

Milestone Review Flysheet 2017-2018

Institution Pennsylvania State University

Milestone CDR

Vehicle Properties

Total Length (in)	112
Diameter (in)	5.61
Gross Lift Off Weigh (lb.)	38.5
Airframe Material(s)	Carbon Fiber Wrapped Blue Tube
Fin Material and Thickness (in)	G10 FR4 Fiberglass 3/16
Coupler Length/Shoulder Length(s) (in)	12/6

Stability Analysis

Center of Pressure (in from nose)	89.98
Center of Gravity (in from nose)	70.35
Static Stability Margin (on pad)	3.5
Static Stability Margin (at rail exit)	2.49
Thrust-to-Weight Ratio	7.58
Rail Size/Type and Length (in)	1.5/144
Rail Exit Velocity (ft/s)	71.6

Recovery System Properties

Drogue Parachute

Manufacturer/Model	Fruity Chutes Elliptical		
Size/Diameter (in or ft)	12" Diameter		
Altitude at Deployment (ft)	5280		
Velocity at Deployment (ft/s)	-		
Terminal Velocity (ft/s)	111.8		
Recovery Harness Material	Kevlar		
Recovery Harness Size/Thickness (in)	0.5		
Recovery Harness Length (ft)	30		
Harness/Airframe Interfaces	3/8" Steel U-Bolt		
Kinetic Energy of Each Section (Ft-lbs)	Nose/Payload	Avionics Bay	Booster
	1778	1854	2416

Recovery Electronics

Altimeter(s)/Timer(s) (Make/Model)	Stratologger Cf
Redundancy Plan and Backup Deployment Settings	Single level redundancy for drogue and main event
Pad Stay Time (Launch Configuration)	2 hours

Motor Properties

Motor Brand/Designation	Cerseroni/ L1390
Max/Average Thrust (lb.)	371/309
Total Impulse (lbf-s)	887
Mass Before/After Burn (lb.)	392 oz/ 271 oz
Liftoff Thrust (lb.)	292
Motor Retention Method	Plywood centering rings

Ascent Analysis

Maximum Velocity (ft/s)	683
Maximum Mach Number	0.61
Maximum Acceleration (ft/s^2)	302
Predicted Apogee (From Sim.) (ft)	5291

Recovery System Properties

Main Parachute

Manufacturer/Model	Fruity Chute Iris Ultra		
Size/Diameter (in or ft)	84" Diameter		
Altitude at Deployment (ft)	700		
Velocity at Deployment (ft/s)	111.8		
Terminal Velocity (ft/s)	17.98		
Recovery Harness Material	Kevlar		
Recovery Harness Size/Thickness (in)	0.5		
Recovery Harness Length (ft)	40		
Harness/Airframe Interfaces	3/8" Steel U-Bolt		
Kinetic Energy of Each Section (Ft-lbs)	Nose/Payload	Avionics Bay	Booster
	46.06	47.97	62.5

Recovery Electronics

Rocket Locators (Make/Model)	SPYTEC STI GL300	
Transmitting Frequencies (all vehicle and payload)	Cell Phone Service (AT&T)	
Ejection System Energetics (ex. Black Powder)	Black Powder	
Energetics Mass - Drogue Chute (grams)	Primary	3
	Backup	4
Energetics Mass - Main Chute (grams)	Primary	2.5
	Backup	3.5
Energetics Masses - Other (grams) - If Applicable	Primary	N/A
	Backup	N/A

Milestone Review Flysheet 2017-2018

Institution Pennsylvania State University

Milestone CDR

Payload	
Payload 1 (official payload)	Overview
	The payload challenge chosen this year is the autonomous rover. The rover will be remotely deployed from the rocket and then autonomously move at least 5 feet away from every part of the rocket. After it has reached its destination, it will deploy a set of foldable solar panels.
Payload 2 (non-scored payload)	Overview

Test Plans, Status, and Results	
Ejection Charge Tests	The ejection charges will be tested before all flights. The charges used will be sufficiently large to ensure deployment of the corresponding parachute without causing damage to the body tube. To complete the ground test, the ejection charges must be loaded and the initiators must be connected to a 40 ft wire extender. Then, the rocket must be assembled and the shear pins must be installed. From a safe distance, a 9V battery can be connected to the wire extender. (Safety note: make sure that everyone is a safe distance away from the rocket and that no one is standing in line with the nose cone or booster section of the rocket.) This will cause the charge to detonate and should separate the rocket. If the rocket does not separate, then the amount of black powder will need to be increased on that section. If the the ejection charge test for the drogue parachute charge also separates the main parachute section, then the amount of black powder in the drogue parachute section will need to be decreased. (Safety note: If any charges do not detonate, then only the lead and safety officer can approach the rocket with the utmost care to disarm the rocket.)
Sub-scale Test Flights	We launched on a Cesaroni J280 and achieved an apogee of 3733 ft. During descent, parachute deployment appeared to be nominal and the rocket touched down at a safe impact velocity. Upon landing, the airframe and major components of the rocket were inspected and no physical damage was observed.
Full-scale Test Flights	A full-scale test flight will be completed February 17th or 18th. This will be a complete test flight with the motor that will be used for the USLI competition. The payload ejection method will be tested after landing to verify that the rover will be able to roll out of the rocket.

Milestone Review Flysheet 2017-2018

Institution Pennsylvania State University

Milestone CDR

Additional Comments

