

Milestone Review Flysheet 2021-2022

Institution Explorer Post 1010

Milestone FRR Submittal

Vehicle Properties	
Total Length (in)	69.685
Diameter (in)	4 in
Gross Lift Off Weigh (lb)	7.45 lbs
Airframe Material(s)	Thick walled paper tubes
Fin Material and Thickness (in)	1/4 in Plywood
Coupler Length(s)/Shoulder Length(s) (in)	Upper section shoulder length

Motor Properties	
Motor Brand/Designation	Cesaroni J357-14A
Max/Average Thrust (lb)	115.3 Lbf / 80.3 Lbf
Total Impulse (lbf-s)	441.9 Lbfs
Mass Before/After Burn (oz)	21.2oz / 9.3oz
Liftoff Thrust (N)	422.6 N (95.0 Lbf)
Motor Retention Method	Retention ring and screw

Stability Analysis	
Center of Pressure (in. from nose)	50.79
Center of Gravity (in. from nose)	40.16
Static Stability Margin (on pad)	2.58
Static Stability Margin (at rail exit)	2.69
Thrust-to-Weight Ratio	12.75:1
Rail Size/Type and Length (in)	1010, 96 in
Rail Exit Velocity (ft/s)	81.06

Ascent Analysis	
Maximum Velocity (ft/s)	573.917
Maximum Mach Number	0.51
Maximum Acceleration (ft/s ²)	564.304
Target Apogee (ft)	3600
Predicted Apogee (From Sim.) (ft)	3293.9

Recovery System Properties - Overall	
Total Descent Time (s)	88
Total Drift in 20 mph winds (ft)	1974.25

Recovery System Properties - Energetics		
Ejection System Energetics (ex. Black Powder)	Black powder	
Energetics Mass - Drogue Chute (grams)	Primary	0.4
	Backup	0.5
Energetics Mass - Main Chute (grams)	Primary	1
	Backup	1
Energetics Mass - Other (grams) - If Applicable	Primary	N/A
	Backup	

Recovery System Properties - Recovery Electronics	
Primary Altimeter Make/Model	RRC3 "Sport" Altimeter
Secondary Altimeter Make/Model	RRC3 "Sport" Altimeter
Other Altimeters (if applicable)	N/A
Rocket Locator (Make/Model)	Featherweight Tracker
Additional Locators (if applicable)	N/A
Transmitting Frequencies (all - vehicle and payload)	2450 MHz, 921 MHz
Describe Redundancy Plan (batteries, switches, etc.)	separate systems and batteries, backup altimeter set to deploy 1 second after apogee; Two redundant ejection charge wells for drogue and two separate
Pad Stay Time (Launch Configuration)	2 Hours

Recovery System Properties - Drogue Parachute				
Manufacturer/Model		Fruity Chutes		
Size or Diameter (in or ft)		12"		
Main Altimeter Deployment Setting		At apogee		
Backup Altimeter Deployment Setting		1 second after apogee		
Velocity at Deployment (ft/s)		0 ft/s		
Terminal Velocity (ft/s)		48 ft/s		
Recovery Harness Material, Size, and Type (examples - 1/2 in. tubular Nylon or 1 in. flat Kevlar strap)		1000 lb rated kevlar line		
Recovery Harness Length (ft)		20 ft		
Harness/Airframe Interfaces		Eye bolt on ebay		
Kinetic Energy of Each Section (Ft-lbs)	Section (Ebay)	Section 2 (Lower sec)	Section 3	Section 4
	88.4	84.7	N/A	N/A

Recovery System Properties - Main Parachute				
Manufacturer/Model		Fruity chutes		
Size or Diameter (in or ft)		36 "		
Main Altimeter Deployment Setting (ft)		600 ft		
Backup Altimeter Deployment Setting (ft)		500 ft		
Velocity at Deployment (ft/s)		48 ft/s		
Terminal Velocity (ft/s)		18 ft/s		
Recovery Harness Material, Size, and Type (examples - 1/2 in. tubular Nylon or 1 in. flat Kevlar strap)		1000 lb rated kevlar line		
Recovery Harness Length (ft)		15 ft		
Harness/Airframe Interfaces		Eye bolt on ebay		
Kinetic Energy of Each Section (Ft-lbs)	Section 1 (Payload)	Section 2 (Ebay)	Section 3 (Lower sec)	Section 4
	20.11	12.4	11.9	N/A

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Payload

Payload	
Payload 1 (official payload)	Overview
	Autonomous Guided Recovery System - The payload will separate from the rocket at apogee. At 500 ft, two redundant jolly logic chute releases will allow a guided parafoil to deploy. At 400 ft the parafoil will autonomously guide itself back to the launch site.
Payload 2 (non-scored payload)	Overview
	N/A

Test Plans, Status, and Results (WILL BE UPDATED WITH STATUS AND RESULTS)

Ejection Charge Tests	Subscale Rocket: We performed two ground tests of the ejection system, with 0.36 grams of black powder forward and 0.48 g aft. Both separations were successful, although we determined that less black powder should be used than initially thought. Additionally, the shear pins slightly zippered the tube so the paper tubes will have to be reinforced more.
Sub-scale Test Flights	The rocket successfully reached an apogee of 600 feet, which was considerably under our target of 800ft. The rocket was 40 grams heavier than what was predicted in OpenRocket, due to some small differences in hardware used. Total flight time was 46 seconds.
Vehicle Demonstration Flights	On February 12 the full scale rocket successfully was launched and recovered. According to the featherweight GPS, the vehicle reached an apogee of 3472 ft. The RRC3 recorded an apogee of 3369 ft. The flight was conducted with a half-kilogram mass simulator in the nosecone.
Payload Demonstration Flights	Plan to launch in March (12/13). This test launch's conditions will be as close as possible to the competition launch.

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Transmitter #1			
Location of transmitter:	Nosecone		
Purpose of transmitter:	GPS tracking to aid in recovery		
Brand	Nordic Semiconductor	RF Output Power (mW)	80 mW
Model	NRF24I01+	Specific Frequency used by team (MHz)	2450
Handshake or frequency hopping? (explain)	N/A		
Distance to closest e-match or altimeter (in)	3 in		
Description of shielding plan:	Separated by plywood bulkhead		

Transmitter #2			
Location of transmitter:	Electronics bay		
Purpose of transmitter:	GPS tracking transmission to aid in recovery		
Brand	Featherweight Altimeters	RF Output Power (mW)	250 mW
Model	Featherweight GPS Tracker	Specific Frequency used by team (MHz)	921
Handshake or frequency hopping? (explain)			
Distance to closest e-match or altimeter (in)	~1.5 in		
Description of shielding plan:	Separated by plywood bulkhead		

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