Milestone Review Flysheet

Institution	Northeastern University	Milestone	Flight Readiness Review

Vehicle Properties	
Total Length (in)	146
Diameter (in)	6.16
Gross Lift Off Weight (lb)	48.9
Airframe Material	Blue Tube
Fin Material	G10 FIber Glass
Coupler Length	2 x 12 inch coupler with 6 inch overlap, 2 x 14 inch coupler with 7inch overap

Motor Properties	
Motor Designation	L2200G-18
Max/Average Thrust (lb)	697.37 / 504.25
Total Impulse (lbf-s)	1135.73
Mass Before/After Burn	10.474lb/4.927lb
Liftoff Thrust (lb)	560
Motor Retention	AeroPack 75mm Motor Retainer

Stability Analysis	
Center of Pressure (in from nose)	115.2
Center of Gravity (in from nose)	93.95
Static Stability Margin	4.32
Static Stability Margin (off launch rail)	3.45
Thrust-to-Weight Ratio	10.3
Rail Size and Length (in)	144
Rail Exit Velocity (ft/s)	91

Ascent Analysis	
Maximum Veloxity (ft/s)	684
Maximum Mach Number	0.608
Maximum Acceleration (ft/s^2)	444
Target Apogee (From Simulations)	5380
Stable Velocity (ft/s)	52
Distance to Stable Velocity (ft)	3.8

Recovery System Properties Drogue Parachute	
Manufacturer/Model	FruityChutes/
Size	Payload Section- 15 in Booster Stage- 18 in
Altitude at Deployment (ft)	Payload Section - 5380.577 Booster Stage - 5380.577
Velocity at Deployment (ft/s)	Payload Section - 0 Booster Stage - 32.1850394
Terminal Velocity (ft/s)	Payload Section - 88.7467 Booster Stage - 91.5794
Recovery Harness Material	Kevlar
Harness Size/Thickness (in)	0.5 Diameter

Recovery System Properties Main Parachute	
Manufacturer/Model	FruityChutes/
Size	Payload Section - 60 in Diameter Booster Stage - 72 in Diameter
Altitude at Deployment (ft)	Payload Section - 500 Booster Stage - 500
Velocity at Deployment (ft/s)	Payload Section - 88.7467 Booster Stage - 91.5794
Terminal Velocity (ft/s)	Payload Section - 18.2415 Booster Stage - 18.9048
Recovery Harness Material	Kevlar
Harness Size/Thickness (in)	0.5 Diameter

Recovery Harness Length (ft)			Payload Section - 15 Booster Stage - 15	
Harness/Airframe Interfaces		3/8in Eyebolt		
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	12.7228	74.4443	72.6101	74.0794

Recovery Harness Length (ft)			Payload Section - 30 Booster Stage - 40	
Harness/Airframe Interfaces		1/2in Hoist Ring with 2in washers		
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	12.7228	74.4443	72.6101	74.0794

Recovery Electronics	
Altimeter(s)/Timer(s) (Make/Model)	PerfectFlite StratoLoggers SL100
Redundancy Plan	Redundant StratoLoggers - 4 in Booster Stage, 2 in Payload Section.
Pad Stay Time (Launch Configuration)	At least two two hours according to StratoLogger manual

Recovery Electronics	
Rocket Locators (Make/Model)	Payload Section - XBee XSC Pro Booster Stage- TeleGPS
Transmitting Frequencies	902Mhz-928Mhz 464 MHz (can support 300 - 348 MHz, 387 - 464 MHz, and 779 - 928 MHz)
Black Powder Mass Drogue Chute (grams)	Payload Section - 1.5g Booster Stage - 1.75g
Black Powder Mass Main Chute (grams)	Payload Section - 2g Booster Stage - 2g

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Autonomous Ground Support Equipment (MAV Teams Only)	
Capture Mechanism	Overview
	N/A
Container Mechanism	Overview
	N/A
Launch Rail Mechanism	Overview
	N/A

Igniter Installation Mechanism	Overview
	N/A

Payload	
Payload 1	Overview
	Our payload is a very passive system because we wanted to minimize failure of the system. The payload should not leave the launch vehicle at any point during the launch. It will be recovered with the rocket via parachute and should not itself affect safety of the launch vehicle
Payload 2	Overview
	N/A

Test Plans, Status, and Results	
Ejection Charge Tests	The ejection charges were tested statically for each separtion event. The blast caps were filled with black powder and the sections were fitted together to simulate how separation would occur during flight. Wires were connected to the electronic matches and the wires ran to a power source a safe distance away. The wires were attached to the pwoer source setting off the charges anad cuases safef separation and deployment of aprachutes in all three tests. This showed that our ejection system worked and should perform during actual flight, and it did during our test flight.
Sub-scale Test Flights	The sub-scale was tested to prove aerodynamic stability of design and deployment of paracutes. The subscale and full scale designs had similar reynolds numbers and therefore had similar coefficeints of drag. This means that they would both behave about the same during flight so the subscale test would validate the flight of the full scale. The design of the interstage to have delayed drogue parachute for the booster stage was tested of the subscale flight and this system worked in preventing the two parachutes, which come out the same section at apogee, from tangling. Our deployment system separating untethered at the interstage at apogee, then the booster separating tethered with a main parachute and the payload sections separating tethered with the other main parahute was tested and verified.
Full-scale Test Flights	We conducted our full scale flight on March 4th 2017, at 3:05 PM, with the Valley AeroSpace Team (VAST), in Monterey, Virginia. The vehicle was cleared for flight by the RSO's and launched on a CTI 54mm 6 Grain XL L-1030 Red Lightning, with a Fully Ballasted Payload. The vehicle was not launched with transmitters, as our HAM radio licensed individual was not available for the launch.

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Additional Comments