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AUTONOMOUS DEPLOYMENT OF SOLAR PANELS: NANOSATELLITE MODULES TESTED IN MICROGRAVITY ENVIRONMENT.

Abstract

The solar panels installed on a CubeSat is considered the main energy source of a Nanosatellites. The deployment mechanism of a solar panel must be analyzed and tested extensively. Any suggested solar panel design should present a low vibrating free spinning deployment mechanism. This paper examines various types of solar panels in order to reach a conclusion of the efficient design when deployed on a 1U or 1.5U unit. However, calculations, analysis, simulations don't always give an extensive picture of how the satellite shall behave during deployment. Thus, testing in a microgravity environment gives a more accurate answer of how the satellite shall behave. In our work, various solar panels mechanisms are developed and eventually tested in microgravity. The first scissor structure is tested in a microgravity environment through a parabolic flight with the National Research Council (NRC) Falcon 20 aircraft. The results are recorded and represented in order to optimize the next design. The average amount of power generated is also a main factor in our evaluation. The next design is based on an Origami structure which will be also analyzed and represented in this manuscript. This experiment is considered the first Egyptian university project in a microgravity environment.