Milestone Review Flysheet 2017-2018

Institution	University of Alabama in Huntsville

Milestone	Flight Readiness Review

Vehicle Properties	
Total Length (in)	106
Diameter (in)	6" fairing + 4" body
Gross Lift Off Weigh (lb.)	41.1
Airframe Material(s)	Fiberglass
Fin Material and Thickness (in)	Fiberglass/0.1875
Coupler Length/Shoulder Length(s) (in)	12/5.5

Motor Properties	
Motor Brand/Designation	Aerotech/L1520T-PS
Max/Average Thrust (lb.)	396.85/352.45
Total Impulse (lbf-s)	835.37
Mass Before/After Burn (lb.)	8.05/3.96
Liftoff Thrust (lb.)	356.11
Motor Retention Method	Aft Retention

Stability Analysis	
Center of Pressure (in from nose)	66.79
Center of Gravity (in from nose)	52.04
Static Stability Margin (on pad)	2.46
Static Stability Margin (at rail exit)	2.52
Thrust-to-Weight Ratio	8.57
Rail Size/Type and Length (in)	1515/T-slot/144
Rail Exit Velocity (ft/s)	77.66

Ascent Analysis	
Maximum Velocity (ft/s)	622.1
Maximum Mach Number	0.55
Maximum Acceleration (ft/s^2)	288
Predicted Apogee (From Sim.) (ft)	5,116

Recovery System Properties				
Drogue Parachute				
Manufacturer/Model			Fruity Chutes/CFC-18	
Size/Diameter (in or ft)			18 in	
Altitude at Deployment (ft)			5319	
Velocity at Deployment (ft/s)			0	
Terminal Velocity (ft/s)			112.7	
Recovery Harness Material			Nylon	
Recovery Harness Size/Thickness (in)			1 in	
Recovery Harness Length (ft)			50 ft	
Harness/Airframe Interfaces		The shock cord that is used for the drogue chute has two connection points, one to the bulkhead on the avionics bay and one to the forward motor retention bulkhead.		
Kinetic Energy of Each Section (Ft-lbs)	Aft Section	Fairing and Coupler	Section 3	Section 4
	1950.88	5030.08		

Recovery System Properties				
Main Parachute				
Manufacturer/Model			Fruity Chute/96" Iris Ultra	
Size/Diameter (in or ft)			96 in	
Altitude at Deployment (ft)			600 ft AGL	
Velocity at Deployment (ft/s)			112.7 ft/s	
Terminal Velocity (ft/s)			17.45 ft/s	
Recovery Harness Material			Nylon	
Recovery Harness Size/Thickness (in)			1 in	
Recovery Harness Length (ft)			50 ft	
Harness/Airframe Interfaces		The shock cord that is used for the main chute has two connection points, one to the bulkhead on the avionics bay and the other to the bulkhead at the aft end of the		
Kinetic Energy of Each Section (Ft-lbs)	Aft Section	Coupler and Upper Airframe	Fairing	Section 4
	46.76	52.72	67.85	

Recovery Electronics	
Altimeter(s)/Timer(s) (Make/Model)	PerfectFlight Stratologger CF
Redundancy Plan and Backup Deployment Settings	Dual, independent system
Pad Stay Time (Launch Configuration)	Indefinite with pull pin installed, unknkown with pin removed (hours)

Recovery Electronics		
Rocket Locators (Make/Model)		Xbee Pro transmitter with Antenova GPS chip
Transmitting Frequencies (all - vehicle and payload)		900 MHz
Ejection System Energetics (ex. Black Powder)		Black Powder
Energetics Mass - Drogue Chute (grams)	Primary	2.25
	Backup	2.75
Energetics Mass - Main Chute (grams)	Primary	3
	Backup	3.5
Energetics Masses - Other (grams) - If Applicable	Primary	12 (CO2)
	Backup	NA

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Payload	
Payload 1 (official payload)	Overview
	The payload selected is the deployable rover. In its compressed state, the payload wheels have a diameter of 5.7 in, a length of 15.04 in, and weighs 6 lb. The payload resides in the 6 in fairing of the launch vehicle. It is ejected through the top of the fairing through the use of a piston. Upon clearing the fairing, springs will pull the wheels to their expanded diameter, 16.06 in and the tail unfolds. The rover will then begin moving, taking temperature, pressure, location data, and images. Upon reaching the required distance, the lid of the chassis will slide open, via a DC motor and linear gear, in order to reveal the solar panels.
Payload 2 (non-scored payload)	Overview

Test Plans, Status, and Results	
Ejection Charge Tests	Standard operating procedures were developed for ejection testing and and followed for testing which occurred on February 17, 2018 before the first attempted full scale flight. The location is a dedicated test area at the UAH Propulsion Research Center and is shielded for testing to be done safely. Eight team members have completely first aid and CPR training and are eligible to conduct testing.
Sub-scale Test Flights	The first subscale flight occurred on November 19th in Childersburg, AL. The conditions were very windy which led to a lower apogee than expected but all recovery systems deployed successfully at their desired altitudes and the rocket was recovered within close range of the launch rail. The second and third flights occurred on December 16th in Childersburg, AL. The second flight appeared to have a canted nozzle in the COTS motor which was not noticed before assembly, which caused the rocket to experience oscillations during flight and did not reach the intended altitude. The third flight, however experienced no anomalies and reached its intended apogee. All subscale flights had successful recoveries and were suitable to refly.
Full-scale Test Flights	The first full-scale flight occured February 24th in Samson, AL. This launch field is hosted by the SouthEast Alabama Rocketry Society, TRA section 38. The vehicle was assembled (without energetics) and inspected the night before the launch. Preparation and launch day activities were conducted according to Standard Operating Procedures. The vehicle reached an altitude of 6893 feet on an Aerotech L1420 Motor. The reflight on March 3rd using the L1520 reached an apogee of 4698 ft, below the competition waiver. The vehicle was successfully recovered after both flgihts.

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Additional Comments