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# DEVELOPMENT OF AN ELECTRO THERMAL CUBESAT PULSED PLASMA THRUSTER

**Abstract**

Modern CubeSat subsystems represent a technically mature line of hardware for the most part, the biggest gap is currently propulsion. Propulsion systems that do exist are often too expensive, lack flight heritage or use pressurized gas supplies which make them unsuitable for certain missions. This paper details work undertaken at ISU to prototype and test a simple Pulsed Plasma Thruster that can eventually be manufactured in house for flight operations. Such a system could be used for Attitude and Orbital Control System (AOCS), drag compensation for low orbits, formation flying operations, deorbit requirements, and even eventually deep space missions. This paper selected a Electro Thermal Pulsed Plasma thruster due to its compliance with necessary CubeSat design drivers primarily the lack of compressed gas. Novel in house adaptive manufacturing with electroplating capabilities were leveraged to manufacture prototypes of this thruster. Early environment firings provided verification of the design and led to a series of multiple pulse firing which allow for an early quantification of the attainable thrust from this system, this is compared with theoretical predictions. Finally, a preliminary vacuum testing environment was designed and setup. Future systems requirements are discussed and preliminary configurations are provided. Lessons learnt from the design and prototyping of Pulsed Plasma Thrusters are provided as well as general discussion of the additive manufacturing techniques and low cost vacuum testing to enable CubeSat electric propulsion system to be designed and produced at universities across the world.