

Milestone Review Flysheet 2018-2019

Institution Piedmont Virginia Community College

Milestone FRR

Vehicle Properties

Total Length (in)	112
Diameter (in)	4 in. to 8 in.
Gross Lift Off Weigh (lb)	50
Airframe Material(s)	Fiberglass, Sapele, ABS, Nylon
Fin Material and Thickness (in)	Fiberglass, 1/4 in.
Coupler Length(s)/Shoulder Length(s) (in)	8 in., 5 in.

Motor Properties

Motor Brand/Designation	Aerotech L1420R
Max/Average Thrust (lb)	407.8/319.2
Total Impulse (lbf-s)	1034.8
Mass Before/After Burn (lb)	10.1 / 4.41
Liftoff Thrust (lb)	349
Motor Retention Method	AeroPack Tailcone Retainer

Stability Analysis

Center of Pressure (in. from nose)	86.5
Center of Gravity (in. from nose)	58.6
Static Stability Margin (on pad)	3.5
Static Stability Margin (at rail exit)	3.7
Thrust-to-Weight Ratio	7.9:1
Rail Size/Type and Length (in)	1515 / 144 in.
Rail Exit Velocity (ft/s)	67.9

Ascent Analysis

Maximum Velocity (ft/s)	706
Maximum Mach Number	0.63
Maximum Acceleration (ft/s ²)	252
Target Apogee (ft)	5,050
Predicted Apogee (From Sim.) (ft)	5,058

Recovery System Properties - Overall

Total Descent Time (s)	44
Total Drift in 20 mph winds (ft)	1,230/1,334

Recovery System Properties - Energetics

Ejection System Energetics (ex. Black Powder)	Black Powder	
Energetics Mass - Drogue Chute (grams)	Primary	8 g
	Backup	8 g
Energetics Mass - Main Chute (grams)	Primary	8 g
	Backup	8 g
Energetics Mass - Other (grams) - If Applicable	Primary	.14 g
	Backup	

Recovery System Properties - Recovery Electronics

Primary Altimeter Make/Model	Missile Works/RRC3
Secondary Altimeter Make/Model	Missile Works/RRC3
Other Altimeters (if applicable)	N/A
Rocket Locator (Make/Model)	Eggfinder Mini Transmitter
Additional Locators (if applicable)	Adafruit RFM95W LoRa
Transmitting Frequencies (all - vehicle and payload)	***Required by CDR*** (Complete on pages 3 and 4)
Describe Redundancy Plan (batteries, switches, etc.)	Fully redundant altimeters and ejection charges. Backup charges at apogee + 1 second, apogee + 2 seconds.
Pad Stay Time (Launch Configuration)	15+ hours

Recovery System Properties - Drogue Parachute

Manufacturer/Model	N/A			
Size or Diameter (in or ft)	N/A			
Main Altimeter Deployment Setting	N/A			
Backup Altimeter Deployment Setting	N/A			
Velocity at Deployment (ft/s)	N/A			
Terminal Velocity (ft/s)	N/A			
Recovery Harness Material, Size, and Type (examples - 1/2 in. tubular Nylon or 1 in. flat Kevlar strap)	N/A			
Recovery Harness Length (ft)	N/A			
Harness/Airframe Interfaces	N/A			
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4

Recovery System Properties - Main Parachute

Manufacturer/Model	FRuity Chutes/ Iris Ultra Compact			
Size or Diameter (in or ft)	7 ft (Booster), 7 ft (Payload)			
Main Altimeter Deployment Setting (ft)	Apogee			
Backup Altimeter Deployment Setting (ft)	Apogee + 1 second, Apogee + 2 seconds			
Velocity at Deployment (ft/s)	0			
Terminal Velocity (ft/s)	13.1 / 13.3			
Recovery Harness Material, Size, and Type (examples - 1/2 in. tubular Nylon or 1 in. flat Kevlar strap)	1/2 tubular Kevlar			
Recovery Harness Length (ft)	12 ft (Booster), 6 ft (Payload)			
Harness/Airframe Interfaces	Two quick links on each end of the recovery harness attached to U-bolts			
Kinetic Energy of Each Section (Ft-lbs)	Booster	Payload	Section 3	Section 4
	44	45		

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Payload

	Overview
Payload 1 (official payload)	UAV/Beacon Deployment
	Overview
Payload 2 (non-scored payload)	

Test Plans, Status, and Results

Ejection Charge Tests	Recovery System charge tests occurred after the launch vehicle was fully constructed, but before any flights.
Sub-scale Test Flights	Subscale flight successfully flown on January 6, 2019.
Vehicle Demonstration Flights	Full-scale flight flown on February 26, 2019. Will re-fly on March 9, 2019
Payload Demonstration Flights	Payload Demonstration Flight scheduled for March 9, 2019

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Transmitter #1

Location of transmitter:☒	Avionics bay in separate section with barrier protection		
Purpose of transmitter:☒	The purpose of the transmitter is to find the booster section of the launch vehicle		
Brand	Eggtimer	RF Output Power (mW)	100
Model	Eggfinder Mini Transmitter	Specific Frequency used by team (MHz)	915
Handshake or frequency hopping? (explain)	No		
Distance to closest e-match or altimeter (in)	3.75 in. to altimeter		
Description of shielding plan:	Two pieces of fiberglass bulkhead will be epoxied together with barrier material in between the two piece of fiberglass to ensure complete barrier protection		

Transmitter #2

Location of transmitter:☒	Payload deployment capsule		
Purpose of transmitter:☒	GPS tracking of payload section		
Brand	Adafruit	RF Output Power (mW)	100
Model	RFM95W LoRa Radio Transceiver	Specific Frequency used by team (MHz)	915
Handshake or frequency hopping? (explain)	No		
Distance to closest e-match or altimeter (in)	7 in. to e-match		
Description of shielding plan:	An intervening bulkhead will be covered with aluminum tape		

Transmitter #3

Location of transmitter:☒	UAV		
Purpose of transmitter:☒	Live Video feed from the UAV		
Brand	Lumenier	RF Output Power (mW)	200
Model	TX5G2R	Specific Frequency used by team (MHz)	5800
Handshake or frequency hopping? (explain)	No		
Distance to closest e-match or altimeter (in)	7 in. to e-match		
Description of shielding plan:	Powered off until outside of the launch vehicle		

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