/87, G01S13/00, G01S11/00, G01S005/04 и др. Oblique scatter object detection and location system / D. Fales, I.I.I. - № 04/257463; Заявлено 11.02.1963; Опубл. 19.10.1976. - 10 с.↑

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A2326. Пат. 3974328 США, МПК F41G7/20, G01S3/786, G01S13/72, F41G7/22, G01S13/00 и др. Line scan area signature detection system / F. J. Thomas, M. W. Farrow. - № 05/437406; Заявлено 28.01.1974; Опубл. 10.08.1976. - 30 с.↑

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Сборник сформирован в рамках выполнения проекта **РФФИ 18-07-01270** "*Создание методики выявления и прогнозирования перспективных направлений развития радиоэлектронных систем, использующих отражение и вторичное излучение радио, акустических и электромагнитных волн в космической, авиационной и наземной технике на базе патентного анализа*"