

LADEE Propulsion System Cold Flow Test

ABSTRACT

Lunar Atmosphere and Dust Environment Explorer (LADEE) is a NASA mission that will orbit the Moon. Its main objective is to characterize the atmosphere and lunar dust environment. The spacecraft development is being led by NASA Ames Research Center and scheduled for launch in 2013. The LADEE spacecraft will be operated with a bi-propellant hypergolic propulsion system using MMH and NTO as the fuel and oxidizer, respectively. The propulsion system utilizes flight-proven hardware on major components. The propulsion layout is composed of one 100-lbf main thruster and four 5-lbf RCS thrusters. The propellants are stored in four tanks (two parallel-connected tanks per propellant component). The propellants will be pressurized by regulated helium.

A simulated propulsion system has been built for conducting cold flow test series to characterize the transient fluid flow of the propulsion system feed lines and to verify the critical operation modes, such as system priming, waterhammer, and crucial mission duty cycles. Propellant drainage differential between propellant tanks will also be assessed. Since the oxidizer feed line system has a higher flow demand than the fuel system does, the cold flow test focuses on the oxidizer system.

The objective of the cold flow test is to simulate the LADEE propulsion fluid flow operation through water cold flow test and to obtain data for anchoring analytical models. The models will be used to predict the transient and steady state flow behaviors in the actual flight operations. The test activities, including the simulated propulsion test article, cold flow test, and analytical modeling, are being performed at NASA Marshall Space Flight Center.

At the time of the abstract submission, the test article checkout is being performed. The test series will be completed by November, 2012.