

Milestone Review Flysheet 2017-2018

Institution Lenoir-Rhyne University

Milestone FRR

Vehicle Properties	
Total Length (in)	78"
Diameter (in)	4" to 6"
Gross Lift Off Weigh (lb.)	22.7
Airframe Material(s)	Kraft Phenolic
Fin Material and Thickness (in)	Maple Plywood, 1/4"
Coupler Length/Shoulder Length(s) (in)	3 " 1/4"

Motor Properties	
Motor Brand/Designation	K660-17
Max/Average Thrust (lb.)	242/148
Total Impulse (lbf-s)	536
Mass Before/After Burn (lb.)	4.3/1.70
Liftoff Thrust (lb.)	243
Motor Retention Method	Aero Pack retainer 54 mm

Stability Analysis	
Center of Pressure (in from nose)	54.4"
Center of Gravity (in from nose)	36.9"
Static Stability Margin (on pad)	2.92
Static Stability Margin (at rail exit)	3.92
Thrust-to-Weight Ratio	10.7
Rail Size/Type and Length (in)	15/15 , 8'
Rail Exit Velocity (ft/s)	69.8

Ascent Analysis	
Maximum Velocity (ft/s)	637
Maximum Mach Number	0.57
Maximum Acceleration (ft/s^2)	312
Predicted Apogee (From Sim.) (ft)	5,354

Recovery System Properties				
Drogue Parachute				
Manufacturer/Model	top Flight			
Size/Diameter (in or ft)	18"			
Altitude at Deployment (ft)	5,354			
Velocity at Deployment (ft/s)	30.9			
Terminal Velocity (ft/s)	67			
Recovery Harness Material	Tubular Nylon			
Recovery Harness Size/Thickness (in)	9 /16"			
Recovery Harness Length (ft)	30			
Harness/Airframe Interfaces	U-Bolts and Quick Links			
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	1330	N/A	N/A	N/A

Recovery System Properties				
Main Parachute				
Manufacturer/Model	Military Surplus			
Size/Diameter (in or ft)	60"			
Altitude at Deployment (ft)	700			
Velocity at Deployment (ft/s)	67			
Terminal Velocity (ft/s)	20			
Recovery Harness Material	Tubular Nylon			
Recovery Harness Size/Thickness (in)	9/16"			
Recovery Harness Length (ft)	15			
Harness/Airframe Interfaces	U-Bolts and Quick Links			
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	73	70.7 (payload section)	N/A	N/A

Recovery Electronics	
Altimeter(s)/Timer(s) (Make/Model)	Perfectflite StartologgerCF and Marsa 54
Redundancy Plan and Backup Deployment Settings	Motor ejections. Altimeter both at apogee. StratologgerCF at 700ft. Marsa 54 at 500ft

Recovery Electronics		
Rocket Locators (Make/Model)	Big Red Bee/ Beeline Transmitter	
Transmitting Frequencies (all - vehicle and payload)	Transition Tracker - 425 MHz Nose cone tracker - 445 MHz	
	4F Black Powder	
Energetics Mass - Drogue Chute (grams)	Primary	1.5
	Backup	1.5
	Primary	Main 2.25

Pad Stay Time (Launch Configuration)	An hour	Energetics Masses - Other (grams) - If Applicable	Backup	Main 2.25
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Payload	
Payload 1 (official payload)	Overview
	Have successfully ground tested spring mechanism. Successfully flight tested electronics for spring separation. Successfully communicated from base to spring ejection electronics and triggered burn wire circuit. Rover moves autonomously. Rover is triggered to turn on autonomously. Bench tested spring separation system with electronics.
Payload 2 (non-scored payload)	Overview

Test Plans, Status, and Results	
Ejection Charge Tests	Performed ground testing for main parachute bay three times. Final decision, that was tested for verification, was 2.25 grams of black powder with 4 shear pins for main parachute bay. Performed ground test for fin can section twice with 1.5 grams and two shear pins being our final decision, which was successfully tested
Sub-scale Test Flights	
Full-scale Test	We flew three full scale test flights. The first flight was with a Loki Research K690 motor. Altitude reached was 2856 feet with successfully apogee deployment

Flights or the drogue parachute. Upon main parachute deployment, the forward bulkhead for the payload section tailed and the payload section came down in pieces. But altimeters worked as expected. The second full scale flight was with a Loki J1000 motor due to higher winds to hopefully prevent the rocket from landing in a tree. At apogee, 2156 feet, the main parachute deployed. Main payload bay charges worked as expected but the rocket was now drifting off the field eventually landing in a tree; with the payload section landing in another tree. We fished out the payload section from the tree but needed a bucket truck to get the rocket three days later. Minimal damage was observed with none functional. The third test flight was with a Loki J820 motor during a winding day. During this flight, the motor chuffed multiple times, along with the launch angle, prevented the rocket from reaching predicted apogee. The apogee for this flight was 1090 feet. Drogue parachute deployed as expected and main as well. All systems nominal. SUCCESS!

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Additional Comments

N/A