CU Aerospace (CUA) has developed a family of satellite propulsion technologies to offer versatility to the CubeSat community. The Monofilament Vaporization Propulsion (MVP) is a low cost, low risk thruster system that uses a space-rated polymer fiber spool as its propellant (no liquid or gaseous propellant requiring pressure vessels or valving). MVP provides a CubeSat with orbit altitude change, collision avoidance, and ultimately deorbit capabilities. The MVP has a compact form factor at 0.9U and mass of 1.05 kg, thereby providing propulsion opportunities for smaller CubeSat profiles. An MVP Flight Unit is now ready for integration into CUA's Dual Propulsion Experiment (DUPLEX) 6U CubeSat for launch in Q2 2025 to achieve TRL 7 or higher.
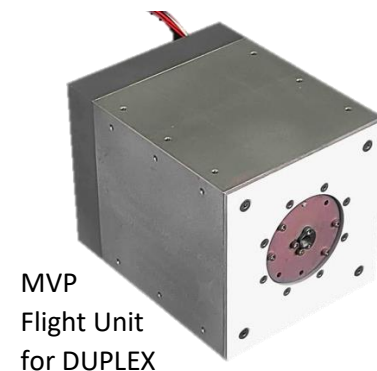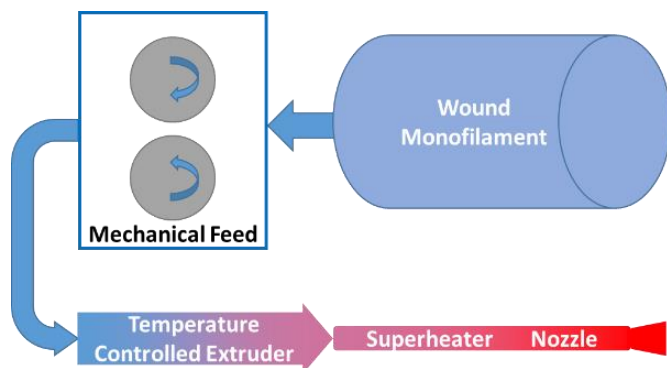
System Information	
Propulsion System Volume	0.93U
Dimensions	9.0 x 9.0 x 11.4 cm
System Lifetime	Not propellant limited
Spacecraft Temperature Range	− 40 to +75
Propellant	POM, gaseous MW = 30
Propellant Mass	430 g
Total Propulsion Wet Mass	1.05 kg
Nominal Mass Flow Rate	5.2 mg/s
Total Thrust Time	23 hr
Specific Impulse	66 s
Thrust, Average During Burn	3.2 mN
Total Impulse	265 N-s
Spacecraft ΔV, M(initial) = 10.5 kg	26 m/s
Propulsion Power (when firing)	33.5 W
Propulsion Power (avg. duty cycled)	13.2 W
Duty Cycle	15.2%
TRL	6

TYPICAL OPERATION AND INTERFACE

MVP draws from 3D printing technology to feed propellant. A preheat is required before firing (~6 minutes), but once warmed the "ready" state is maintained with minimal power draw and thermal loading. When firing, the system uses approximately 34 W (duty cycled average is only 13.2 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.

0.93U MVP SYSTEM INTERFACE:

- 12V power interface (can modify on request)
- RS422 and TTL level RS232 comms protocols available
- Mounting interface designed for typical CubeSat structures, adaptable to customer requirements

MVP Flight Unit for DUPLEX

TOP

114.3 mm

FRONT

90.0 mm

90.0 mm

80.5 mm

48.5 mm

16.5 mm

6.9 mm

83.1 mm

SIDE

ELECTRICAL WIRE LEAD OUT

BACK

ISO VIEW
THRUSTER SIDE

Insulator

Aeroglaze
A276-Coated
Faceplate

Delrin Propellant
Spool & Housing

Electronics &
Propellant
Feed System
(Enclosed in Core of Spool)

Thruster
Nozzle

MVP Flight Hardware