



Advanced Optical Mass Gauge

Problem Statement

Current methods for consumable gauging (including bookkeeping, PVT method) indirectly measure propellant and accumulate large mass uncertainties and require vehicle to thrust to acquire measurements. The AOMG will improve measurement accuracy to >99% total mass, extending mission lifetime by months.

- This flight opportunity will raise the TRL from 4 to 5 and collect data on pre-calibrated fuel levels to validate theoretical calculations .

- Propellant gauging supports operators and providers of: civilian and military satellites, near-Earth and deep space missions, crewed and cargo transfer vehicles, propellant depots and robotic service missions, and launch vehicles.

Technology Development Team

Jason D. Reimuller, Mass Dynamix
jason.reimuller@massdynamix.com
Mass Dynamix, Inc. 1440 Sloat Blvd., San Francisco, CA 94132.

- Potential partners: ATK (provided prototype tank) and Boeing.

Proposed Flight Experiment

Experiment Readiness:

- September 2013

Test Vehicles:

- Parabolic Aircraft, sRLV

Test Environment:

- The experiment has yet to be flown in a microgravity environment. Initial flights are requested through the use of a parabolic aircraft.

Test Apparatus Description:

- The experiment will consist of two tanks filled with varying volumes of test fluid. Several variations of the tank configuration, laser power, and analog fluid will be tested. The first tank will be a 12" operational prototype fitted with the AOMG system modified so that pre-determined volumes of test fluid may be introduced. A transparent acrylic tank will also be used for flow visualization. The operator will introduce pre-determined volumes of test fluids to the tanks between parabolas.



Technology Maturation

- TRL4 to TRL5: sufficiently test/validate optical gauge in microgravity environment (2013).
- TRL6+: fly as a hosted payload, integrated on a satellite system for test in operational environment (2014-15). No deadlines specified.

Objective of Proposed Experiment

- Objectives: Raise TRL from 4 to 5 and validate the gauge sensor design and fuel level algorithms.
- This test will validate the functionality of the system using the prototypical titanium spacecraft tank in reduced gravity and collect functional data through measurements of various fill levels of the tank by determining the operability using an alcohol-based propellant and testing the system for various fill levels. Fluid visualization data will also be obtained.