



# FIBER-FED PULSED PLASMA THRUSTER (FPPT) SYSTEM SOLID INERT POLYMER PROPELLANT JUNE 2021

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  $\Delta V$  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 29,200 N-s, a peak continuous thrust of 0.33 mN at 48 W to the power processing unit (PPU), or a maximum specific impulse of 3,500 seconds. The design incorporates a modularized 32 J capacitor bank energy storage unit (ESU) to achieve a balance between performance and propellant volume. Presently, FPPT is in the late stages of development in a NASA Phase II SBIR program. Thrust vectoring of  $\pm 10^\circ$  has been demonstrated in a laboratory FPPT system and is planned for incorporation into flight systems in the future.

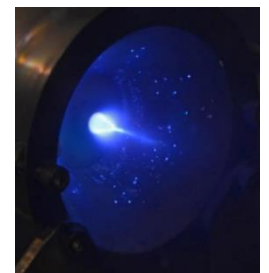
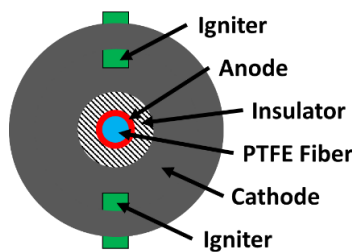
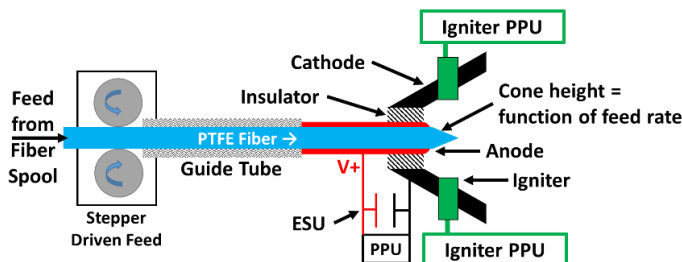
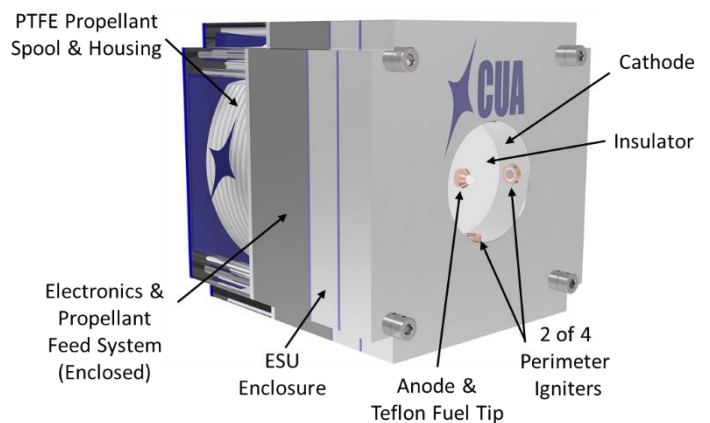
System Information		
System lifetime	$> 10^8$ pulses	
System temperature range [°C]	- 40 to +75	
Nominal Power to PPU [W]	48	
Propulsion system volume	1.0U	1.7U
Nominal mass flow rate [mg/s]	0.017 – 0.036	0.010
Nominal Pulse Energy [J]	16	32
Specific Impulse [s]	1,000 – 1,700	3,500
Nominal Thrust [mN]	0.28 – 0.35	0.33
Minimum Impulse Bit [ $\mu$ N-s]	100	200
Total impulse [N-s]	3,240 – 5,500	29,200
Propellant Mass [kg]	0.33	0.85
Total propulsion wet mass [kg]	1.54	2.83
$\Delta V$ (FPPT wet mass + 10 kg s/c) [m/s]	285 – 484	2,355
TRL	5 (est. 6 by June 2021)	

## TYPICAL OPERATION AND INTERFACE

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.

### Developmental 1.7U FPPT system interface:

- 12V power interface (Can modify on request)
- RS422 and TTL level RS232 communication protocol available for all thruster control and feedback
- Mounting interface designed for typical CubeSat structure via external enclosure adaptable to customer requirements



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