

Milestone Review Flysheet 2018-2019

Institution University of South Florida

Milestone CDR

Vehicle Properties

Total Length (in)	141
Diameter (in)	6
Gross Lift Off Weight (lb)	55.2
Airframe Material(s)	Fiberglass
Fin Material and Thickness (in)	Carbon Fiber, 1/8
Coupler Length(s)/Shoulder Length(s) (in)	6 (Typ.), 5 (Nose Cone)

Motor Properties

Motor Brand/Designation	Aerotech L2200
Max/Average Thrust (lb)	697.3, 494.6
Total Impulse (lbf-s)	1147.4
Mass Before/After Burn (lb)	10.47, 4.927
Liftoff Thrust (lb)	562
Motor Retention Method	75mm Aero Pack Flanged Retainer

Stability Analysis

Center of Pressure (in. from nose)	102
Center of Gravity (in. from nose)	88.4
Static Stability Margin (on pad)	2.27
Static Stability Margin (at rail exit)	2.36
Thrust-to-Weight Ratio	8.96
Rail Size/Type and Length (in)	Type 1515, 144
Rail Exit Velocity (ft/s)	79.6

Ascent Analysis

Maximum Velocity (ft/s)	609
Maximum Mach Number	0.541
Maximum Acceleration (ft/s ²)	389
Target Apogee (ft)	5000
Predicted Apogee (From Sim.) (ft)	5220

Recovery System Properties - Overall

Total Descent Time (s)	84.1
Total Drift in 20 mph winds (ft)	2466.65

Recovery System Properties - Energetics

Ejection System Energetics (ex. Black Powder)	Black Powder	
Energetics Mass - Drogue Chute (grams)	Primary	TBD (with ejection tests)
	Backup	TBD (with ejection tests)
Energetics Mass - Main Chute (grams)	Primary	TBD (with ejection tests)
	Backup	TBD (with ejection tests)
Energetics Mass - Other (grams) - If Applicable	Primary	TBD (with ejection tests)
	Backup	TBD (with ejection tests)

Recovery System Properties - Recovery Electronics

Primary Altimeter Make/Model	MissileWorks RRC3
Secondary Altimeter Make/Model	MissileWorks RRC3
Other Altimeters (if applicable)	(2) RRC3, (1) RRC2+
Rocket Locator (Make/Model)	MissileWorks RTx
Additional Locators (if applicable)	MissileWorks RTx
Transmitting Frequencies (all - vehicle and payload)	See pages 3 & 4.
Describe Redundancy Plan (batteries, switches, etc.)	All altimeters will have fully redundant backup systems, with completely isolated batteries, switches, wiring, electronic matches, and deployment charges.
Pad Stay Time (Launch Configuration)	Up to 180 minutes, using 3.5V, 750 mAh LiPo batteries.

Recovery System Properties - Drogue Parachute

Manufacturer/Model	SkyAngle			
Size or Diameter (in or ft)	20"			
Main Altimeter Deployment Setting	Apogee			
Backup Altimeter Deployment Setting	Apogee + 1.0s			
Velocity at Deployment (ft/s)	0			
Terminal Velocity (ft/s)	136			
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)	25			
Harness/Airframe Interfaces	SS Swivels, 1/4" SS Quick Links, 5/16" SS U-Bolts, 3/16" FRP bulkheads			
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	6754.66			

Recovery System Properties - Main Parachute

Manufacturer/Model	Fruity Chutes Iris Standard			
Size or Diameter (in or ft)	96" (Upper), 84" (Lower)			
Main Altimeter Deployment Setting (ft)	750 (Upper), 725 (Lower)			
Backup Altimeter Deployment Setting (ft)	735 (Upper), 710 (Lower)			
Velocity at Deployment (ft/s)	136 (Upper & Lower)			
Terminal Velocity (ft/s)	13.25 (U), 14.84 (L)			
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)	33.5			
Harness/Airframe Interfaces	SS Swivels, 1/4" SS Quick Links, 5/16" SS U-Bolts, 3/16" FRP bulkheads			
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	65.56	73.52		

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Payload

Payload	
Payload 1 (official payload)	<p style="text-align: center; margin: 0;">Overview</p> <p>Our new payload design is a two-wheeled, horizontally-orientated rover. The rover will contain an Arduino, batteries, soil recovery module, and all guidance sensors. The projected diameter is 5.67"; the internal diameter of the rocket body. The rover will be seat-ed inside a reserved section alongside the leveling system that will prevent deployment issues. The rover will be deployed via a whicked deployment system and complete the mission objective after an initiating signal has been received.</p>
Payload 2 (non-scored payload)	<p style="text-align: center; margin: 0;">Overview</p> <p>The secondary payload installed in the launch vehicle will be a dynamic apogee adjustment subsystem. This system is a form of airbrakes and will be used to slow the rocket during ascent in order to accurately reach the desired target altitude. The airbrakes system will dynamically modify the coefficient of drag during flight, extending or retracting dynamic fins as necessary using a stepper motor.</p>

Test Plans, Status, and Results

Ejection Charge Tests	<p style="text-align: center;">Subscale ejection tests completed, yielding: 1.5g for drogue, 2g for lower section main, 3g for upper section main. Full-scale ejection tests scheduled for initial test launch on February 16, 2019.</p>
Sub-scale Test Flights	<p style="text-align: center;">Initial subscale launch succesfully completed on November 17, 2018, full analysis available in CDR Report. Two more subscale test flights scheduled for January 19, 2019.</p>
Vehicle Demonstration Flights	<p style="text-align: center;">Full scale initial test launch scheduled for February 16, 2019.</p>
Payload Demonstration Flights	<p style="text-align: center;">Full scale demonstration flight with active payload scheduled for March 16, 2019.</p>

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Transmitter #1

Location of transmitter:	Upper Section Avionics Bay		
Purpose of transmitter:	Real-time flight data and GPS location.		
Brand	Digi	RF Output Power (mW)	250
Model	XBee-PRO 900HP	Specific Frequency used by team (MHz)	902-928
Handshake or frequency hopping? (explain)	Frequency Hopping Spread Spectrum (FHSS) w/ software selectable channels		
Distance to closest e-match or altimeter (in)	2.2 (from antenna to RRC3)		
Description of shielding plan:	Significant spacing and 1/8" FRP barriers between transmitter and altimeters / e-matches, and thick nylon tubes around nearby threaded rods.		

Transmitter #2

Location of transmitter:	Lower Section Avionics Bay		
Purpose of transmitter:	Real-time flight data and GPS location.		
Brand	Digi	RF Output Power (mW)	250
Model	XBee-PRO 900HP	Specific Frequency used by team (MHz)	902-928
Handshake or frequency hopping? (explain)	Frequency Hopping Spread Spectrum (FHSS) w/ software selectable channels		
Distance to closest e-match or altimeter (in)	2.2 (from antenna to RRC3)		
Description of shielding plan:	Significant spacing and 1/8" FRP barriers between transmitter and altimeters / e-matches, and thick nylon tubes around nearby threaded rods.		

Transmitter #3

Location of transmitter:	Payload		
Purpose of transmitter:	To communicate with the payload, sending activation trigger remotely as instructed		
Brand	Digi	RF Output Power (mW)	250
Model	XBee-Pro 900HP	Specific Frequency used by team (MHz)	902-928
Handshake or frequency hopping? (explain)	Frequency Hopping Spread Spectrum (FHSS) w/ software selectable channels		
Distance to closest e-match or altimeter (in)	12		
Description of shielding plan:	Walls of the payload will be lined with carbon fiber to prevent interference		

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