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A COMPACT LAUNCH LOCK SYSTEM FOR CUBESAT-SIZED PAYLOADS

Abstract

This paper presents the design, realization and testing of a launch lock mechanism for a CubeSat-size pointing system for an optical payload. The mechanism consists of a base, a preloaded clamp that locks the pointing system and increases its stiffness during the launch phase and two redundant custom shape memory alloy actuators. The latter are responsible for opening the locking clamp and thus make the pointing system free to move after orbit insertion.

First, a trade-off of alternative solutions has been carried out considering aspects such as simplicity, reliability, size, rigidity and redundancy, along with the very stringent requirements posed by the pointing system in terms of available volume and mass. In fact, integration of the launch lock mechanism within the pointing system proved to be the major design challenge, which led to the selection of a custom solution for the actuator, since no lock and release systems for CubeSat payloads are available as commercial products. Then, a detailed mechanical design of the baseline architecture was realized and a prototype was assembled. The system features very low mass (<40g), high reliability due to the presence of a redundant actuator for the release system and a redundant sensor system to check the position of the clamp (closed and open).

Preliminary tests demonstrate the system working principle and the achievement of the required increase of stiffness of the pointing system. The system validation in orbit is expected by early 2020.