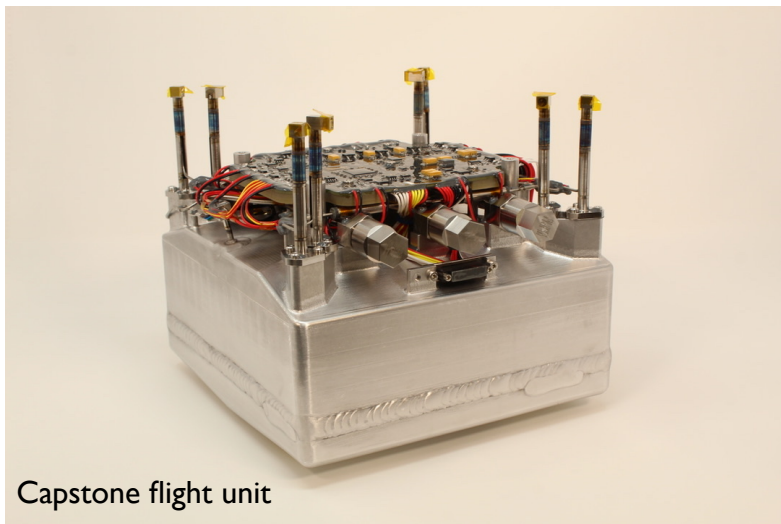


# Propulsion for Small Spacecraft

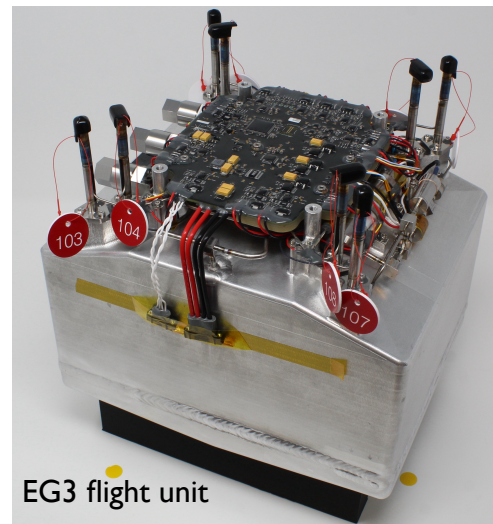


## Heritage solution for missions with high-impulse and high-thrust requirements:

- Pump-fed monopropellant, dual-mode and bipropellant systems
- Customizable thruster configurations for translational burns or 6-DOF for rendezvous and docking
- Proven propellants with predictable properties, assured long-life reliability, and well-understood handling requirements (hydrazine and NTO)
- Monopropellant system has flight heritage (EG3) and will be used on NASA Capstone mission
- Bipropellant system undergoing flight qualification and preparing for flight delivery in 2022
- Realistic Isp >285 sec (bipropellant) and >200 sec (monopropellant)
- Propellant mass fraction ~70% (configuration dependent)
- Pump-fed pressurization mitigates range safety concerns by eliminating high launch pressure
- Cubesat/ESPA-compatible scalable tanks maximize system  $\Delta V$  (efficient volume utilization)
- Long-standing experience in safe and affordable propellant handling procedures
- Fully compliant with range safety (AFSCM 91-710) and *do-no-harm* shared launch requirements

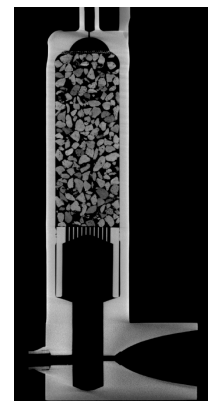
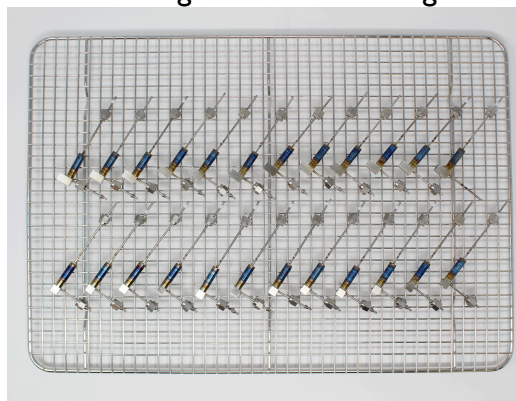


Capstone flight unit

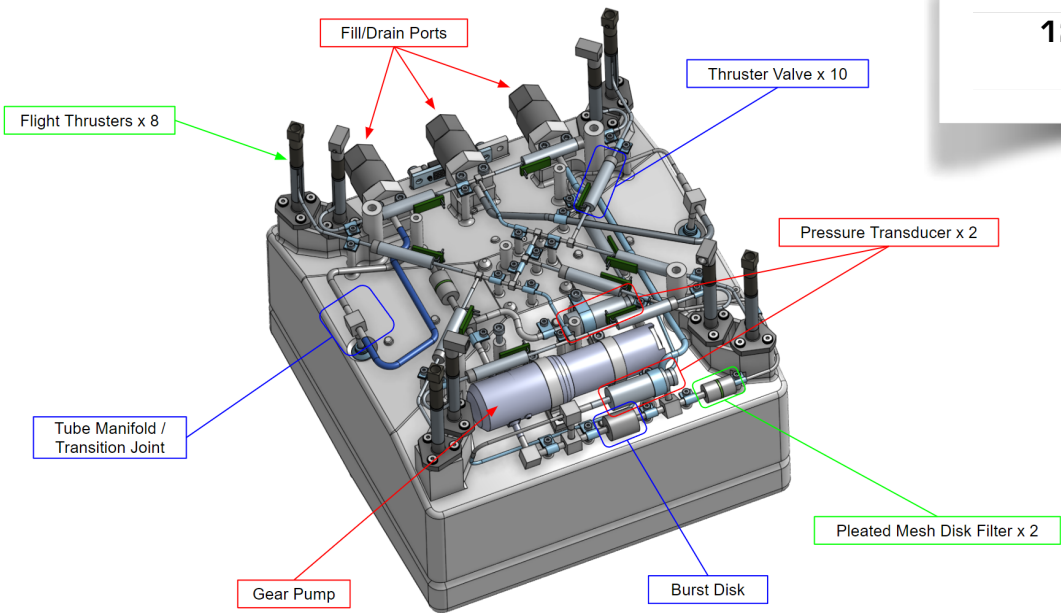


EG3 flight unit

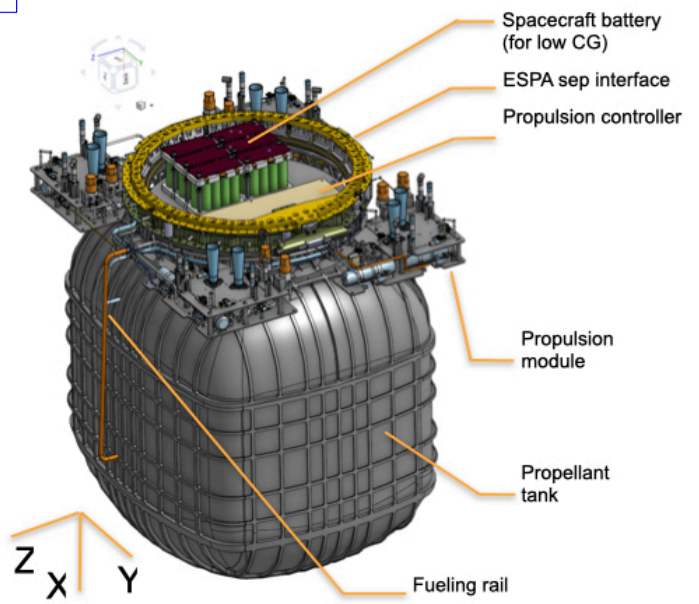
## Testing and manufacturing



## 12U Cubesat integrated propulsion module



**ESPA-class propulsion** can deliver 3+ km/s  $\Delta v$ . It attaches directly to the ESPA separation interface to reduce mass, improve packing efficiency and lower CG



## Unprecedented flight heritage in small satellite propulsion

