

## DEVELOPMENT AND TESTING OF A NOVEL GREEN PROPELLANT

### PISTON TANK

C.E Diaz and D. P. Cavender  
NASA Marshall Space Flight Center  
Huntsville, AL

K. Higdon, J. Abrams, M.E. Duchek and H. Mader  
Analytical Mechanics Associates, Inc.  
Huntsville, AL

### ABSTRACT

Analytical Mechanics Associates (AMA), in cooperation with NASA Marshall Space Flight Center's (MSFC's) Spacecraft Propulsion Systems Branch, developed and tested a novel propellant tank design that employs an internal piston pressurized with an inert gas to expel propellant to thrusters. During the course of this activity, AMA designed, oversaw fabrication, and delivered to MSFC for testing, a piston propellant tank sized for 3U or larger cubesats. MSFC conducted liquid expulsion testing using ethylene glycol as a referee fluid to map the tank's performance at different pressures and piston positions. Following the expulsion test campaign, the tank is planned to be integrated into a propulsion system test bed for hot fire tests with a 100mN monopropellant thruster to evaluate the tank's influence on thruster performance when operated in a flight like manner. Described in this paper is a comprehensive summary of how the tanks were designed, built, and tested. The fundamental knowledge gained through the fabrication and testing of these tanks gives evidence that the piston tank design may be scalable to meet the requirements and constraints of other small satellites.