Milestone Review Flysheet 2018-2019

Institution	University of California, Santa Cruz

Milestone	FRR

Vehicle Properties	
Total Length (in)	104.27
Diameter (in)	5.52
Gross Lift Off Weigh (lb)	22.96
Airframe Material(s)	Carbon Fiber
Fin Material and Thickness (in)	MDF .25
Coupler Length(s)/Shoulder Length(s) (in)	5.5

Motor Properties	
Motor Brand/Designation	AeroTech L1000
Max/Average Thrust (lb)	224.81
Total Impulse (lbf-s)	2714 Ns
Mass Before/After Burn (lb)	22.6/19.51
Liftoff Thrust (lb)	22.6
Motor Retention Method	Bolted plate

Stability Analysis	
Center of Pressure (in. from nose)	78.878
Center of Gravity (in. from nose)	59.873
Static Stability Margin (on pad)	2.28
Static Stability Margin (at rail exit)	2.5
Thrust-to-Weight Ratio	9.9
Rail Size/Type and Length (in)	96
Rail Exit Velocity (ft/s)	61

Ascent Analysis	
Maximum Velocity (ft/s)	730
Maximum Mach Number	0.65
Maximum Acceleration (ft/s^2)	384
Target Apogee (ft)	5280
Predicted Apogee (From Sim.) (ft)	5429

Recovery System Properties - Overall	
Total Descent Time (s)	72
Total Drift in 20 mph winds (ft)	2101

Recovery System Properties - Energetics		
Ejection System Energetics (ex. Black Powder)		Black Powder
Energetics Mass - Drogue Chute (grams)	Primary	2
	Backup	2
Energetics Mass - Main Chute (grams)	Primary	N/A
	Backup	N/A
Energetics Mass - Other (grams) - If Applicable	Primary	2
	Backup	2

Recovery System Properties - Recovery Electronics	
Primary Altimeter Make/Model	Strattologger CF/PerfectFlite
Secondary Altimeter Make/Model	Easy Mini/Altus Metrum
Other Altimeters (if applicable)	-
Rocket Locator (Make/Model)	Eggfinder TX
Additional Locators (if applicable)	-
Transmitting Frequencies (all - vehicle and payload)	***Required by FRR*** (Complete on pages 3 and 4)
Describe Redundancy Plan (batteries, switches, etc.)	Each altimeter system is powered seperately and connected to independent charges
Pad Stay Time (Launch Configuration)	>1hr

Recovery System Properties - Drogue Parachute				
Manufacturer/Model			Fruity Chutes	
Size or Diameter (in or ft)			18 in	
Main Altimeter Deployment Setting			Apogee	
Backup Altimeter Deployment Setting			Apogee + 2 sec	
Velocity at Deployment (ft/s)			0	
Terminal Velocity (ft/s)			112	
Recovery Harness Material, Size, and Type (examples - 1/2 in. tubular Nylon or 1 in. flat Kevlar strap)			1/2 in. tubular Nylon	
Recovery Harness Length (ft)			10	
Harness/Airframe Interfaces		1/4-20 I Bolts		
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	54.37	59.94		

Recovery System Properties - Main Parachute				
Manufacturer/Model			Fruity Chutes	
Size or Diameter (in or ft)			60 in	
Main Altimeter Deployment Setting (ft)			500	
Backup Altimeter Deployment Setting (ft)			500	
Velocity at Deployment (ft/s)			112	
Terminal Velocity (ft/s)			20	
Recovery Harness Material, Size, and Type (examples - 1/2 in. tubular Nylon or 1 in. flat Kevlar strap)			1/2 in. tubular Nylon	
Recovery Harness Length (ft)			30	
Harness/Airframe Interfaces		1/4-20 I Bolts		
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	16.68	18.39		

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Payload

	Overview
Payload 1 (official payload)	SlugBuggy is the team's answer to the soil sample collection payload challenge. The rover has been designed to be safely and securely housed within the rocket's air frame during flight, deploy upon landing with the proper orientation correction, drive a minimum of 10ft from the landing sight taking into account the vast range of possible terrains, collect at least 10mL of soil, and seal the sample. The rover features a 3D printed unibody chassis driven by two independently driven silicone tracks. This enables the rover to traverse a majority of the expected terrains and perform obstacle avoidance maneuvers. Once the rover has reached a minimum of 10ft from the landed rocket airframe, the bull-dozer like soil sample collection scoop will deploy. The rover will then drive forward (further away from the rocket) and collect the soil sample. The scoop will then be returned to the closed position, pressed up against the sealing lid to complete the collection task.
Payload 2 (non-scored payload)	

Test Plans, Status, and Results

Ejection Charge Tests	Ejection charge tests will be completed before any flight of the the vehicle
Sub-scale Test Flights	Sub-scale was flown on Decmber 8th at the LUNAR launch site at 4:01pm.
Vehicle Demon-stration Flights	Full scale rocket was flown on February 16th and suffered a failure of payload bay securement and damage to the recovery airframe requiring replacement. Full scale launch was done at the FAR launch site on 2/16/19 at 3:55pm. Full scale will be reflown on March 9th/10th or March 16th.
Payload Demon-stration Flights	Payload was flown with the full scale launch on 2/16/19, however a failure of the payload bay securement led to loss of the entire rover and sled, requring a redesign and rebuild. Payload will be reflown along with the full scale on March9th/10th or March 16th.

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Transmitter #1			
Location of transmitter:	Nosecone		
Purpose of transmitter:	Location		
Brand	Eggfinder	RF Output Power (mW)	100
Model	Eggfinder TX	Specific Frequency used by team (MHz)	915
Handshake or frequency hopping? (explain)	None		
Distance to closest e-match or altimeter (in)			
Description of shielding plan:	Rover payload will shield all incoming transmissions from other electronic systems		

Transmitter #2			
Location of transmitter:	Recovery Section		
Purpose of transmitter:	Reciver for payload activation		
Brand	Digi International	RF Output Power (mW)	250
Model	XBee-PRO	Specific Frequency used by team (MHz)	20 kbps (Digital)
Handshake or frequency hopping? (explain)	Freqency Hopping		
Distance to closest e-match or altimeter (in)	20 in for altimeter, 3in for black-powder charge.		
Description of shielding plan:	No shielding, module is a reciver.		

Transmitter #3			
Location of transmitter:	N/A		
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:	N/A		
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:	N/A		
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:	N/A		
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

The additional energetics are for payload section seperation once landed. These have their own arming circuit and remote triggering. Using a Digi International XBee-PRO reciver using a 20 kbps (digital) frequency and 250Mw of power.