

Milestone Review Flysheet

Institution Vanderbilt University

Milestone PDR

Vehicle Properties

Total Length (in)	102
Diameter (in)	5.5
Gross Lift Off Weigh (lb)	37.9
Airframe Material	carbon fiber
Fin Material	carbon fiber
Drag	0.4

Motor Properties

Motor Manufacturer	Cesaroni
Motor Designation	L1720
Max/Average Thrust (lb)	438/387.4
Total Impulse (lbf-s)	832.5
Mass Before/After Burn	7.38/3.5
Liftoff Thrust (lb)	438

Stability Analysis

Center of Pressure (in from nose)	75.2
Center of Gravity (in from nose)	64.6
Static Stability Margin	1.91
Static Stability Margin (off launch rail)	2.3
Thrust-to-Weight Ratio	12
Rail Size and Length (in)	144
Rail Exit Velocity	85

Ascent Analysis

Maximum Velocity (ft/s)	650	
Maximum Mach Number	0.58	
Maximum Acceleration (ft/s^2)	375	
Target Apogee (From Simulations)	5300	
Stable Velocity (ft/s)	45	
Distance to Stable Velocity (ft)	4	

Recovery System Properties

Dogue Parachute

Manufacturer/Model	Fruity Chutes			
Size	30"			
Altitude at Deployment (ft)	apogee			
Velocity at Deployment (ft/s)	65			
Terminal Velocity (ft/s)	69			
Recovery Harness Material	Kevlar			
Harness Size/Thickness (in)	0.5 (6000 lb)			
Recovery Harness Length (ft)	25(11/16 W; 3000lb)			
Harness/Airframe Interfaces	U-bolt and Quicklink			
Kinetic Enerfy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	1776	739		

Recovery System Properties

Main Parachute

Manufacturer/Model	fruity Chutes			
Size	12 ft			
Altitude at Deployment (ft)	700			
Velocity at Deployment (ft/s)	69			
Terminal Velocity (ft/s)	13.4			
Recovery Harness Material	Kevlar			
Harness Size/Thickness (in)	0.5 (6000 lb)			
Recovery Harness Length (ft)	36			
Harness/Airframe Interfaces	U-Bolt and Quick Link			
Kinetic Enerfy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	16.73	11.2	66.9	

Recovery Electronics

Altimeter(s)/Timer(s) (Make/Model)	Startologger
Redundancy Plan	Two altimeters will be used for both main and drogue deployments
Pad Stay Time (Launch Configuration)	>>2 hrs

Recovery Electronics

Rocket Locators (Make/Model)	16mW Big Red Bee
Transmitting Frequencies	433.91 Mhz
Black Powder Mass Drogue Chute (grams)	1.1
Black Powder Mass Main Chute (grams)	3.5

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Autonomous Ground Support Equipment (MAV Teams Only)

Capture Mechanism	Overview
	N/A
Container Mechanism	Overview
	N/A
Launch Rail Mechanism	Overview
	N/A
Igniter Installation Mechanism	Overview
	N/A

Payload

Payload 1	Overview
	The payload section of the rocket will house a fuel tank and fuel pressurization system. An on-board camera will be used to visualize the liquid sloshing during the subscale rocket flights. This tank is made of a clear material. This will allow us to verify a suitable design for slosh reduction. For the full scale flight and competition flight, a real fuel tank will be used, and fuel will be delivered to a monopropellant thruster. The thruster will serve as validation that fuel was successfully extracted.
Payload 2	Overview
	The structural analysis systems of the payload have the goal of determining the forces encountered by the rocket in flight and confirming the accuracy of the finite element analysis model as a structural health predictor. The subscale rocket launch will be used to test the structural health monitoring systems in preparation for the full-scale launch.

Test Plans, Status, and Results

Ejection Charge Tests	Ground based ejection charge testing will be performed prior to all test launches. This testing involves assembling the whole rocket included live charges, shear pins, and properly packed parachutes. The charges are then detonated to ensure proper parachute deployment and rocket separation. Deployment tests before our first flight were successful, and the same procedures will be carried out before future launches.
Sub-scale Test Flights	One subscale flight is scheduled for November 14, 2015
Full-scale Test Flights	One full scale flight will be completed prior to competition. This flight is expected to take place in February 2016.

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Additional Comments