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Author: Mr. Sasi Kiran Palateerdham
University of Rome "La Sapienza", Italy, sasikiran.palateerdham@uniroma1.it

Mrs. Karthika Regunatha Perumal
Politecnico di Milano, Italy, karthika.regunatha@mail.polimi.it
Dr. Antonella Ingenito
Sapienza University of Rome, Italy, antonella.ingenito@uniroma1.it
Prof. Roberto Andriani
Italy, roberto.andriani@polimi.it
Mr. Mauro Panzanaro
Italy, mauropanzanaro@tecras.it
Mr. Lakshmi Narayana Phaneendra Peri
Scuola di Ingegneria Aerospaziale "La Sapienza", Italy, phanindra.p123@gmail.com

3D PRINTED MINIATURIZED MICRO THRUSTERS FOR CUBESAT APPLICATIONS

Abstract

Small satellite capabilities and uses are quickly developing in the New Space business, because of advancements in electronics and shrinking. Small satellites have several advantages, including a shorter development time, lower costs, simple maintenance, and mass production. As a result, tiny satellites are currently being investigated for nearly all space applications. Because of the ability to adapt and reconfigure the formation, incrementally add new or update older pieces of the structure, which provides inherent versatility, multi-mission capabilities and design flexibility, mission enhancement, and so on, advancements in the formation flying have undoubtedly increased the mission value in recent years. The satellite is subjected to a number of perturbations once it is launched into orbit around the Earth, and the satellites must function in the given orbit/formation and coordinate with one another in order to meet the mission's objectives. Miniaturized propulsion technologies, including as chemical and electrical propulsion, play a critical role in achieving mission designs and maintaining satellite formation flying in this environment. In this article, the feasibility of a 3D printed solid propellant micro rocket thrusters, fully integrated in an opposing array is examined both numerically and experimentally. The advantage of this system lays in the possibility of firing the rocket individually or with others depending on thrust requirements. A micro-igniter is used to start the combustion of the solid propellant. The Theoretical, Numerical and experimental results show that the microthruster, made of nylon and carbon fiber, have good mechanical and thermal resistance and simultaneously good performance is achieved with a reduced cost, production and manufacturing time.