Milestone Review Flysheet 2018-2019

Institution	University of South Florida

Milestone	CDR

Vehicle Properties

Total Length (in)	138
Diameter (in)	6
Gross Lift Off Weight (lb)	56.3
Airframe Material(s)	Fiberglass
Fin Material and Thickness (in)	Carbon Fiber, 1/8
Coupler Length(s)/Shoulder Length(s) (in)	6 (Coupler), 5 (Shoulder)

Motor Properties

Motor Brand/Designation	Cesaroni L2200
Max/Average Thrust (lb)	697.3 / 505.1
Total Impulse (lbf-s)	1147.4
Mass Before/After Burn (lb)	10.54 / 4.993
Liftoff Thrust (lb)	562
Motor Retention Method	75mm Aero Pack Flanged Retainer

Stability Analysis

Center of Pressure (in. from nose)	99.94
Center of Gravity (in. from nose)	85.234
Static Stability Margin (on pad)	2.41
Static Stability Margin (at rail exit)	2.49
Thrust-to-Weight Ratio	9.98
Rail Size/Type and Length (in)	Type 1515, 144
Rail Exit Velocity (ft/s)	77.8

Ascent Analysis

Maximum Velocity (ft/s)	587
Maximum Mach Number	0.526
Maximum Acceleration (ft/s^2)	378
Target Apogee (ft)	5000
Predicted Apogee (From Sim.) (ft)	4606

Recovery System Properties - Overall

Total Descent Time (s)	83
Total Drift in 20 mph winds (ft)	2132

Recovery System Properties - Energetics

Ejection System Energetics (ex. Black Powder)		Black Powder
Energetics Mass - Drogue Chute (grams)	Primary	2
	Backup	2
Energetics Mass - Main Chute (grams)	Primary	3.5
	Backup	3.5
Energetics Mass - Other (grams) - If Applicable	Primary	2
	Backup	2

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 LiPos and Energizer Industrial 9V.

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
	304.2			

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)		700 (Upper), 700 (Lower)		
Backup Altimeter Deployment Setting (ft		700 (Upper), 700 (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
	52.52	40.45		

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Payload	
Payload 1 (official payload)	Overview: Our new payload design is a two-wheeled, horizontonally-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 whiched deployment system and complete the mission objective after an initiating signal has been received.
Payload 2 (non-scored payload)	Overview: The secondary payload has been removed from the launch vehicle for this year's competition.

Test Plans, Status, and Results	
Ejection Charge Tests	Subscale ejection tests completed, yielding: 1.5g for drogue, 2g for lower section main, 3g for upper section main. Full-scale ejection tests completed on Feberuary 26, 2019 and March 2, 2019, yielding noted values above.
Sub-scale Test Flights	Initial subscale launch succesfully completed on November 17, 2018, full analysis available in CDR Report.
Vehicle Demon-stration Flights	Full scale initial test launches completed on February 26 and March 2, however in both instances the main parachute deployed early (at apogee) causing extreme drift. All other systems functioned perfectly.
Payload Demon-stration Flights	All vehicle demonstration flights contained active payload.

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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