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AN ANGULAR MOMENTUM RING STORAGE DEVICE PROTOTYPE FOR CUBESATS BASED ON A LIQUID METAL ACTUATOR

Abstract

Ongoing development in the field of liquid metal actuators paired with the need of precise attitude control on Cubesats lead to the development of an angular momentum ring storage device that can be mounted on a Cubesat side panel. This single-axis actuator is based on a rectangular shaped channel structure containing an electromagnetically conductive fluid for angular momentum storage. The channel structure also includes the structure for a tailored electromagnetic pumping unit and is made using rapid prototyping technologies. The pumping unit is mounted on a small printed circuit board that also houses an inertial sensor and a solid momentum control algorithm.

This concept offers the benefits of liquid metal actuators (wear-free operation, strong shock resistance, reduced power demand, and flat design) and frees the inner volume of Cubesats that was occupied by micro reaction wheels and their drive unit.

Successfull performance tests on an air bearing platform showed the actuator's capability to carry out Cubesat attitude control maneuvers. A model with reinforced structure adapted to Cubesat requirements is currently in development. In this paper, the current state of research and development will be presented.