

Baseline Design Correlation/Cross Check

Alpha CubeSat Mass Budget Correlation

System	Subsystem	Part Name	Description	Vendor	Quantity	Mass gram	Total Mass gram
Power	Solar Array	3U CubeSat Solar Panel	Solar Reflectenna Array	Pumpkin	12	170	2040
Electronics	Bus	XB1 Cubesat Bus	AGPS, C&DH, EPS and Battery Pack	GomSpace	1	1150	1150
	Ka Transceiver	SWIFT-KTX	Ka Band Transceiver	Tethers Unlimited	1	500	500
Propulsion	Ion Thrusters	BIT-1	Ion Thruster	Busek	4	53	212
	Ion Tank		Ion Iodine Propellant and Tank		2	3129.09	6258.188
	Ion Feed Valve		Ion Feed Valve	Busek	4	35	140
	Chemical	Chemical Propulsion	Aerojet unit with propellant as reference	Aerojet	1	3200	3200
Total				Maximum Consumption			13500.188

Estimated Baseline Mass Consumption	13500.19
Total Mass Budget	14000
Estimated Spacecraft Level Mass Margin (kg)	499.81
Estimated Spacecraft Level Mass Margin (%)	3.57%

Alpha CubeSat Power Budget Correlation

System	Subsystem	Part Name	Description	Vendor	Quantity	Power watts	Total Power watts
Power	Solar Array	3U CubeSat Solar Panel	Solar Reflectenna Array	Pumpkin	12	8.00	96.00
Total				Maximum Production			96.00
Electronics	Bus	XB1 Cubesat Bus	AGPS, C&DH, EPS and Battery Pack	GomSpace	1	6.30	6.30
	Ka Transceiver	SWIFT-KTX	Ka Band Transceiver	Tethers Unlimited	1	16.00	16.00
Propulsion	Ion Thrusters	BIT-1	Ion Thruster	Busek	4	10.00	40.00
	Ion Tank		Ion Iodine Propellant and Tank		2	0.00	0.00
	Ion Feed Valve		Ion Feed Valve	Busek	4	0.04	0.16
	Chemical	Chemical Propulsion	Aerojet unit with propellant as reference	Aerojet	1	4.00	4.00
Total				Maximum Consumption			66.46

Estimated Baseline Power Consumption	66.46
Total Power Budget (watts)	96.00
Estimated Spacecraft Level Power Margin (watts)	29.54
Estimated Spacecraft Level Power Margin (%)	30.77%

Alpha CubeSat Volume Budget Correlation

System	Subsystem	Part Name	Description	Vendor	Quantity	Length mm	Width mm	Height mm	Volume U	Total Volume U
Power	Solar Array	3U CubeSat Solar Panel	Solar Reflectenna Array	Pumpkin	12	100.00	100.00	2.00	0.02	0.24
Electronics	Bus	XB1 Cubesat Bus	AGPS, C&DH, EPS and Battery Pack	GomSpace	1	200.00	100.00	50.00	1.00	1.00
	Ka Transceiver	SWIFT-KTX	Ka Band Transceiver	Tethers Unlimited	1	86.00	86.00	45.00	0.33	0.33
Propulsion	Ion Thrusters	BIT-1	Ion Thruster	Busek	4	34.60 dia.		28.80	0.11	0.43
	Ion Tank		Ion Iodine Propellant and Tank		2	150.00	100.00	50.00	0.75	1.50
	Ion Feed Valve		Ion Feed Valve	Busek	4	20.00	20.00	25.00	0.01	0.04
	Chemical	Chemical Propulsion	Aerojet unit with propellant as reference	Aerojet	1	227.00	100.00	100.00	2.27	2.27
Total						Maximum Consumption				5.82

Estimated Baseline Volume Consumption	5.82
Total Volume Budget	6
Estimated Spacecraft Level Volume Margin (U)	0.18
Estimated Spacecraft Level Volume Margin (%)	3.07%

Engineering Notes:

- Attached are masses and envelopes for configuration shown in renderings along with data sheets.
- I have used an Aerojet chemical thruster with integrated propellant as a reference to estimate the chemical propulsion system weight.
- Solar panel weights are estimated by adding thickness to Clyde 3U panel without magnetorque and scaling mass accordingly (multiplier = 2mm/1.6mm).
- Ion propellant tanks are calculated as 2mm wall thickness filled with iodine.
- NOS Nitrous Bottle 14705NOS used as descriptive place holder. Valve assembly provided may be replaced with other hardware.
- Links for COTS components are listed below.

Solar Array	3U CubeSat Solar Panel	Solar Reflectenna Array	http://www.clyde-space.com/cubesat_shop/solar_panels/3u_solar_panels/64_3u-cubesat-side-solar-panel
Bus	XB1 Cubesat Bus	AGPS, C&DH, EPS and Battery Pack	http://gomspace.com/index.php?p=products-p31us
Ka Transceiver	SWIFT-KTX	Ka Band Transceiver	http://www.tethers.com/SWIFT.html
Ion Thrusters	BIT-1	Ion Thruster	http://www.busek.com/index_html_files/70011950%20RevA%20Data%20Sheet%20for%20BIT-1%20Ion%20Thruster.pdf
Ion Tank		Ion Iodine Propellant and Tank	
Ion Feed Valve		Ion Feed Valve	http://www.busek.com/technologies_valves.htm
Chemical	Chemical Propulsion	Aerojet unit with propellant as reference	https://www.rocket.com/cubesat/mps-120xl