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SOLID MICROROCKETS FOR LOW THRUST APPLICATIONS

Abstract

Small satellite applications are experiencing rapid growth in the New Space industry, primarily propelled by advancements in electronics and miniaturization. Small satellites offer numerous benefits, such as shortened development times, cost reduction, simplified maintenance, and decreased mass. Consequently, miniature satellites are currently under investigation for a broad spectrum of space-based applications. Furthermore, recent developments in formation flying have significantly boosted mission value, owing to the adaptability and reconfigurability of satellite formations.

Once deployed into Earth's orbit, satellites encounter various perturbations and must efficiently operate within the designated orbit or formation while coordinating with one another to achieve mission objectives. The integration of miniaturized propulsion technologies plays a pivotal role in realizing mission designs and sustaining satellite formation flying in this dynamic environment. This article explores the feasibility of 3D printed solid propellant micro rocket thrusters arranged in an opposing array, examining both numerical simulations and experimental data.

A noteworthy advantage of this system lies in its capability to fire the rockets individually or collectively, depending on thrust requirements. Theoretical and experimental results show that these microthrusters, constructed from nylon, exhibit good mechanical and thermal resistance while achieving high-performance levels. Additionally, this innovative approach offers reduced costs and shorter production and manufacturing timelines, presenting it as a promising solution for future space missions.