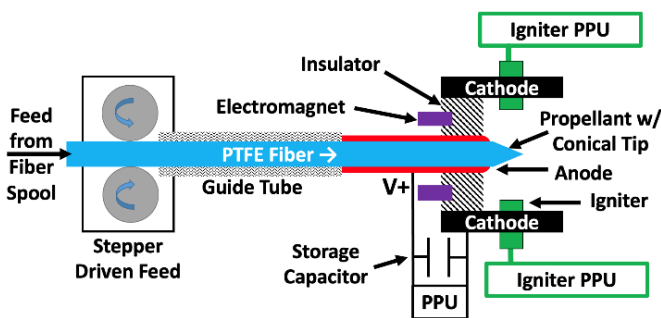


The CU Aerospace (CUA) Fiber-fed Pulsed Plasma Thruster (FPPT) self-contained system uses PTFE fiber as propellant. This approach enables CUA to provide competitive ΔV to CubeSat and small satellite customers at a substantially lower cost and risk profile than traditional liquid or gaseous propulsion systems that use valves and pressurized tank feed systems. In a 1.7U form factor, FPPT can provide a peak total impulse of 24,000 N-s, a peak continuous thrust of 0.50 mN at 96 W input power, and a maximum specific impulse of 3,200 seconds. The design incorporates a modularized 32 J energy storage unit (ESU) to achieve a balance between performance and propellant volume. The FPPT has a unique gimbal-less thrust vectoring capability allowing reaction wheel desaturation and attitude control outside Earth’s magnetic field. Presently, an FPPT flight unit is being qualified for launch on CUA’s NASA-funded Dual Propulsion Experiment (“DUPLEX”) 6U CubeSat mission in early 2023. Thrust vectoring of $\pm 10^\circ$ in the pitch and yaw axes has been measured on a laboratory FPPT system and will be demonstrated on the DUPLEX mission.



OPERATION AND TYPICAL PERFORMANCE

FPPT fires on demand without warmup. It mechanically feeds PTFE propellant fiber from a non-rotating spool through the anode, utilizing a pulsed discharge to electromagnetically accelerate fuel to provide thrust. Power, thrust, mass flow rate, and resultant specific impulse levels are user-selectable by adjusting propellant feed rate, pulse rate, and bank voltage.



| System Information | | |
|--|--------------------------|--------|
| System Lifetime | > 10 ⁸ pulses | |
| System Temperature Range [°C] | - 40 to +75 | |
| Nominal Pulse Energy [J] | 32 | |
| Propulsion System Volume | 1.7U | |
| Pulse Rate [Hz] | 1 | 3 |
| Nominal Power to PPU [W] | 32 | 96 |
| Nominal Mass Flow Rate [mg/s] | 0.0053 | 0.0158 |
| Nominal Thrust [mN] | 0.17 | 0.50 |
| Minimum Impulse Bit [μN-s] | 165 | |
| Specific Impulse [s] | 3,200 | |
| Total Impulse [N-s] | 24,000 | |
| Propellant Mass [kg] | 0.78 | |
| Total propulsion wet mass [kg] | 3.03 | |
| ΔV (FPPT wet mass + 10 kg s/c) [m/s] | 1,900 | |
| TRL | 5 (est. 6 by Q3 2022) | |

BASELINE 1.7U FPPT SYSTEM INTERFACE

- 12V power interface (can modify on request)
- RS422 or TTL level RS232 communication protocols available
- Mounting interface
 - Designed for typical CubeSat structure with external enclosure
 - Adaptable to customer requirements
- 21.7 x 9.0 x 8.65 cm³ envelope
- Total mass of 3.03 kg

