Milestone Review Flysheet 2017-2018

Institution	Vanderbilt University

Milestone	Flight Readiness Review

Vehicle Properties	
Total Length (in)	82.35
Diameter (in)	5.5
Gross Lift Off Weigh (lb.)	29.3
Airframe Material(s)	Carbon Fiber
Fin Material and Thickness (in)	Carbon Fiber / 0.125
Coupler Length/Shoulder Length(s) (in)	4

Motor Properties	
Motor Brand/Designation	Loki L1400
Max/Average Thrust (lb.)	609.3/314.7
Total Impulse (lbf-s)	640.8
Mass Before/After Burn (lb.)	29.3/26.2
Liftoff Thrust (lb.)	361.1
Motor Retention Method	Retaining Ring

Stability Analysis	
Center of Pressure (in from nose)	55.0
Center of Gravity (in from nose)	44.0
Static Stability Margin (on pad)	2.0
Static Stability Margin (at rail exit)	2.1
Thrust-to-Weight Ratio	11.5
Rail Size/Type and Length (in)	144
Rail Exit Velocity (ft/s)	92.0

Ascent Analysis	
Maximum Velocity (ft/s)	644
Maximum Mach Number	0.57
Maximum Acceleration (ft/s^2)	456
Predicted Apogee (From Sim.) (ft)	5,077

Recovery System Properties Drogue Parachute		
Manufacturer/Model		Fruity Chutes
Size/Diameter (in or ft)		18 in
Altitude at Deployment (ft)		1s after apogee (2s)
Velocity at Deployment (ft/s)		32.2
Terminal Velocity (ft/s)		88.4
Recovery Harness Material		Kevlar
Recovery Harness Size/Thickness (in)		7/16" (5300 lb)
Recovery Harness Length (ft)		50 ft
Harness/Airframe Interfaces		U-bolt, Eye-bolts, and Quick Link
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2
	1724	1335

Recovery System Properties Main Parachute			
Manufacturer/Model			Fruity Chutes
Size/Diameter (in or ft)			6 ft
Altitude at Deployment (ft)			700 (500)
Velocity at Deployment (ft/s)			88.4
Terminal Velocity (ft/s)			18.1
Recovery Harness Material			Kevlar
Recovery Harness Size/Thickness (in)			7/16" (5300 lb)
Recovery Harness Length (ft)			50 ft
Harness/Airframe Interfaces			U-bolt, Eye-bolts, and Quick Link
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3
	55.8	21.1	40.8

Recovery Electronics	
Altimeter(s)/Timer(s) (Make/Model)	PerfectFlite Stratologger CF
Redundancy Plan and Backup Deployment Settings	Two altimeters will be used for both the main and drogue deployments
Pad Stay Time (Launch Configuration)	>> 2 hrs

Recovery Electronics		
Rocket Locators (Make/Model)		BigRedBee Beeline Transmitter
Transmitting Frequencies (all - vehicle and payload)		433.910 MHz
Ejection System Energetics (ex. Black Powder)		4F Black Powder
Energetics Mass - Drogue Chute (grams)	Primary	2.1
	Backup	2.6
Energetics Mass - Main Chute (grams)	Primary	3.3
	Backup	4.1
Energetics Masses - Other (grams) - If Applicable	Primary	
	Backup	

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Payload	
Payload 1 (official payload)	Overview The design team will implement an imaging target detection system which will inform the set point of a motorized sectional roll control system. The imaging system will detect ground-based targets in the frame of each image taken, while the roll control will center the targets in the frame of the image.
Payload 2 (non-scored payload)	Overview Additionally, the team will place a secondary IMU in the aft section of the rocket to fully characterize the dynamics of our system.

Test Plans, Status, and Results	
Ejection Charge Tests	Ground-based ejection charge testing will be performed prior to all test launches. This testing involves assembling the whole rocket including live charges, shear pins, and properly packed parachutes. The charges are then detonated to ensure proper parachute deployment and rocket separation. These tests will be performed before each launch.
Subscale Test Flights	The team has performed 3 subscale flights to date. The first two validated two stage recovery and the third provided partial payload validation.
Full-scale Test Flights	In order to demonstrate the functionality of the full-scale flight vehicle, a launch was performed on Sunday, February 25th. The full-scale launch was a complete success, with ideal execution of the dual deployment recovery system, safe recovery of all on-board systems, and limited drift. Furthermore, the launch validated the payload's logic and ability to control the upper section of the rocket to hold on an angular setpoint, as evidenced through IMU data gathered during the flight and the on-board camera footage of the rocket in flight.

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Additional Comments