

Large Angle Scanner using Novel Flexures (NSTP-2 Exploratory Ideas)

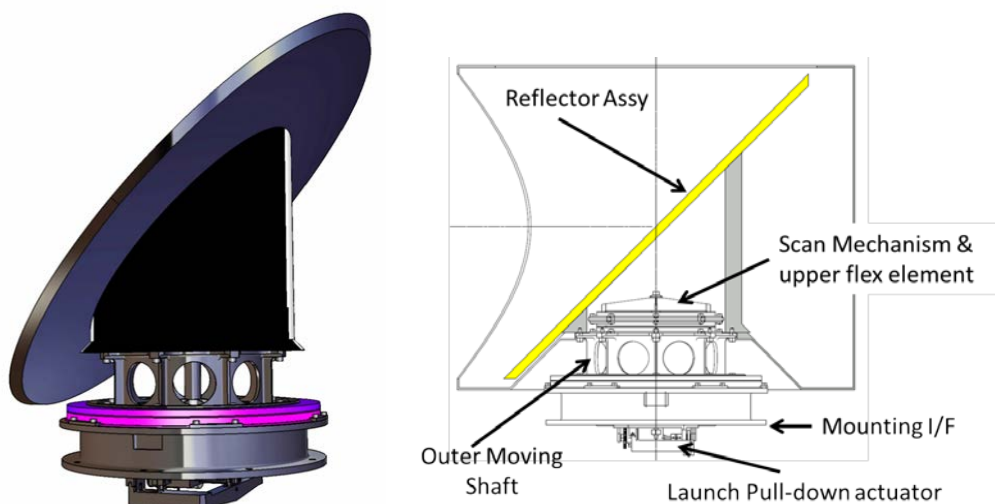
Executive Summary

This project was undertaken to establish the technical feasibility of using Spacemech's novel flexure technology in future space based scan mechanisms. The first stage of the study was a market survey which identified a number of potential applications and the requirements for these were then researched and reviewed. The study has identified the need for two different types of scanners each with distinctively different requirements. A flexure based solution was found for both types and a credible preliminary design solution for each was established. The most challenging application was for LEO Earth observation instruments that require very large scan angles (typically up to $\pm 118^\circ$) and the mass of rotating payload (typically a 2kg reflector) needed to be supported in a cantilevered fashion. The required life cycles for both types of scan mechanisms are many hundreds of millions.

The established design solution incorporated a pair of radically new in-side-out flexures that allows a static central support shaft to be used with a moving outer tube as the output drive shaft. The configuration also includes an integrated launch protection which provides the high robustness and stiffness needed to support the larger reflectors during launch. The established implementation provides a compact, mass efficient and elegant solution which is expected to comply with all of the most critical requirements for future applications. With this design and associated flexure technology it now becomes possible to replace the ball bearings of conventional EO scan systems and in doing so it eliminates a significant spacecraft-level risk and has major benefits to overall verification and schedule costs. Advantages include:

- Infinite life, predictable by design and analysis, so life testing becomes a formality.
- Free of, and resistant to, contamination (higher reliability and ideal for optical applications)
- No friction or torque noise, so better pointing performance is expected.

The above characteristics also make it a very attractive solution for other instrument applications such as: wide-angle imaging LIDARs, optical filter/chopper wheels, and calibration switching devices.



The Spacemech Large Angle Scanner (LAS)