

Milestone Review Flysheet 2019-2020

Institution Piedmont Virginia Community College

Milestone FRR

Vehicle Properties	
Total Length (in)	126
Diameter (in)	6
Gross Lift Off Weigh (lb)	52.5
Airframe Material(s)	fiberglass
Fin Material and Thickness (in)	plywood, 0.50
Coupler Length(s)/Shoulder Length(s) (in)	6

Payload Deployment	
Location: Air or Ground (if applicable)	Air
Altitude of Deployment (if applicable)	400

Motor Properties	
Motor Brand/Designation	Aerotech, L1170 FJ
Max/Average Thrust (lb)	334.6/262.9
Total Impulse (lbf-s)	951
Mass Before/After Burn (lb)	11.2 / 5.0
Liftoff Thrust (lb)	292
Motor Retention Method	Aeropack retainer

Recovery System Properties - Recovery Electronics	
Primary Altimeter Make/Model	MissileWorks/RRC3
Secondary Altimeter Make/Model	MissileWorks/RRC3
Other Altimeters (if applicable)	n/a
Rocket Locator (Make/Model)	MissileWorks/T3
Additional Locators (if applicable)	Eggfinder
Transmitting Frequencies (all - vehicle and payload)	***Required by CDR*** (Complete on pages 3 and 4)
Pad Stay Time (Launch Configuration)	15+ hours
Describe Redundancy Plan (batteries, switches, etc.)	Each device has an independent battery, switch, and igniter

Stability Analysis	
Center of Pressure (in. from nose)	96.4
Center of Gravity (in. from nose)	77.4
Static Stability Margin (on pad)	3.1
Static Stability Margin (at rail exit)	3.2
Thrust-to-Weight Ratio	5.1:1
Rail Size/Type and Length (in)	1515/ 144in
Rail Exit Velocity (ft/s)	60.3

Recovery System Properties - Drogue Parachute	
Manufacturer/Model	Fruity Chutes
Size or Diameter (in)	24
Main Altimeter Deployment Setting	Apogee
Backup Altimeter Deployment Setting	Apogee + 2s
Velocity at Deployment (ft/s)	0
Terminal Velocity (ft/s)	127
Recovery Harness Material, Size, and Type (examples - 1/2 in. tubular Nylon or 1 in. flat Kevlar strap)	3/4 in. tubular Kevlar
Recovery Harness Length (ft)	35
Harness/Airframe Interfaces	Dual U-Bolts
Kinetic Energy (Ft-lbs)	Section 1 Section 2 Section 3 Section 4
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Ascent Analysis	
Maximum Velocity (ft/s)	439
Maximum Mach Number	0.4
Maximum Acceleration (ft/s^2)	642.2
Target Apogee (ft)	4,800
Predicted Apogee (From Sim.) (ft)	3,817

Recovery System Properties - Overall	
Total Descent Time (s)	52
Total Drift in 20 mph winds (ft)	2,073/2,342

Recovery System Properties - Energetics		
Ejection System Energetics (ex. Black Powder)		black powder
Energetics Mass - Drogue Chute (grams)	Primary	5.5
	Backup	6
Energetics Mass - Main Chute (grams)	Primary	7.5
	Backup	8
Energetics Mass - Other (grams) - If Applicable	Primary	
	Backup	

Recovery System Properties - Main Parachute	
Manufacturer/Model	Fruity Chutes
Size or Diameter (in or ft)	84in.(booster)48in.(payload)
Main Altimeter Deployment Setting (ft)	700
Backup Altimeter Deployment Setting (ft)	600
Velocity at Deployment (ft/s)	127
Terminal Velocity (ft/s)	17.8/15.4
Recovery Harness Material, Size, and Type (examples - 1/2 in. tubular Nylon or 1 in. flat Kevlar strap)	3/4 in. tubular Kevlar
Recovery Harness Length (ft)	35
Harness/Airframe Interfaces	Dual U-Bolts
Kinetic Energy (Ft-lbs)	Section 1 Section 2 Section 3 Section 4
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Payload	
Payload 1 (official payload)	Overview
	Sample collecting rover, housed in payload bay. Will be deployed with RSO consent at 400 to descend on a parawing.
Payload 2 (non-scored payload)	Overview

Test Plans, Status, and Results	
Ejection Charge Tests	A ground fire ejection test was performed using the planned 5.5 g (drogue) and 7.5 g (main) charges. The resulting separation was energetic, driving the sections apart to nearly the length of the recovery harness, and clearly ejecting the chute/deployment bag packages well clear of the airframe.
Sub-scale Test Flights	We flew our subscale rocket and it flew perfectly both parachutes deployed and brought both sections of the rocker down together
Vehicle Demonstration Flights	The ascent, apogee separation, and drogue descent went as intended. When the main parachutes deployed, the payload section came away because of the recovery harness breaking loose from the payload bay attachment point, likely due to a failure to properly secure the knot attaching the quick link at that end. A fin on the booster section also hit the payload section's main parachute and ripped it. The payload section came down hard but didn't have any major damage. The mass simulator remained attached to the payload main chute and landed safely. The booster section main chute deployed normally and landed safely.
Payload Demonstration Flights	Planned for March 14, 2020

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Location of transmitter:☒	Avionics bay		
Purpose of transmitter:☒	GPS tracking of the booster section		
Brand	Eggfinder	RF Output Power (mW)	100
Model		Specific Frequency used by team (MHz)	919
Handshake or frequency hopping? (explain)	no		
Distance to closest e-match or altimeter (in)	3.75 in. to altimeter		
Description of shielding plan:	Foil-coated bulkhead between GPS and altimeters		

Transmitter #2			
Location of transmitter:☒	nosecone		
Purpose of transmitter:☒	GPS tracking of the nosecone		
Brand	Missileworks	RF Output Power (mW)	200
Model	T3	Specific Frequency used by team (MHz)	925
Handshake or frequency hopping? (explain)	no		
Distance to closest e-match or altimeter (in)	55 in.		
Description of shielding plan:	Foil-coated bulkhead between GPS and altimeters		

Transmitter #3			
Location of transmitter:☒			
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:☒			
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:☒			
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:☒			
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