

# **Atout Process Ltd; Real Time Multi-Phase Mass and Density Measurement in zero gravity**

## **Project Summary**

A feasibility study into the application of Atout Process Electrical Capacitance Tomography (ECT) multi-phase imaging technology to zero g measurement of propellant (or oxidizer and other liquids). It is proposed that in zero g, the distribution of propellant in liquid and gas phases can be measured, displayed in 3D, with accurate determination of total mass.

ECT may be ideally suited to space applications. The electronics and sensor arrays can be extremely low mass, and critically the technique does not dissipate heat into the propellant, which makes it intrinsically safe, and suitable for cryogenic liquids.

Applications anticipated:

1. Real time imaging of propellant within storage tanks, giving continuous true total mass indications, regardless of the distribution of gas and liquid. Additionally, a real time image of distribution would enable a leak caused by a micrometeorite penetration to be located.
2. Real time metering of true mass during propellant transfer in zero g, enabling orbital and deep space refuelling between docked spacecraft.
3. True multi-phase mass flow metering within the rocket motor, to enable the design of robust zero g start up motors without the need for settling impulse or positive displacement.

Terrestrial instrumentation exists which will be used to test basic zero g performance using simple drop tests. This project will demonstrate initial feasibility and allow detailed costing of prototype zero g systems.