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DESIGN AND TESTING OF A HYBRID ROCKET MOTOR TO ENABLE INTERPLANETARY CUBESAT MISSIONS

Abstract

In recent years, there has been increasing interest in extending the capabilities of CubeSats in a push to enable stand-alone interplanetary CubeSat missions. Such missions will require small propulsion systems with the ability to deliver significant delta-V. There is currently no off-the-shelf propulsion system capable of delivering the impulse required for orbit insertion around another planet whilst fitting within the CubeSat form factor. The hybrid rocket motor is a promising form of propulsion for this application due to its relatively high specific impulse, propellant options with reduced criticality to failure, and ability to be re-ignited. Development of a hybrid rocket motor using non-toxic propellants for interplanetary CubeSat missions has been ongoing at the Jet Propulsion Laboratory. This paper will summarize the past two years of effort towards the design and development of this motor for flight. To date, nearly 30 successful hot-fires have been conducted in support of this effort. Details of the test facility, combustion chamber design iterations, and test results shall be provided. The design and test results of an augmented spark igniter for multiple re-starts of the hybrid rocket motor shall also be provided. The challenges of progressing this system towards flight shall be discussed along with the work to go for the system.