Milestone Review Flysheet 2017-2018

Institution	North Carolina State University

Milestone	PDR

Vehicle Properties	
Total Length (in)	125
Diameter (in)	7.5
Gross Lift Off Weigh (lb.)	47
Airframe Material(s)	Blue Tube body, fiberglass nosecone
Fin Material and Thickness (in)	Aircraft Grade Birch Plywood 1/4 in.
Coupler Length/Shoulder Length(s) (in)	12 in. / 6 in.

Motor Properties	
Motor Brand/Designation	AeroTech L2200G-PS
Max/Average Thrust (lb.)	697.29 / 504.25
Total Impulse (lbf-s)	1147.42
Mass Before/After Burn (lb.)	10.54 / 4.99
Liftoff Thrust (lb.)	504.25
Motor Retention Method	Retainer, Engine Mount, Centering ring

Stability Analysis	
Center of Pressure (in from nose)	92.2
Center of Gravity (in from nose)	76.9
Static Stability Margin (on pad)	2.03
Static Stability Margin (at rail exit)	2.075
Thrust-to-Weight Ratio	14.83
Rail Size/Type and Length (in)	1.5 x 1.5 x 96 aluminum rail
Rail Exit Velocity (ft/s)	59.5

Ascent Analysis	
Maximum Velocity (ft/s)	716
Maximum Mach Number	0.64
Maximum Acceleration (ft/s^2)	466
Predicted Apogee (From Sim.) (ft)	5573

Recovery System Properties				
Drogue Parachute				
Manufacturer/Model		Fruity Chute / Classic Elliptical		
Size/Diameter (in or ft)		36		
Altitude at Deployment (ft)		Apogee (5280 ft AGL)		
Velocity at Deployment (ft/s)		0		
Terminal Velocity (ft/s)		58.43		
Recovery Harness Material		Kevlar		
Recovery Harness Size/Thickness (in)		0.5		
Recovery Harness Length (ft)		40		
Harness/Airframe Interfaces		U-bolt with quick link		
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	407.87	798.74	900.71	

Recovery System Properties				
Main Parachute				
Manufacturer/Model		Fruity Chute / Iris Ultra Compact		
Size/Diameter (in or ft)		120 in.		
Altitude at Deployment (ft)		1000		
Velocity at Deployment (ft/s)		58.43		
Terminal Velocity (ft/s)		14.41		
Recovery Harness Material		Kevlar		
Recovery Harness Size/Thickness (in)		0.5		
Recovery Harness Length (ft)		40		
Harness/Airframe Interfaces		Black powder charge and u-bolt with quick link		
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	24.92	48.79	55.03	

Recovery Electronics	
Altimeter(s)/Timer(s) (Make/Model)	StratoLoggerCF PerfectFlite
Redundancy Plan and Backup Deployment Settings	Entacore AIM USB 3.0
Pad Stay Time (Launch Configuration)	1 hr

Recovery Electronics		
Rocket Locators (Make/Model)		BigRedBee/ BRB 900 MHz GPS
Transmitting Frequencies (all vehicle and payload)		900 MHz - Required for CDR
Ejection System Energetics (ex. Black Powder)		Goex 4F Black Powder
Energetics Mass - Drogue Chute (grams)	Primary	5.6
	Backup	5.6
Energetics Mass - Main Chute (grams)	Primary	6.6
	Backup	6.6
Energetics Masses - Other (grams) - If Applicable	Primary	N/A
	Backup	N/A

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Payload

	Overview
Payload 1 (official payload)	The payload is a custom designed rover which is to deploy from the internal structure of the launch vehicle upon remote triggering. During flight, it is housed in the payload tube which is rotating about a Lazy Susan bearing system. Upon landing, the payload tube self-rights, and the electric latch keeping the rover in the tube is unlocked. At the same time, the rover exits the payload tube is to autonomously drive 5 ft in any direction and deploy foldable solar cell panels upon reaching the final resting point. The solar panels will be deployed using a rotating arm with folded panels attached. As the arm rotates, the panels unfurl.

	Overview
Payload 2 (non-scored payload)	N/A

Test Plans, Status, and Results

Ejection Charge Tests	In order to ensure that the altimeters used for ejection charges onboard the rocket execute correctly, altimeters will be placed in a vacuum chamber and will be hooked up to an LED. If the LED illuminates at the correct pressure, then it will be deemed worthy for flight. Black powder ejection charge testing will take place to confirm calculations performed in the PDR. These calculations rely on a constant to find the ideal pressure for a certain separation force. Testing will start with the calculated amount of black powder loaded into a mock-up of each section that is weighted and connected appropriately. Further tests will be performed until the sections separate by the appropriate amount.
Sub-scale Test Flights	The subscale test flight is scheduled for November 18-19 2018. During this test, the primary mission system designs will be validated and any failures will be accounted for in future documentation. The subscale payload will not incorporate a rover but will include a payload experiment that will incorporate an altimeter and a spinning orientation sensor to measure the roll rate and effect of a rotating payload on the orientation and launch behavior of the rocket. The launch vehicle will also test recovery systems for launch vehicle. Altimeter accuracy will also be validated during these tests.
Full-scale Test Flights	The full-scale test flight will take place in February, 2018 (specific date is unknown at this time). This test will validate all launch vehicle and payload systems and provide complete confidence in mission success prior to FRR. Payload will implement deployable rover and rover mission will be tested and completed. . Launch vehicle recovery system timing and sizing will be confirmed. Target apogee and altimeter accuracy will be tested and necessary weight adjustments will be made in the weeks preceeding FRR.

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Additional Comments