



The CUA Monofilament Vaporization Propulsion (MVP) system is an electrothermal thruster that uses a space-rated plastic as propellant. This approach enables CUA to deliver competitive delta-V to CubeSat customers at a substantially lower cost and dramatically lower risk profile than traditional liquid or gaseous propulsion systems having pressure vessels. In a 1U form factor, MVP provides a total impulse of 540 N-s with a peak continuous thrust of 6.7 mN. A flight-like MVP is presently being fabricated for flight qualification testing on a NASA Phase II SBIR program.

System Information	
Propulsion system volume	1U
System lifetime	Not propellant limited
Spacecraft temperature range	Not propellant limited
Propellant	POM, gaseous MW = 30
Propellant Mass	660 g
Total propulsion wet mass	1.2 kg (est)
Nominal mass flow rate	8.2 mg/s
Total thrust time	22 hr
Specific Impulse	83 s
Primary Thrust	6.7 mN
Total impulse	540 N-s
Spacecraft $\Delta V$ , M(initial) = 4 kg	150 m/s
Spacecraft propulsion power	35 W
TRL	5-6

### TYPICAL OPERATION AND INTERFACE

MVP draws from 3D printing technology to feed propellant. A preheat is required before firing (~3 minutes), but once warmed the “ready” state is maintained with minimal power draw and thermal loading. When firing, the micro-resistojet uses approximately 30 W. Propellant fiber is mechanically drawn from a fixed spool into the extruder where it evaporates. Lower thrust and power levels are available but at reduced specific impulse. Propellant metering is precise, but evaporation time results in “softer” starts and stops. As a consequence, minimum impulse bit is inherently larger than gaseous propulsion systems with fast-actuating valves, and is still being characterized. This represents the largest trade-off for the reduced system cost, complexity, and risk.

Developmental 1U MVP system interface:

- Unregulated battery voltage line (for resistojet and preheat, will be **stepped down**)
- Regulated 12 V line (<2 W when firing)
- I<sup>2</sup>C communication protocol (other options available on request)
- Mounting interface designed for typical CubeSat structure via external enclosure adaptable to customer requirements

