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AN EXPERIMENTAL AND CONCEPTUAL ENGINEERING MODEL OF A CUBE-SATELLITE USING ABLATIVE LASER PROPULSION FOR FUTURE DEEP SPACE MISSIONS

Abstract

This research paper would outline a pragmatic conceptual model of space Ablative Laser Propelled(ALP) cube-satellite including the modes, breakdown regimes, and propulsion efficiency with its comprising technologies, and operational scenarios to facilitate affordable deep space missions. This propulsion can be implemented in small-satellites for deep space missions for longer life. Ablative laser propulsion (ALP) is a new electric propulsion concept with a 45-year history and it is one of the most promising concepts in the family of laser propulsion schemes and can be used across a variety of fields with a wide range of applications in space. ALP reflects a higher payload in addition to lesser launch costs in comparison with other conventional methods of producing thrusts and particularly helping the design, manufacture, testing, operations, and technological developments of small satellite propulsion systems. The laser propulsion system and associated technologies act as an enabler to efficient satellite access to deep space, orbit change, and overcoming the challenges of obtaining high performance within a small volume and mass. To ensure system performance and reliability in the harsh environment, appropriate thermal control architectures of all LASER's systems are discussed with finite element modeling(FEM), computational fluid dynamics(CFD), and System Tool Kit(STK) as well as, General Mission Analysis Tool(GMAT) simulations.

Keywords: ALP, Small Satellites, LASER, Cube-Satellite, FEM, CFD, STK