

Milestone Review Flysheet 2017-2018

Institution Rensselaer Polytechnic Institute

Milestone CDR

Vehicle Properties		Motor Properties	
Total Length (in)	86.75	Motor Brand/Designation	Aerotech K828
Diameter (in)	4	Max/Average Thrust (lb.)	293/199
Gross Lift Off Weigh (lb.)	19.6	Total Impulse (lbf-s)	485
Airframe Material(s)	Phenolic	Mass Before/After Burn (lb.)	4.9/1.9
Fin Material and Thickness (in)	1/8" G10 Fiberglass	Liftoff Thrust (lb.)	250
Coupler Length/Shoulder Length(s) (in)	Tracker bay: 8" coupler w/ 4" shoulder; Electronics/Payload Bay: 12" coupler w/ two 4" shoulders	Motor Retention Method	8-32 screws, washers, and tee nuts through aft centering ring

Stability Analysis		Ascent Analysis	
Center of Pressure (in from nose)	67.26	Maximum Velocity (ft/s)	718
Center of Gravity (in from nose)	54.004	Maximum Mach Number	0.64
Static Stability Margin (on pad)	3.29	Maximum Acceleration (ft/s ²)	445
Static Stability Margin (at rail exit)	2.367	Predicted Apogee (From Sim.) (ft)	5299
Thrust-to-Weight Ratio	10.15:1		
Rail Size/Type and Length (in)	1" rail 96" long		
Rail Exit Velocity (ft/s)	78.6		

Recovery System Properties		Recovery System Properties	
Droge Parachute		Main Parachute	
Manufacturer/Model	Rocketman Ballistic Mach II	Manufacturer/Model	LOC SkyAngle Classic II
Size/Diameter (in or ft)	24"	Size/Diameter (in or ft)	60"
Altitude at Deployment (ft)	5280	Altitude at Deployment (ft)	500'
Velocity at Deployment (ft/s)	0	Velocity at Deployment (ft/s)	64
Terminal Velocity (ft/s)	64	Terminal Velocity (ft/s)	20.09
Recovery Harness Material	Tubular Nylon	Recovery Harness Material	Tubular Nylon
Recovery Harness Size/Thickness (in)	9/16"	Recovery Harness Size/Thickness (in)	9/16"
Recovery Harness Length (ft)	25'	Recovery Harness Length (ft)	25'
Harness/Airframe Interfaces	.25" aircraft birch bulkheads w/ 1/4"-20 forged steel eyebolts (500lb test)	Harness/Airframe Interfaces	.25" aircraft birch bulkheads w/ 1/4"-20 forged steel eyebolts (500lb test)
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3
	272	426	267
Kinetic Energy of Each Section (Ft-lbs)	Section 4	Section 1	Section 2
	267	26.86	42.02
		Section 3	Section 4
		26.39	

Recovery Electronics		Recovery Electronics	
Altimeter(s)/Timer(s) (Make/Model)	Perfectflite Stratologger SL100 and Featherweight Raven3	Rocket Locators (Make/Model)	Xbee Series 1 900MHz radio
Redundancy Plan and Backup Deployment Settings	Stratologger is the primary, with droge at apogee and main at 500'. Raven 3 has drogue at apogee +1 second, main at 450'.	Transmitting Frequencies (all - vehicle and payload)	900 MHz
Pad Stay Time (Launch)		Ejection System Energetics (ex. Black Powder)	4f Black Powder
		Energetics Mass - Droge Chute (grams)	Primary: 1 Backup: 1.5
		Energetics Mass - Main Chute (grams)	Primary: 2 Backup: 2.5
		Energetics Masses - Other	Primary

Configuration)

>1 hour

(grams) - If Applicable

Backup

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Payload

Payload	
Payload 1 (official payload)	Overview
	<p>The proposed payload design complies with NASA's requirements outlined in the 2018 NSL Handbook section 4.4 in that it will include an on board camera system designed to identify and differentiate between 3 different colored tarps. Two Pi Cam v2 camera modules will be used to capture the images, which will be analyzed in real time by a custom designed software package run on two Raspberry Pi 3 Model B's. A photograph with the colored tarps outlined will qualify as a successful experiment.</p>
Payload 2 (non- scored payload)	Overview
	N/A

Test Plans, Status, and Results

Ejection Charge Tests	<p>Ejection charge tests were completed prior to the flight of the subscale rocket in December, confirming the technique to be used for charge quantity derivation, as the amounts used were sufficient to separate the two sections. Further ejection charge testing is planned once construction of the full scale launch vehicle is completed, to confirm the charge quantities listed above.</p>
Sub-scale Test Flights	<p>The subscale rocket was flown on Saturday, December 16th, 2017 at the NOVAAR launch in The Plains, VA. The subscale flight was conducted on the Aerotech I357 motor, and achieved an apogee of 1969,' well in line with the simulations. The dual deploy system (which employed the same Stratologger SL100 altimeter to be used in the full scale rocket) successfully deployed the drogue parachute at apogee and the main at 700' (this higher altitude main deployment was selected due to the higher drogue descent rate of our subscale rocket), however, the main parachute became entangled with its parachute protector. Adjustments have been made to the arrangement of the parachute protector configuration and the parachute packing procedure to address this anomaly.</p>
Full-scale Test Flights	<p>The first full-scale test flight is planned for mid-February in upstate NY. This test will feature the completed full-scale launch vehicle, a working payload, and the tested working ejection charge quantities determined from our ejection charge testing. Further test flights will then be conducted to both address any anomalies from this first flight and further refine the launch vehicle to reach the target 5280' apogee.</p>

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Additional Comments