

# Milestone Review Flysheet 2017-2018

**Institution** North Carolina State University

**Milestone** CDR

## Vehicle Properties

Total Length (in)	128
Diameter (in)	7.5
Gross Lift Off Weigh (lb.)	47.1
Airframe Material(s)	Blue Tube body, plastic nosecone
Fin Material and Thickness (in)	Aircraft Grade Birch Plywood 1/4 in.
Coupler Length/Shoulder Length(s) (in)	6 in. / 6 in.

## Stability Analysis

Center of Pressure (in from nose)	94.9
Center of Gravity (in from nose)	79.5
Static Stability Margin (on pad)	2.05
Static Stability Margin (at rail exit)	2.075
Thrust-to-Weight Ratio	14.97
Rail Size/Type and Length (in)	1.5 x 1.5 x 96 aluminum rail
Rail Exit Velocity (ft/s)	77.3

## Recovery System Properties

### Drogue Parachute

Manufacturer/Model	Fruity Chute / Classic Elliptical
Size/Diameter (in or ft)	24
Altitude at Deployment (ft)	Apogee (5280 ft AGL)
Velocity at Deployment (ft/s)	0
Terminal Velocity (ft/s)	93.47
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 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

## 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

## Ascent Analysis

Maximum Velocity (ft/s)	702
Maximum Mach Number	0.63
Maximum Acceleration (ft/s^2)	457
Predicted Apogee (From Sim.) (ft)	5371

## Recovery System Properties

### Main Parachute

Manufacturer/Model	Fruity Chute / Iris Ultra Standard			
Size/Diameter (in or ft)	120 in.			
Altitude at Deployment (ft)	700			
Velocity at Deployment (ft/s)	93.47			
Terminal Velocity (ft/s)	13.85			
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
	21.1	46.04	46.99	

## 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	6.2	
	Backup	6.7	
Energetics Mass - Main Chute (grams)	Primary	6.6	
	Backup	7.1	
Energetics Masses - Other (grams) - If Applicable	Primary	N/A	
	Backup	N/A	

# Milestone Review Flysheet 2017-2018

**Institution** North Carolina State University

**Milestone** CDR

## Payload

Payload	
Payload 1 (official payload)	<p style="text-align: center;">Overview</p> <p>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.</p>
Payload 2 (non-scored payload)	<p style="text-align: center;">Overview</p> <p style="text-align: center;">N/A</p>

## Test Plans, Status, and Results

Ejection Charge Tests	<p>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.</p>
Full-scale Test Flights	<p>The full-scale test flight will take place in February 24, 2018 . 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 preceding FRR.</p>

# Milestone Review Flysheet 2017-2018

**Institution**

North Carolina State University

**Milestone**

CDR

**Additional Comments**