ASTRODYNAMICS SYMPOSIUM (C1)
Attitude Dynamics (1) (3)

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AN ANGULAR MOMENTUM RING STORAGE DEVICE FOR SMALL SATELLITES BASED ON A LIQUID METAL ACTUATOR

Abstract

Within the scope of the TechnoSat nanosatellite mission, the functionality of a fluid dynamic device for spacecraft attitude manipulation shall be demonstrated. This single-axis actuator rests upon on a circular channel structure that contains an electrically conductive fluid for angular momentum storage. The setup is complemented by a tailored electromagnetic pumping unit, an inertial sensor and a solid momentum control algorithm.

In contrast to reaction wheels, this concept offers wear-free operation due to the absence of moving mechanical parts. Moreover, strong shock resistance, reduced power demand and flat design are profitable reasons for its application in small satellites.

Successful performance tests on an air bearing platform demonstrated high system agility and proved the actuator's capability to carry out small satellite attitude control maneuvers. The flight model of the fluid dynamic actuator for on-orbit verification is currently in development. In this paper, the current state of research and development will be presented.