



FIBER-FED PULSED PLASMA THRUSTER (FPPT) SYSTEM

SOLID INERT POLYMER PROPELLANT

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The CU Aerospace (CUA) Fiber-fed Pulsed Plasma Thruster (FPPT) system is a pulsed plasma thruster that 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 pressure vessels. In a 1.1U form factor, FPPT provides a peak total impulse of 5,500 N-s, a peak continuous thrust of 0.38 mN at 48 W to the power processing unit (PPU), or a peak maximum specific impulse of 2,400 seconds. The design incorporates 16 J capacitor bank energy storage unit (ESU) modules to trade propellant volume for performance. Presently, FPPT is in the later stages of development on a NASA Phase II SBIR program.

System Information		
System lifetime	> 10 ⁸ pulses	
System temperature range [°C]	- 40 to +75	
Nominal mass flow rate [mg/s]	0.017 – 0.036	0.011 – 0.022
Nominal Power to PPU [W]	48	
Propulsion system volume	1.0U	1.7U
Nominal Pulse Energy [J]	16	32
Specific Impulse [s]	1,000 – 1,700	1,600 – 2,400
Nominal Thrust [mN]	0.28 – 0.35	0.27 – 0.34
Minimum Impulse Bit [μ N-s]	100	200
Total impulse [N-s]	3,240 – 5,500	13,450 – 20,180
Propellant Mass [kg]	0.33	0.86
Total propulsion wet mass [kg]	1.54	2.83
ΔV (FPPT wet mass + 10 kg s/c) [m/s]	330 – 560	1,405 – 2,110
TRL	5 (est. 6 by Nov. 2020)	

TYPICAL OPERATION AND INTERFACE

FPPT starts immediately without warmup and mechanically feeds PTFE propellant fiber from a non-rotating spool through the anode where it is subjected to a pulsed discharge and electromagnetically accelerated to provide thrust. Varied power, thrust, mass flow rate, and resultant specific impulse levels are user-selectable by adjusting propellant feed rate, pulse rate, and optionally adjustable bank voltage.

Developmental 1.1U FPPT system interface:

- Unregulated bus battery voltage to PPU
- I²C communication protocol (other options available on request) for all thruster control and feedback
- Mounting interface designed for typical CubeSat structure via external enclosure adaptable to customer requirements

