Thruster Constraints

Identifier	Attribute	Desired Attributes
P1	Thrust Directions	3-DOF attitude control, axial propulsion (in -Z direction, see Thruster Volume Allocation diagram)
P2	Total Impulse of thruster/RCS system	≥500 Ns
P3	Propellant type	No Hydrazine or fuel with comparable safety concerns. Heating of propellant to increase specific impulse is acceptable.
M1	Footprint to fit spacecraft bus	107.1mm x 233.4 mm
M2	Height of thruster system	64 mm point design (if 64 mm is not sufficient to meet total impulse, give required height; scaling of performance in 'mm' around point design also requested)
M3	Bus enclosure	Thruster system fits entirely within the spacecraft bus and allocated volume; no extrusions from bus allowable.
M4	Safety Factors	Meets safety factors for Ultimate and Yield stresses in MIL-STD-1540C
M5	Total Mass	2.5 kg maximum

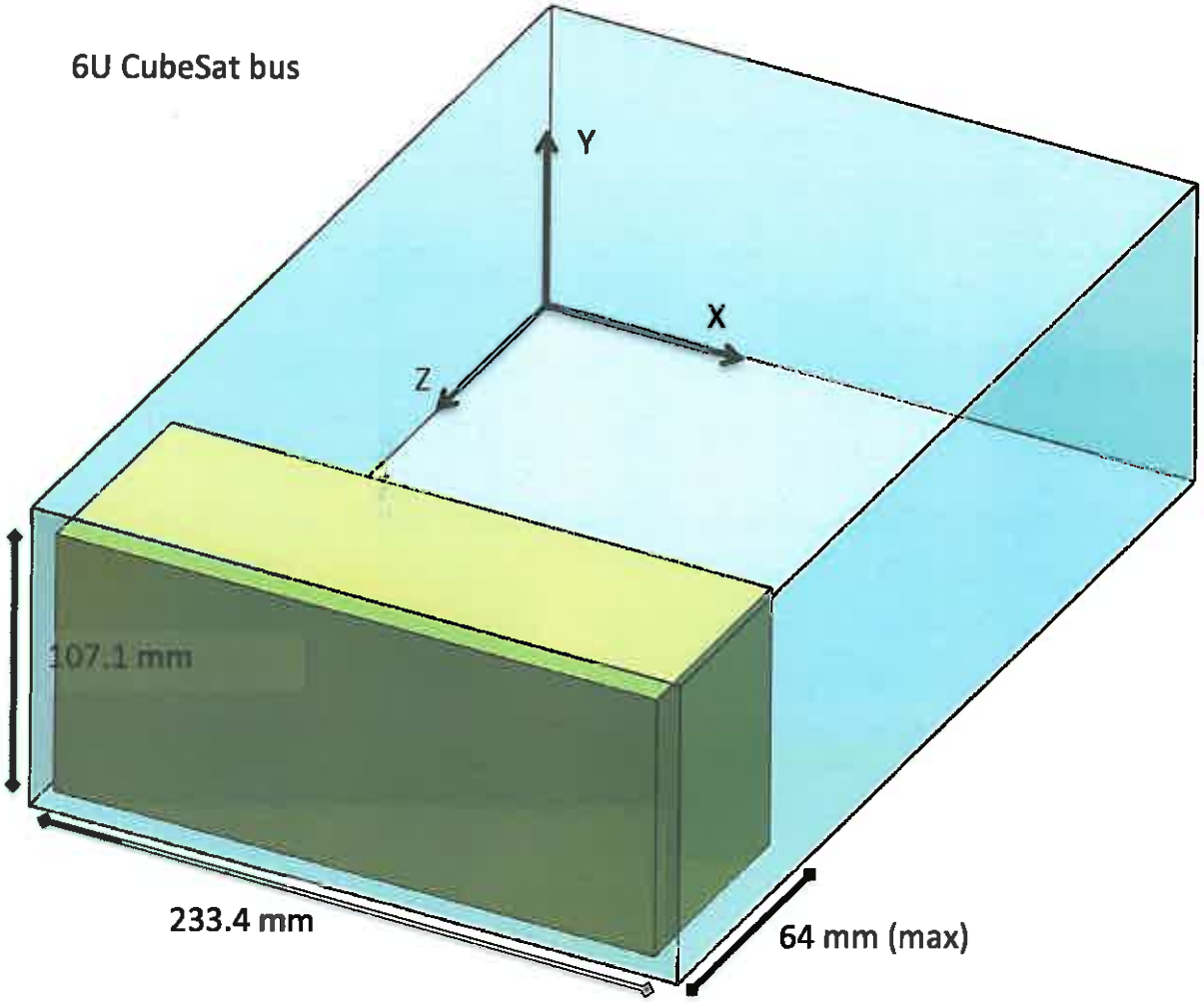
Requested Information for Each Thruster System

Identifier	**Identification**
I1	Company
I2	Model Number
	Technical Performance
T1	Number of thrusters, valves, and valve drivers in system
T2	Proposed configuration of thrusters and possible locations of thrusters in allocated volume
T3	Type of propellant used
T4	Pressure of propellant room temp (psi)
T5	Pressure of propellant at given performance levels (psi)
T6	Temperature of propellant at given performance levels (°C)
T7	Total Mass of propellant (kg)
T8	Usable Mass of propellant (kg)
T9	Dry mass of system (kg)
T10	Exterior Dimensions of thruster system (mm)
T11	Total impulse of system (N-s)
T12	Minimum impulse bit (mN-s)
T13	Mass of propellant expended at minimum pulse (kg)
T14	Exit velocity of propellant (m/s)
T15	Total ΔV for 14 kg spacecraft (m/s)
T16	Thruster force magnitude for all thrusters (mN)
T17	Specific impulse of system, both steady-state and pulsed (s)
T18	Tolerance on direction of thrust relative to nominal thruster direction due to alignment (degrees)
T19	Tolerance on direction of thrust relative to nominal thruster direction due to firing accuracy in each thruster (degrees)
T20	Lifetime maximum number of thruster firings
T21	Leakage rate (cc/hr)

T22	Maximum power (W)
T23	Steady-state power (W) for cases below (if other cases relevant, please specify): • system on, not heating propellant, not firing • system on, heating propellant, not firing • system on, heating propellant, firing thruster(s)
T24	Power and data electrical interface
T25	Radiation tolerance (kRad) (see figure below)
T26	Lifetime limiting factors
T27	Expected lifetime (For deep space 0.8 AU to 1.2 AU from Sun)
T28	Minimum height to meet total impulse (see P2 requirement)
T29	Total impulse of system at max height (see M2 requirement)
T30	Scaling information on height vs mass of fuel and total impulse (i.e. kg/cm and Ns/cm)
T31	Minimum possible system height and resulting total impulse
T32	Descriptive system Concept of Operations including permissible duration of system operation for axial thrust and RCS capabilities
T33	Center of Mass (CM) uncertainties (Beginning of Mission (BOM) and End of Mission (EOM), if known
	Schedule
S1	Delivery schedule after contract start for EDU and flight unit(s)
	Cost
C1	Cost of non-recurring engineering
C2	Cost of EDU (each)
C3	Cost of flight unit (each)
C4	Cost of analysis and testing (if not included in above)
	Analysis and Testing
A1	List of analyses and tests which will be done for design and each unit

A2	Deliverable products and data from analyses/tests
	Flight Qualification and Heritage
F1	Describe any missions that might be similar, such as other CubeSat missions or other space heritage, where this or a similar design was used.

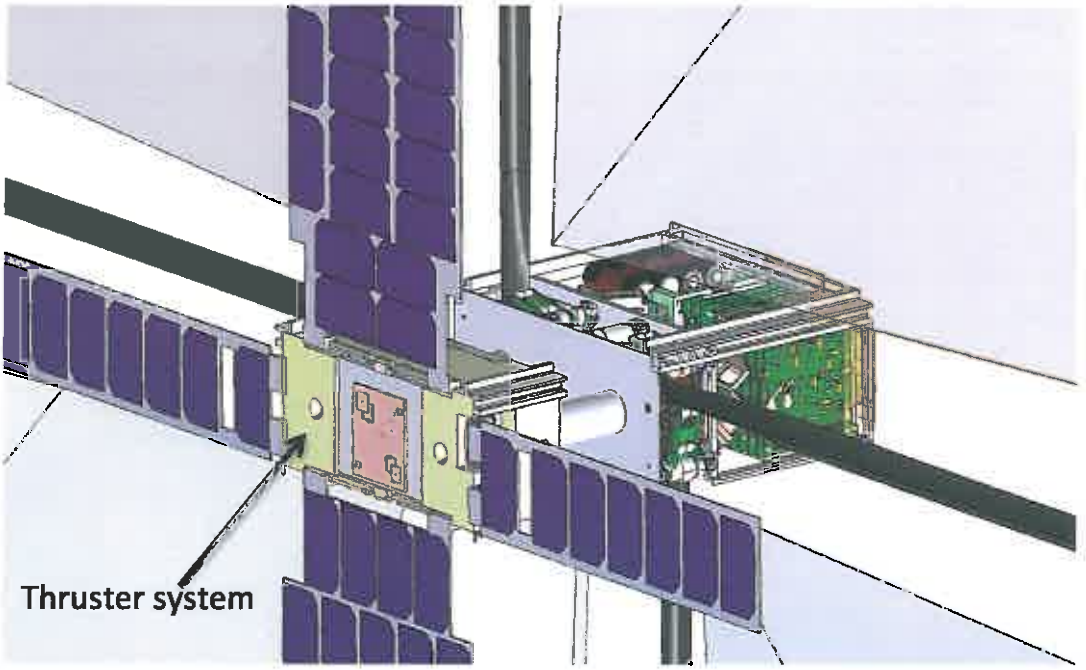
Thruster System Volume Allocation



1600 cm^3 Total Useable Volume*

* Must accommodate pass-through wiring harness < 0.4 inches (10.2 mm) in diameter, consisting of a combination of wire and coax, with minimum bend radius requirement of < 0.5 inches (12.7 mm).

Spacecraft Bus Design Concept



NEA Scout Radiation Tolerance

The propulsion system shall meet all safety, interface and performance requirements defined in this document during and after exposure to the radiation dose depth curve in the figure *NEAS Dose Depth* that matches the appropriate level of equivalent shielding of the electronics. All electronic parts used in the propulsion system shall utilize technologies or designs immune to latch-up below an LET of 37 MeV-cm^2/mg.