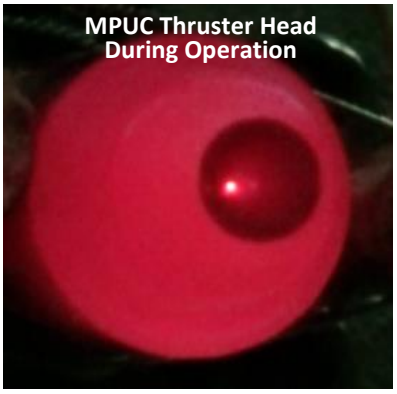
MONOPROPELLANT PROPULSION UNIT FOR CUBESATS (MPUC) SYSTEM
LOW FLAME TEMPERATURE GREEN MONOPROPELLANT
JULY 2024

The CU Aerospace (CUA) Monopropellant Propulsion Unit for CubeSats (MPUC) is an advanced propulsion system designed for CubeSats. It utilizes a "green" chemical monopropellant known as CUA monopropellant, formulation 10 (CMP-X), which is non-detonable and has low toxicity, making it safer to handle with benign storage characteristics. The CUA Catalyst, formulation 9 (CC-9) bed uses non-refractory construction materials thanks to a ~950°C flame temp. CMP-X was tested to meet safety criteria and detonability was verified by a certified facility with UN Test Series 1,2,3, and 6 to readily meet criteria for either 1.4S or outright exclusion from the explosives class.

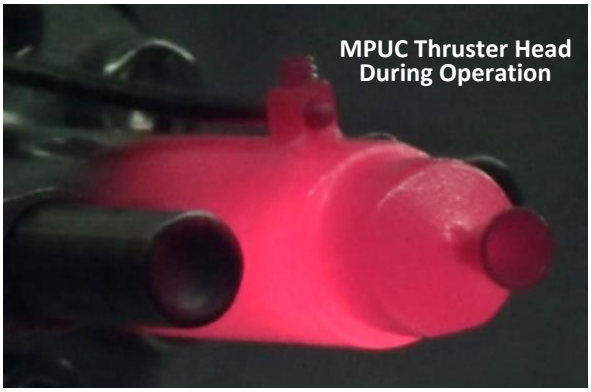
PARAMETER / PROPULSION SYSTEM	MPUC (1U*)	MPUC (1.5U*)	MPUC (2U*)
Thruster System Body Volume [cm^3] (without length of thruster head)	1,000	1,500	2,000
Propulsion Technology	Monopropellant		
Propellant	H_2O_2-Ethanol		
Nominal Power Draw [W]	3		
Specific impulse [s]	178 (avg. over life)		
Mass Flow Rate [mg/s]	132		
Thrust [mN]	230		
Total impulse [N-s]	740	1407	2122
Vol. Impulse (total impulse / system volume) [N-s / liter]	740	938	1061
Propellant Mass [g]	424	805	1214
Dry Mass [g]	1350	1641	2036
Propulsion System Wet Mass [g]	1774	2446	3250
Delta-V capability [s] (**S/C Wet Mass 14 kg**)	54	103	158
TRL Thruster Head	6		
TRL Integrated System (MPUC 1.5U)	4		

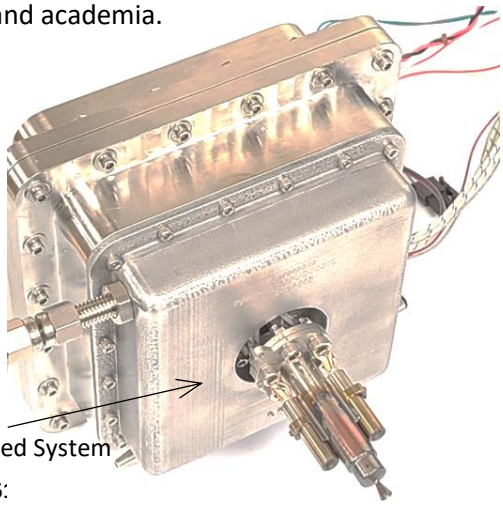
**System package volume assumes the length of the external thruster head can be housed in the CubeSat deployer spring*

Propellant is driven by gaseous inert pressurant, providing constant fuel flow and thrust over the system lifetime. High "volumetric impulse" (N-s/liter) performance levels of >700 N-s/liter for the anticipated 2U system and ~180 s specific impulse for the optimized thruster head will provide significant orbital maneuverability and also enable end of mission de-orbiting. The average power requirement is projected to be a moderate ~3 W based on previously-developed hardware. CMP-X thrusters have demonstrated up to 188 s specific impulse at 230 mN thrust during thrust stand testing and continuous firing times > 10 min.



This compact, lightweight system with moderate thrust and high volumetric impulse provides an affordable and scalable propulsion option for CubeSats, suitable for a range of applications across defense, industry, and academia.

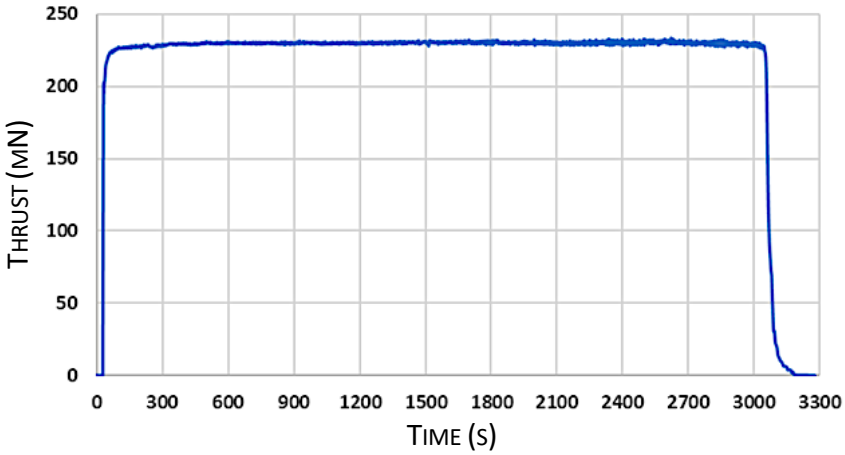




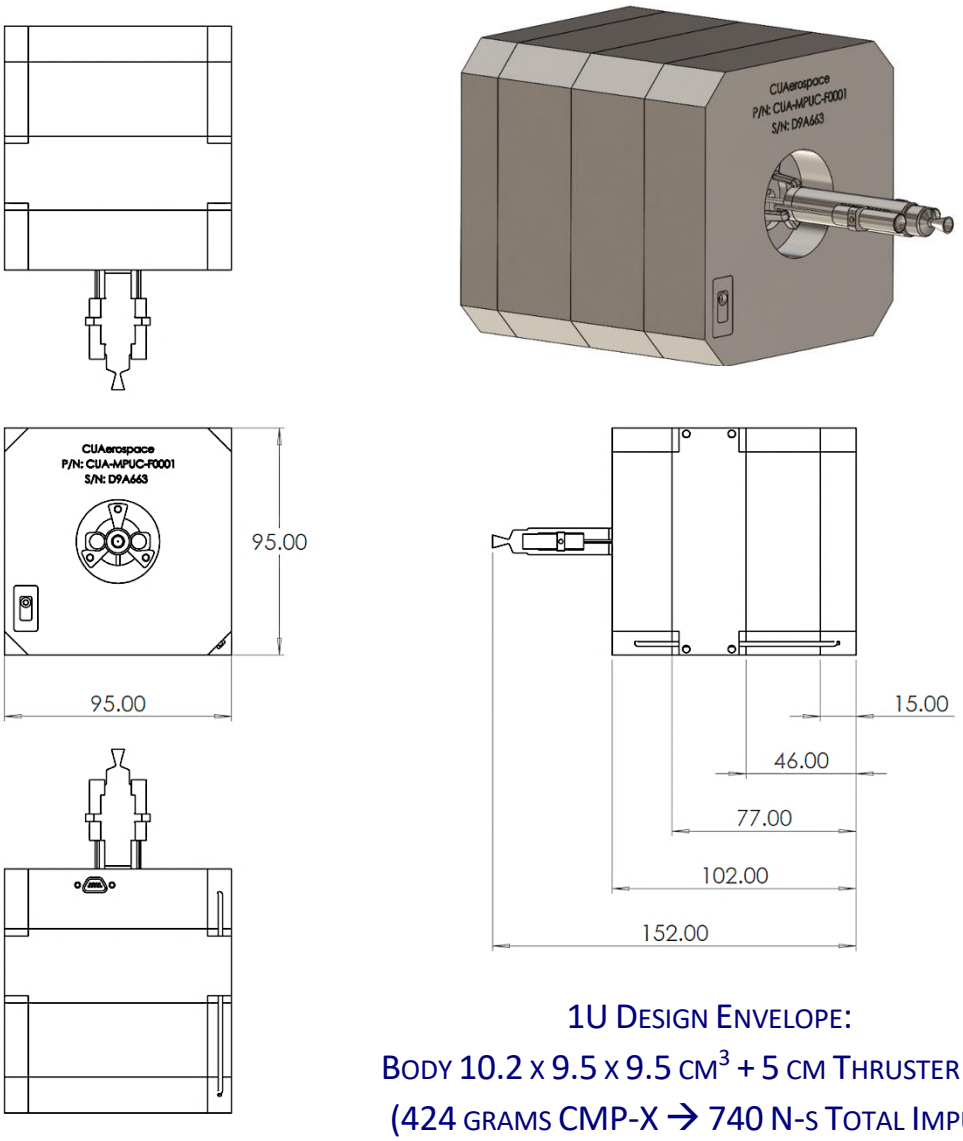
MPUC Thruster Head w/
Brassboard Propellant Feed System

CUA | 3001 NEWMARK DRIVE | CHAMPAIGN, IL 6
T: (217) 239-1701 | INFO@CUA.SPACE | WWW.CU

MPUC Test Data and Design Envelope



Experimental Test Data
(> 50 min Continuous Firing
w/ Brassboard Feed System)



1U Design Envelope:
Body 10.2 x 9.5 x 9.5 cm^3 + 5 cm Thruster Head
(424 grams CMP-X → 740 N-s Total Impulse)