

# Milestone Review Flysheet 2017-2018

**Institution** Oregon State University

**Milestone** FRR

## Vehicle Properties

Total Length (in)	104
Diameter (in)	5.3
Gross Lift Off Weigh (lb.)	39.4
Airframe Material(s)	Carbon Fiber/Fiber Glass
Fin Material and Thickness (in)	Carbon Fiber, .152"
Coupler Length/Shoulder Length(s) (in)	8" total, 5.3" extended

## Stability Analysis

Center of Pressure (in from nose)	70.74 in
Center of Gravity (in from nose)	58.6 in
Static Stability Margin (on pad)	2.25
Static Stability Margin (at rail exit)	3
Thrust-to-Weight Ratio	5.7
Rail Size/Type and Length (in)	1515 / 12ft
Rail Exit Velocity (ft/s)	64.7 ft/s

## Recovery System Properties

### Drogue Parachute

Manufacturer/Model		Top Flight X-Type		
Size/Diameter (in or ft)		1.5 ft, 2.0 ft		
Altitude at Deployment (ft)		4875 ft AGL (apogee)		
Velocity at Deployment (ft/s)		0 ft/s		
Terminal Velocity (ft/s)		86.14 ft/s, 77.00 ft/s		
Recovery Harness Material		Tubular Nylon		
Recovery Harness Size/Thickness (in)		1 in		
Recovery Harness Length (ft)		21 ft, 30 ft		
Harness/Airframe Interfaces		Welded Eyenuts; Sewn Loops in Bridle; 3000# swivels between bridle and shrouds attached on butterfly loop		
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	397	1,336	1,765	N/A

## Recovery Electronics

Altimeter(s)/Timer(s) (Make/Model)	Missile Works RRC3; Stratologger CF Jolly Logic Chute Release
Redundancy Plan and Backup Deployment Settings	2 Altimeters for each section; separate batteries for each altimeter; separate charges for each altimeter; 2 Chute Releases per main
Pad Stay Time (Launch Configuration)	Altimeters: 8+ hours Tracking Unit: 3 hours

## Motor Properties

Motor Brand/Designation	Aerotech L850W
Max/Average Thrust (lb.)	266.4 lb./ 176.8 lb.
Total Impulse (lbf-s)	830.7
Mass Before/After Burn (lb.)	8.10 lb / 3.55 lb
Liftoff Thrust (lb.)	227.0 lb
Motor Retention Method	Threaded Retainer

## Ascent Analysis

Maximum Velocity (ft/s)	545 ft/s
Maximum Mach Number	0.49
Maximum Acceleration (ft/s^2)	190 ft/s^2
Predicted Apogee (From Sim.) (ft)	4875 ft

## Recovery System Properties

### Main Parachute

Manufacturer/Model		Fruity Chutes Iris		
Size/Diameter (in or ft)		7.0 ft, 8.0 ft		
Altitude at Deployment (ft)		800 ft. AGL		
Velocity at Deployment (ft/s)		86.14 ft/s, 77.00 ft/s		
Terminal Velocity (ft/s)		15.16 ft/s, 14.07 ft/s		
Recovery Harness Material		Tubular Nylon		
Recovery Harness Size/Thickness (in)		1 in		
Recovery Harness Length (ft)		21 ft, 30 ft		
Harness/Airframe Interfaces		Welded Eyenuts; Sewn Loops in Bridle; 3000# swivels between bridle and shrouds attached on butterfly loop		
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	13.28	44.66	57.19	N/A

## Recovery Electronics

Rocket Locators (Make/Model)	X-Bee Pro 900HP; Sparkfun Venus GPS	
Transmitting Frequencies (all - vehicle and payload)	902-928 MHz	
Ejection System Energetics		Black Powder
Energetics Mass - Drogue Chute (grams)	Primary	4.5 g
	Backup	6.75 g
Energetics Mass - Main Chute (grams)	Primary	N/A
	Backup	N/A
Energetics Masses - Other (grams) - If Applicable	Primary	5.5 g
	Backup	8.25 g

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Payload	
Payload 1 (official payload)	Overview
	<p>The payload will be a deployable, autonomous rover. A servo-actuated solar array will be mounted on the top surface of the rover. The rover will be housed in the payload bay of the launch vehicle, fully enclosed, during launch and descent. After landing the rover will exit the open end of the payload bay. The rover will drive at least five feet away from all parts of the airframe, navigating away from the launch vehicle and around other obstacles by using data from its sensors. Once the rover has reached a sufficiently clear location, the solar array will open, completing the mission.</p>
Payload 2 (non- scored payload)	Overview
	N/A

Test Plans, Status, and Results	
Ejection Charge Tests	<p>Full-Scale Test Plan: After final launch vehicle assembly with bulkheads and recovery system, a remote ignition system will be used to ensure proper separation and parachute ejection with selected amount of black powder Status: Testing occurred between 1/16/18 and 2/24/18 Results: Successful - complete separation</p> <p>Sub-Scale Test Plan: After final launch vehicle assembly with bulkheads and recovery system, a remote ignition system will be used to ensure proper separation and parachute ejection with selected amount of black powder Status: Completed - 1/6/2017 Results: Successful - complete separation</p>
Sub-scale Test Flights	<p>Test Plan: Construct sub-scale rocket with same stability margin as final launch vehicle; sub-scale will contain the same ejection controllers as the final assembly Status: Complete - 1/6/2017 Results: Successful launch, rocket safely recovered</p>
Full-scale Test Flights	<p>Test Plan: The full-scale rocket will be representative of final design; final recovery and ejection system will be onboard full-scale planned for 2/17/17. The final rover payload will be onboard a second full-scale launch planned for 3/3/17 Status: Preliminary design completed, will be amended as rocket design changes Results: Failed, Rocket not recovered successfully - Launched on 3/3/17 due to weather concerns on 2/17/17.</p>

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Additional Comments

None