SPACE PROPULSION SYMPOSIUM (C4)
Propulsion Systems I (1)

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LIQUID OXYGEN / LIQUID METHANE PROPULSION AND CRYOGENIC ADVANCED DEVELOPMENT

Abstract

Exploration Systems Architecture Studies conducted by NASA in 2005 identified the liquid oxygen (LOX) / liquid methane (LCH4) propellant combination as a prime candidate for the Crew Exploration Vehicle Service Module propulsion and for later use for ascent stage propulsion of the lunar lander. Both the Crew Exploration Vehicle and Lunar Lander were part the Constellation architecture, which had the objective to provide global sustained lunar human exploration capability. From late 2005 through the end of 2010, NASA and industry matured advanced development designs for many components that could be employed in relatively high thrust, high delta velocity, pressure fed propulsion systems for these two applications. The major investments were in main engines, reaction control engines, and the devices needed for cryogenic fluid management such as screens, propellant management devices, thermodynamic vents, and mass gauges. Engine and thruster developments also included advanced high reliability low mass igniters. Extensive tests were successfully conducted for all of these elements. For the thrusters and engines, testing included sea level and altitude conditions. This advanced development provides a mature technology base for future liquid oxygen / liquid methane pressure fed space propulsion systems. This paper documents the design and test efforts along with resulting hardware and test results.