

SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (4)

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MICRO-PROPULSION BASED ON VACUUM ARCS: ACCESSIBLE TECHNOLOGIES FOR
CUBESAT MISSIONS**Abstract**

Satellite missions allow scientists and agencies to perform different tasks in space, such as scientific missions, and earth observation. Generally, these missions are expensive and only accessible to developed countries. With the introduction of CubeSats, this has changed. These small satellites are accessible and allow universities and organizations to send their own satellites into space. This trend has allowed countries with smaller space budgets to participate in space activities that used to be only accessible to developed countries. Once in space, though, these satellites are at the mercy of orbit-decay mechanisms such as atmospheric drag and the Earth's tidal effects. Since CubeSats are usually bound to low earth orbits, these effects have a detrimental effect on the satellites orbit. The only way to counteract these effects is by having an on-board propulsion system. The μ CAT thruster based on vacuum arcs is designed to be a low-cost alternative propulsion system for CubeSats. With a low mass overhead of only 200 g, which includes the circuitry and the thruster head, these systems are small, yet powerful. Depending on the duty cycle, it is possible to control more than one thruster with a single circuit board, hence making the system even more mass-efficient. With these thrusters, it is possible to extend the lifetime of satellite missions by several months by counteracting these orbit decay mechanisms. The thrusters use solid metallic propellants that represent no health hazard to scientists and engineers working on the system. Another advantage of these systems is the fact that this thruster does not have the overhead associated with gas feed systems, such as pressurized propellant tanks, valves, tubing, and mass flow controllers. Therefore, there is no risk loss of propellant due to leaks or hazards involving pressurized components. The high ion velocities produced by the inherent physical properties of the vacuum arc provide the thruster with a specific impulse of approximately 2000 seconds depending on the metal that is used.