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)	53.9
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	Cesaroni L2375
Max/Average Thrust (lb)	629, 551
Total Impulse (lbf-s)	1093
Mass Before/After Burn (lb)	9.17, 4.05
Liftoff Thrust (lb)	551
Motor Retention Method	75mm Aero Pack Flanged Retainer

Stability Analysis	
Center of Pressure (in. from nose)	102
Center of Gravity (in. from nose)	87.6
Static Stability Margin (on pad)	2.40
Static Stability Margin (at rail exit)	2.48
Thrust-to-Weight Ratio	10.22
Rail Size/Type and Length (in)	Type 1515, 144
Rail Exit Velocity (ft/s)	76.7

Ascent Analysis	
Maximum Velocity (ft/s)	608
Maximum Mach Number	0.54
Maximum Acceleration (ft/s^2)	328
Target Apogee (ft)	5000
Predicted Apogee (From Sim.) (ft)	5025

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 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 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.

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 scheduled for initial test launch on February 16, 2019.
Sub-scale Test Flights	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.
Vehicle Demonstration Flights	Full scale initial test launch scheduled for February 16, 2019.
Payload Demonstration Flights	Full scale demonstration flight with active payload scheduled for March 16, 2019.

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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