



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 1.15U form factor, MVP provides a total impulse of 334 N-s with a peak continuous thrust of 4.5 mN. A flight-like MVP passed environmental and subsystem qualification testing on a NASA Phase II SBIR program.

### TYPICAL OPERATION AND INTERFACE

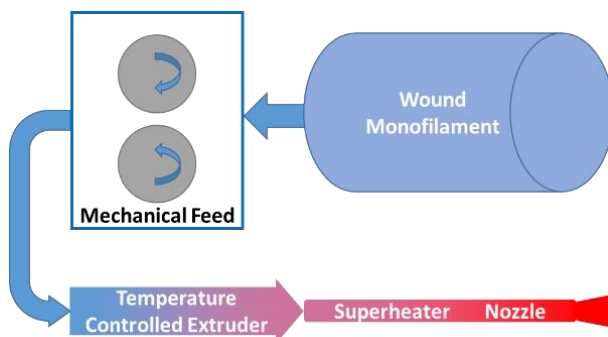
MVP draws from 3D printing technology to feed propellant. A preheat is required before firing (~3 minutes), but once warmed the “ready” state is maintained with minimal power draw and thermal loading. When firing, the system uses approximately 45 W (duty cycled average is only 13.5 W). Propellant fiber is mechanically drawn from a fixed spool into the extruder where it evaporates. Propellant metering is precise, but evaporation time results in “softer” starts and stops.

As a consequence, minimum impulse bit is inherently much larger than gaseous propulsion systems with fast-actuating valves; this represents the largest trade-off for the reduced system cost, complexity, and risk.

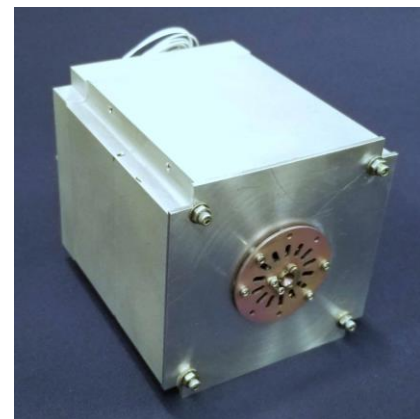
Developmental 1.15U MVP system interface:

- 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

System Information	
Propulsion system volume	1.15U
System lifetime	Not propellant limited
Spacecraft temperature range	Not propellant limited
Propellant	POM, gaseous MW = 30
Propellant Mass	516 g
Total propulsion wet mass	1.14 kg
Nominal mass flow rate	7.0 mg/s
Total thrust time	22 hr
Specific Impulse	66 s
Primary Thrust	4.5 mN
Total impulse	334 N-s
Spacecraft ΔV, M(initial) = 4 kg	89 m/s
Propulsion power when firing	45 W
Propulsion power (avg. duty cycled)	13.5 W
TRL	6



MVP Schematic



MVP 1.15U Flight-Like System