

Milestone Review Flysheet

Institution The University of Alabama

Milestone Preliminary Design Review

Vehicle Properties

Total Length (in)	93
Diameter (in)	5.5
Gross Lift Off Weigh (lb)	26.87
Airframe Material	Fiberglass
Fin Material	Fiberglass
Drag	0.467

Motor Properties

Motor Manufacturer	Cesaroni Technology Inc.
Motor Designation	L805
Max/Average Thrust (lb)	367.3
Total Impulse (lbf-s)	6296
Mass Before/After Burn	12.072/10.678
Liftoff Thrust (lb)	244.1

Stability Analysis

Center of Pressure (in from nose)	64.98
Center of Gravity (in from nose)	54.37
Static Stability Margin	1.93 calibers
Static Stability Margin (off launch rail)	0.47
Thrust-to-Weight Ratio	13.77
Rail Size and Length (in)	118
Rail Exit Velocity	71.5

Ascent Analysis

Maximum Velocity (ft/s)	642
Maximum Mach Number	0.58
Maximum Acceleration (ft/s ²)	385
Target Apogee (From Simulations)	5290
Stable Velocity (ft/s)	62.62
Distance to Stable Velocity (ft)	7.94

Recovery System Properties

Dogue Parachute

Manufacturer/Model	Giant Leap Rocketry/TAC-1 (pre-owned)			
Size	54			
Altitude at Deployment (ft)	5280			
Velocity at Deployment (ft/s)	2.313			
Terminal Velocity (ft/s)	24.5			
Recovery Harness Material	Kevlar			
Harness Size/Thickness (in)	0.5			
Recovery Harness Length (ft)	4.17			
Harness/Airframe Interfaces	Parachute harness will be secured to an eye bolt on the electronics bay bulk plate			
Kinetic Energy of Each Section (Ft-lbs)	Nose Cone	Forward	Aft	
	20.64	107.5	6.9	

Recovery System Properties

Main Parachute

Manufacturer/Model	Giant Leap Rocketry/TAC-1 (pre-owned)			
Size	110			
Altitude at Deployment (ft)	900			
Velocity at Deployment (ft/s)	24.44			
Terminal Velocity (ft/s)	12.14			
Recovery Harness Material	Kevlar			
Harness Size/Thickness (in)	0.625			
Recovery Harness Length (ft)	5.58			
Harness/Airframe Interfaces	Parachute harness will be secured to eye bolts on the electronics bay bulk plate and the aft section bulk plate.			
Kinetic Energy of Each Section (Ft-lbs)	Nose Cone	Forward	Aft	
	20.64	26.5	1.68	

Recovery Electronics

Altimeter(s)/Timer(s) (Make/Model)	PerfectFlite Stratologger
Redundancy Plan	Team will use two Stratologgers to ensure ignition of black powder charges
Pad Stay Time (Launch Configuration)	1 hour and 30 minutes

Recovery Electronics

Rocket Locators (Make/Model)	Adafruit Ultimate GPS
Transmitting Frequencies	900 Hz
Black Powder Mass Drogue Chute (grams)	4
Black Powder Mass Main Chute (grams)	4

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Autonomous Ground Support Equipment (MAV Teams Only)

Capture Mechanism	Overview
Container Mechanism	Overview
Launch Rail Mechanism	Overview
	Include Description of rail locking mechanism
Igniter Installation Mechanism	Overview

Payload

Payload 1	Overview
	Payload 1 will be a landing hazards detection system. This system will use a camera to take images of the ground during descent and analyze these images to detect hazards.
Payload 2	Overview
	Payload 2 will be a guided descent system. This system will use the data from the landing hazards detection system and the Raspberry Pi to control servo motors, which will in turn control the payload's parafoil.

Test Plans, Status, and Results

Ejection Charge Tests	The team plans to use ground testing of the black powder charges to ensure the charge will produce the correct pressure to eject the parachutes. The test will be a static ignition of full scale charges at the Pheonix Missile Works launch area.
Sub-scale Test Flights	The team plans to build a sub-scale launch vehicle with a scaled payload, weight, and motor. The sub-scale will model the flight of the full scale as closely as possible. The team currently plans to launch the sub-scale rocket on November 22.
Full-scale Test Flights	The team will test all sub-systems and components of the full scale rocket, and at least one full scale mission will be flown. Full scale flights will provide the team with data on altitude, stability, and performance of the recovery system of the rocket.

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Additional Comments

Stability Velocity, Distance to stable velocity, and Static stability margin (off launch rail) were all calculated at a wind speed of 20 mph.