Milestone Review Flysheet

Please see Milestone Review Flysheet Instructions.

Institution	University of Louisville	Milestone	CDR

Vehicle Properties	
Total Length (in)	143
Diameter (in)	6.17
Gross Lift Off Weight (lb)	41.8
Airframe Material	Fiberglass
Fin Material	Fiberglass
Drag	Drag coefficient: 0.45

Motor Properties	
Motor Manufacturer(s)	Cesaroni
Motor Designation(s)	L935-IM
Max/Average Thrust (lb)	356.5/209.9
Total Impulse (lbf-sec)	707.4
Mass (before, after burn)	5.6, 1.8
Liftoff Thrust (lb)	148.4

Stability Analysis	
Center of Pressure (in from nose)	99.79
Center of Gravity (in from nose)	84.15
Static Stability Margin	2.54
Thrust-to-Weight Ratio	5.27
Rail Size (in)/ Length (in)	120
Rail Exit Velocity (ft/s)	65.4

Ascent Analysis		
Maximum Velocity (ft/s)	428	
Maximum Mach Number	0.38	
Maximum Acceleration (ft/s^2)	225	
Target Apogee (1st Stage if Multiple Stages)	3033	
Stable Velocity (ft/s)	50	
Distance to Stable Velocity (ft)	7.9	

Recovery System Properties Upper Airframe Parachute				
Manufacturer/Model		Vortex Ring - custom made		
Size		42.8 ft^2		
Altitude at Deployment (ft)			3000	
Velocity at Deployment (ft/s)			64.4	
Terminal Velocity (ft/s)			15.2	
Recovery Harness Material			9/16" tubular nylon	
Harness Size/Thickness (in)			9/16"	
Recovery Harness Length (ft)			30	
Harness/Airframe Interfaces		1/4 inch U-bolt and quick link		
Kinetic Energy of Each Section (ft-lbs)	Section 1 (Upper Airframe)	Section 2	Section 3	Section 4
	60			

Recovery System Properties Lower Airframe Parachute				
Manufacturer/Model		Cruciform - custom made		
Size		38.5 ft^2		
Altitude at Deployment (ft)			1500	
Velocity at Deployment (ft/s)			34.19	
Terminal Velocity (ft/s)			18.57	
Recovery Harness Material			9/16" tubular nylon	
Harness Size/Thickness (in)			9/16"	
Recovery Harness Length (ft)			25	
Harness/Airframe Interfaces		1/4 inch U-bolt and quick link		
Kinetic Energy of Each Section (ft-lbs)	Section 1 (Lower Airframe)	Section 2 (Cache Capsule)	Section 3	Section 4
	60	30		

Recovery Electronics	
Altimeter(s)/Timer(s) (Make/Model)	PerfectFlite StratoLogger (x6)
Redundancy Plan	Each avionics bay will utlize a StatoLogger for a primary altimeter and will have a StratoLogger as a back up altimeter.

Recovery Electronics	
Rocket Locators (Make/Model)	Garmin Astro DC 40 (x2) EggFinder (x1)
Transmitting Frequencies	Garmin Astro DC 40 - 151880 MHz EggFinder - 900 MHz
Black Powder Mass Upper Airframe Chute (grams)	4

Pad Stay Time (Launch Configuration)	1 hour

Black Powder Lower Airframe Chute (grams)	4

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Autonomous Ground Support Equipment (AGSE)

Capture Mechanism	Overview A threadless screw will move down the height of the ground station where two gripper arms will grab the payload. From there, they will raise to system height, the rod rotates 90 degrees and then inserts the paylaod into the vehicle.
Container Mechanism	Overview The cache will be inserted into two clips, located inside the capsule. The clips mechanically retain the capsule. The doors to the capsule are actuated via servo, further retaining the door.
Launch Rail Mechanism	Overview The rail will not be locked in place, instead, a screw mechanism will guide the tower to the proper position. A motor will monitor and provide necessary torque to keep the platform at the 5 degree of vertical postion as stated from the statement of work. The motor will monitor and provide required torque to maintain position.
Igniter Installation Mechanism	Overview The igniter will be augmented with dowel rods and aluminum tape for shielding. Four wheels will extrude the igniter wire until it is in the proper placement in the vehicle. A magnetic field sensor will detect a magnetic flag on the wire to ensure proper placement.
CG Location of Launch Pad (in inches) When Rail is Horizontal (Use Base of Rail as the Reference Point)	
Moment Analysis	Vehicle horizontal: 22 inches (relative to ground) Vehicle in launch position: 26 inches (relative to ground)

Payload

Payload 1	Overview Custom weather sensing (wind speed, wind direction, and temperature) will be placed on the ground station to get a gradient of conditions that would effect flight. This data will be transmitted via bluetooth communications to the vehicle during flight to be recovered with the cache system.
Payload 2	Overview

Test Plans, Status, and Results

Ejection Charge Tests	All ejection charges will be tested on the ground prior to flight to ensure that black powder charges are all properly sized.
Sub-scale Test Flights	A subscale vortex ring was constructed and tested. This was used to verrify the design and the coefficient of drag that can be achived for the parachute.

Full-scale Test Flights	Multiple tests are planned to validate all systems on board.

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Additional Comments

Unconventional payload deployment with use of cache capsule at 1,000 feet by use of fairing ejection system.