Milestone Review Flysheet 2019-2020

Institution	University of Alabama in Huntsville

Milestone	PDR

Vehicle Properties

Total Length (in)	120
Diameter (in)	6.188 inches outer
Gross Lift Off Weigh (lb)	52.8
Airframe Material(s)	Fiberglass
Fin Material and Thickness (in)	Fiberglass, 0.125 (1/8) inch
Coupler Length(s)/Shoulder Length(s) (in)	13 in

Motor Properties

Motor Brand/Designation	AeroTech Rocketry L1420R-PS
Max/Average Thrust (lb)	407.8 / 319.2
Total Impulse (lbf-s)	1034.8
Mass Before/After Burn (lb)	10.06 / 5.64
Liftoff Thrust (lb)	~300
Motor Retention Method	Aeropack flange retention ring

Stability Analysis

Center of Pressure (in. from nose)	85.376
Center of Gravity (in. from nose)	66.488
Static Stability Margin (on pad)	3.05
Static Stability Margin (at rail exit)	2.13
Thrust-to-Weight Ratio	6.045
Rail Size/Type and Length (in)	144 inches
Rail Exit Velocity (ft/s)	68.5

Ascent Analysis

Maximum Velocity (ft/s)	554
Maximum Mach Number	0.487
Maximum Acceleration (ft/s^2)	206
Target Apogee (ft)	4500
Predicted Apogee (From Sim.) (ft)	4438

Recovery System Properties - Overall

Total Descent Time (s)	89
Total Drift in 20 mph winds (ft)	2134

Recovery System Properties - Energetics

Ejection System Energetics (ex. Black Powder)		Black Powder
Energetics Mass - Drogue Chute (grams)	Primary	To Be Determined
	Backup	TBD
Energetics Mass - Main Chute (grams)	Primary	TBD
	Backup	TBD
Energetics Mass - Other (grams) - If Applicable	Primary	TBD
	Backup	TBD

Payload Deployment

Location: Air or Ground (if applicable)	Air
Altitude of Deployment (if applicable)	600 feet

Recovery System Properties - Recovery Electronics

Primary Altimeter Make/Model	Perfect Flite StratoLogger CF
Secondary Altimeter Make/Model	Perfect Flite StratoLogger CF
Other Altimeters (if applicable)	N/A
Rocket Locator (Make/Model)	Xbee Pro-S3B
Additional Locators (if applicable)	N/A
Transmitting Frequencies (all - vehicle and payload)	902-928 MHz
Pad Stay Time (Launch Configuration)	Up to 70 hours
Describe Redundancy Plan (batteries, switches, etc.)	Two power sources. Redundant charges for both drogue and main

Recovery System Properties - Drogue Parachute

Manufacturer/Model			Fruity Chute IFC	
Size or Diameter (in or ft)			24 inch	
Main Altimeter Deployment Setting			Apogee (4438 ft)	
Backup Altimeter Deployment Setting			1 second after apogee	
Velocity at Deployment (ft/s)			0	
Terminal Velocity (ft/s)			89.84	
Recovery Harness Material, Size, and Type (examples - 1/2 in. tubular Nylon or 1 in. flat Kevlar strap)			1 in tubular Nylon	
Recovery Harness Length (ft)			30	
Harness/Airframe Interfaces		TBD		
Kinetic Energy (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	N/A	N/A	N/A	N/A

Recovery System Properties - Main Parachute

Manufacturer/Model			Fruity Chute CFC	
Size or Diameter (in or ft)			96 inch	
Main Altimeter Deployment Setting (ft)			600 feet	
Backup Altimeter Deployment Setting (ft)			550 feet	
Velocity at Deployment (ft/s)			89.84	
Terminal Velocity (ft/s)			12.77	
Recovery Harness Material, Size, and Type (examples - 1/2 in. tubular Nylon or 1 in. flat Kevlar strap)			1 in tubular Nylon	
Recovery Harness Length (ft)			50	
Harness/Airframe Interfaces		TBD		
Kinetic Energy (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	31	44	26	45

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Payload

	Overview
Payload 1 (official payload)	The primary payload flown in the vehicle is designed to complete the lunar ice collection mission. The payload is a ground based rover with two tracks for travel and a scoop for collecting the ice. The rover will be driven by an operator using an RC transmitter. During the mission, the rover will also be tracked via a ground station and will relay critical information to the ground station via a telemetry radio link.

	Overview
Payload 2 (non-scored payload)	No additional experiment will be flown along with Payload 1.

Test Plans, Status, and Results

Ejection Charge Tests	Small amounts of black powder will incrementally be placed in the launch system and fired. The amount of powder will be increased until the parachutes and payload can be reliably ejected very time, without using an excesive amount. Sub-scale tests will be conducted before the sub-scale launch day. Full scale tests will be conducted sometime between bulding the full scale rocket and first test launch. No results yet, as no test has been conducted yet.
Sub-scale Test Flights	A sub-scale test flight is planned for November 9th, 2019. Two (2) identical rockets will be flown, and each rocket shall be flown twice to ensure repeatable results. The purpose for a sub-scale test is to ensure the stability of the rocket will not be too little or too great, and that recovery will deploy and behave as predicted. These tests will help to plan and prepare for the later full scale rocket building, simulations, and launch testing.
Vehicle Demon-stration Flights	The first vehicle full scale test flight will use a mass simulator in lieu of an actual payload. This will be in order to test the full scale rocket's flight path, stability, recovery, and other factors without risking any catastrophicc failure to the payload. The Vehicle Demonstration Flight will be conducted sometime after the final design of the rocket has been finalized, however a specific date has not been decided yet. The CRW wants to only fly a full scale test after a final design has been chosen to limit changes and variations as best as possible. After a test shows the rocket design is experimentally practical, a Payload Demonstration Flight will be conducted. No results yet as the test has not been conducted.
Payload Demon-stration Flights	After a full scale vehicle test using a mass simulator has been conducted, the vehicle will be tested with a fully functioning payload. This will allow for the vehicle team to not only repeat their previous experiment, but it will allow the payload team to test their deployment from the vehicle and recovery. No results yet as no test has been conducted.

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Transmitter #1

Location of transmitter:	Inside the payload		
Purpose of transmitter:	Telemetry and ground station tracking		
Brand	Holybro	RF Output Power (mW)	100
Model	Transciever Telemetry Transmitter V3	Specific Frequency used by team (MHz)	960
Handshake or frequency hopping? (explain)	Frequency Hopping Spread Spectrum (FHSS)		
Distance to closest e-match or altimeter (in)	NA		
Description of shielding plan:	NA		

Transmitter #2

Location of transmitter:	Carried by Payload Operator		
Purpose of transmitter:	Drive the payload during the mission		
Brand	FySky	RF Output Power (mW)	100
Model	Q X7	Specific Frequency used by team (MHz)	2400
Handshake or frequency hopping? (explain)	Frequency hopping using the built-in FrySky ACCST technology		
Distance to closest e-match or altimeter (in)	NA		
Description of shielding plan:	NA		

Transmitter #3

Location of transmitter:	No other transmitters are used		
Purpose of transmitter:			
Brand		RF Output Power (mW)	
Model		Specific Frequency used by team (MHz)	
Handshake or frequency hopping? (explain)			
Distance to closest e-match or altimeter (in)			
Description of shielding plan:			

Transmitter #4

Location of transmitter:	No other transmitters are used		
Purpose of transmitter:			
Brand		RF Output Power (mW)	
Model		Specific Frequency used by team (MHz)	
Handshake or frequency hopping? (explain)			
Distance to closest e-match or altimeter (in)			
Description of shielding plan:			

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Transmitter #5

Location of transmitter:	No other transmitters are used		
Purpose of transmitter:			
Brand		RF Output Power (mW)	
Model		Specific Frequency used by team (MHz)	
Handshake or frequency hopping? (explain)			
Distance to closest e-match or altimeter (in)			
Description of shielding plan:			

Transmitter #6

Location of transmitter:	No other transmitters are used		
Purpose of transmitter:			
Brand		RF Output Power (mW)	
Model		Specific Frequency used by team (MHz)	
Handshake or frequency hopping? (explain)			
Distance to closest e-match or altimeter (in)			
Description of shielding plan:			

Additional Comments