Milestone Review Flysheet 2017-2018

Institution	UC Berkeley

Milestone	FRR

Vehicle Properties	
Total Length (in)	113
Diameter (in)	6.079, 4.014
Gross Lift Off Weigh (lb.)	27.91
Airframe Material(s)	Blue Tube, Kraft Phenolic, Fiberglass, Aluminum
Fin Material and Thickness (in)	Fiberglass, .125
Coupler Length/Shoulder Length(s) (in)	6in/4in dependent on diameter

Motor Properties	
Motor Brand/Designation	Cesaroni Technology L730-P
Max/Average Thrust (lb.)	273.6/165.9
Total Impulse (lbf-s)	621.4
Mass Before/After Burn (lb.)	4.95/1.98
Liftoff Thrust (lb.)	130.5
Motor Retention Method	54mm Aero Pack motor retainer

Stability Analysis	
Center of Pressure (in from nose)	78.214
Center of Gravity (in from nose)	63.802
Static Stability Margin (on pad)	2.57
Static Stability Margin (at rail exit)	2.61
Thrust-to-Weight Ratio	6.07
Rail Size/Type and Length (in)	1515 - 12ft
Rail Exit Velocity (ft/s)	80.2

Ascent Analysis	
Maximum Velocity (ft/s)	588
Maximum Mach Number	0.53
Maximum Acceleration (ft/s^2)	275
Predicted Apogee (From Sim.) (ft)	5323

Recovery System Properties Drogue Parachute				
Manufacturer/Model			Fruity Chutes	
Size/Diameter (in or ft)			24in Elliptical	
Altitude at Deployment (ft)			apogee/5280ft	
Velocity at Deployment (ft/s)			0	
Terminal Velocity (ft/s)			65.18	
Recovery Harness Material			Strap Nylon	
Recovery Harness Size/Thickness (in)			0.5in	
Recovery Harness Length (ft)			21.84	
Harness/Airframe Interfaces		1) U-Bolt on Transition tube, 2) Top and bottom links of Tender Descender		
Kinetic Energy of Each Section (Ft-lbs)	Nosecone	Booster	Section 3	Section 4
	733	700		

Recovery System Properties Main Parachute				
Manufacturer/Model			Fruity Chutes/Iris Ultra Compact	
Size/Diameter (in or ft)			72in Toroidal	
Altitude at Deployment (ft)			550	
Velocity at Deployment (ft/s)			67.041	
Terminal Velocity (ft/s)			17.29	
Recovery Harness Material			Strap Nylon	
Recovery Harness Size/Thickness (in)			0.5in	
Recovery Harness Length (ft)			47.09	
Harness/Airframe Interfaces		1) Tender Descender quicklinks, 2) U-Bolt of avionics bay		
Kinetic Energy of Each Section (Ft-lbs)	Nosecone	Booster	Section 3	Section 4
	54.51	52.01		

Recovery Electronics	
Altimeter(s)/Timer(s) (Make/Model)	Perfectflite Stratologger CF
Redundancy Plan and Backup Deployment Settings	Two altimeters, redundant ejection charges, two tender descenders
Pad Stay Time (Launch Configuration)	2 hours

Recovery Electronics		
Rocket Locators (Make/Model)	TeleGPS	
Transmitting Frequencies (all vehicle and payload)	923 MHz	
Ejection System Energetics (ex. Black Powder)		Black Powder
Energetics Mass - Drogue Chute (grams)	Primary	4
	Backup	4
Energetics Mass - Main Chute (grams)	Primary	0.5
	Backup	0.5
Energetics Masses - Other (grams) - If Applicable	Primary	
	Backup	

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Payload	
Payload 1 (official payload)	Overview
	The Deployment design consists of a black powder charged system as opposed to the previously put forth pneumatic piston system for PDR. A loose bulkhead in between the transition and payload sections of the airframe will push up against wooden posts glued in between the gears in the wheels in the rover once the black powder is ignited, effectively separating the two sections. Next, the ejection subsystem design maintains the same scissor lift design described in PDR, with minor changes such as removing a servo, adding metal cross-members to the scissor links, and using laser-cut plastics being made to promote ease and improvement of assembly. The current movement subsystem design also features essentially the same cylindrical rover model outlined in PDR, with slight variations like moving from a partially to fully-enclosed frame made for improved durability and easier manufacturing. Finally, the solar subsystem design described in PDR remains mostly unchanged, with modifications in sizing of solar cells and panels, polycarbonate pieces, and the hood of the rover as well as removing a servo due to weight and volume restrictions.
Payload 2 (non-scored payload)	Overview

Test Plans, Status, and Results	
Ejection Charge Tests	Sub-scale ejection charge tests, four two-gram black powder charges evenly split above and below the main parachute, took place the day of the subscale launch and were sucessful.
Sub-scale Test Flights	Sub-scale Test Flight took place December 16th at Livermore Unit NAR (LUNAR). Altitude of 4366ft was reached and a successful two stage recovery was completed along with successful electronics readings. Minor damage were dealt to the parachutes from the black powder charges.
Full-scale Test Flights	A full-scale test flight took place February 3rd at Livermore Unit NAR (LUNAR). Apogee 5361.5ft of reached, however, the parachures did not sucessfully unfurl, and the launch vehicle had a high-speed crash landing. Still, ascent was unaffected and this provided airframe with much data. We will be completing a second test flight on March 10th or 11th

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Additional Comments