

Pico Fluid Dynamic Actuators in CubeSats

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As CubeSat capabilities continue to expand as the number of missions increase each year, the Attitude Determination and Control or (ADCS) subsystem is a major hurdle for CubeSat developers to undertake. The ADCS subsystem commonly contains actuators that are used to change the attitude of a CubeSat by means of reaction wheels. This proposal aims to present the use of alternate novel pico Fluid Dynamic Actuators or (pFDAs) to provide 3-axis attitude control for a 1U CubeSat. In contrast to bulky reaction wheels pFDAs offer an increase in payload volume optimization and can be configured in a 3 or 4 actuator variant to provide system redundancy. Additionally pFDAs feature no moving parts and can provide faster or more immediate torque. The use of pFDAs can now enable CubeSats with novel mission scenarios such as Artificial Swath Increase (ASI) and Single-Spacecraft Stereo-Imaging (SSSI). Ongoing research and development of pFDAs will feature testing in suborbital test flights onboard the Technische Universität Berlin Picosatellite EXperiment 7 (TUPEX7). With the use of low cost manufacturing technologies like 3d printing, commercial off the shelf electronics and open source communication protocols such as SPI, I2C, CAN pFDAs can disrupt trade off analysis and unlock new CubeSat potential.

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