Paper ID: 55090
student

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Smart Materials and Adaptive Structures (9)

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STUDY AND DEVELOPMENT OF SATELLITE SOLAR PANELS DEPLOYMENT SYSTEM

Abstract

Deployable solar arrays for CubeSats tend to follow a common reliable format. One or more panels are connected to the satellite's main body by spring loaded hinges, folded up against its outward surfaces. The folded panels are usually held down and eventually released by a burn wire mechanism, which is centered around the melting of a string using joule heating. This solution is used due to its reliability, simplicity, low cost and low mass. Alternatively, it is also common for both the deployment and release mechanisms to function by shape memory actuation. The trigger for the shape memory effect can be joule heating (active), or heat from exposure to sunlight (passive). Based on a preliminary research of the state of the art and commercial off-the-shelf solutions, this project aims to develop two custom alternatives: one with active and another with passive release. These alternatives must satisfy a set of minimum requirements seeking, at the same time, an optimization of the current available options. The parameters that will lead to the final selection include cost, mass, solar array exposed area, deployment time and power consumption of the release mechanism. The proposed custom solutions will follow a standard product development cycle considering, in particular, the tribological challenges of the space environment, and analyzed using computer aided kinematic simulations. An experimental test of at least one of the solutions using rapid prototyping techniques is expected to be performed, to access and validate the initial requirements. An improvement in the solar panel deployment mechanisms would putatively open the possibilities for innovative missions capable of carrying high power demand payloads. Simultaneously, an improvement on the mass and form factor ratio of these systems could be achieved and employed in future CEiiA small satellite missions.