

Milestone Review Flysheet 2017-2018

Institution Wichita State University

Milestone PDR

Vehicle Properties	
Total Length (in)	92
Diameter (in)	5.5
Gross Lift Off Weigh (lb.)	22
Airframe Material(s)	Blue Tube Body, Fiberglass Nose
Fin Material and Thickness (in)	Aluminum, 0.2
Coupler Length/Shoulder Length(s) (in)	11.0 / 5.5

Motor Properties	
Motor Brand/Designation	AeroTech K560W
Max/Average Thrust (lb.)	169.4 / 125.9
Total Impulse (lbf-s)	543.4
Mass Before/After Burn (lb.)	6.05 / 2.91
Liftoff Thrust (lb.)	128
Motor Retention Method	Bulkhead Bolted Motor Foreclosure

Stability Analysis	
Center of Pressure (in from nose)	62.0
Center of Gravity (in from nose)	75.2
Static Stability Margin (on pad)	2.28
Static Stability Margin (at rail exit)	2.38
Thrust-to-Weight Ratio	5.7
Rail Size/Type and Length (in)	1.5/1515, 144
Rail Exit Velocity (ft/s)	56.4

Ascent Analysis	
Maximum Velocity (ft/s)	621
Maximum Mach Number	0.56
Maximum Acceleration (ft/s ²)	231.2
Predicted Apogee (From Sim.) (ft)	5,338

Recovery System Properties				
Drogue Parachute				
Manufacturer/Model	Dino Chutes / X-Form			
Size/Diameter (in or ft)	36 in			
Altitude at Deployment (ft)	5,260			
Velocity at Deployment (ft/s)	32.1			
Terminal Velocity (ft/s)	61.8			
Recovery Harness Material	Kevlar			
Recovery Harness Size/Thickness (in)	750 lb / 0.125			
Recovery Harness Length (ft)	30			
Harness/Airframe Interfaces	500# Ball Bearing Swivel, 3/8" Quick Link 3/8" Eye Bolt, 3/8" Quick Link			
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	344	722.5	N/A	N/A

Recovery System Properties				
Main Parachute				
Manufacturer/Model	Fruity Chutes / Iris Ultra			
Size/Diameter (in or ft)	60 in			
Altitude at Deployment (ft)	600			
Velocity at Deployment (ft/s)	61.8			
Terminal Velocity (ft/s)	14.9			
Recovery Harness Material	Kevlar			
Recovery Harness Size/Thickness (in)	750 lb / 0.125			
Recovery Harness Length (ft)	30			
Harness/Airframe Interfaces	500# Ball Bearing Swivel, 3/8" Quick Link 3/8" Eye Bolt, 3/8" Quick Link			
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	20	42	N/A	N/A

Recovery Electronics	
Altimeter(s)/Timer(s) (Make/Model)	PerfectFlite / StratologgerCF x2 Jolly Logic / Chute Release x2
Redundancy Plan and Backup Deployment Settings	Fault-tolerant ejection (can still deploy on just one of the two nominal pyro charges). Identical backup flight altimeter connected to both charges for Apogee +1.5 seconds. Identical chute releases connected "in-series" for 600 ft and 500 ft.
Pad Stay Time (Launch Configuration)	7 hrs

Recovery Electronics		
Rocket Locators (Make/Model)	Xbee RF TX + GPS Module (Spy Tec / STI GL300 for redundancy)	
Transmitting Frequencies (all - vehicle and payload)	***Required by CDR***	
Ejection System Energetics		
Energetics Mass - Drogue Chute (grams)	Primary	1.33
	Backup	1.33
Energetics Mass - Main Chute (grams)	Primary	N/A
	Backup	N/A
Energetics Masses - Other (grams) - If Applicable	Primary	N/A
	Backup	N/A

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Payload

Payload	
Payload 1 (official payload)	Overview
	<p>The team has elected to conduct the Autonomous Rover payload experiment.</p> <p>The rover will deploy after the vehicle has landed from the fore section of the rocket using a spur gear and rack system, the vehicle will autonomously use a folding top door which also carries solar panels on the inside to reorient itself and utilize its gear wheels to move across the rough terrain until its final destination and deploy the folding top door fully to reveal the solar panels on both the vehicle and the top door.</p>
Payload 2 (non-scored payload)	Overview
	N/A

Test Plans, Status, and Results

Ejection Charge Tests	<p>The team will conduct the following ground based ejection charge tests</p> <p>Ignition & Equivalency Testing (Complete) Tests: Pyrodex charge, E-matches (Successful)</p> <p>Sub-Scale Ejection & Release Testing (Nov. 24 - Nov. 28) Tests: Actual sub-scale vehicle, Pyrodex charge, 1xStratologgerCF AND Drogue Chute Deployment, 1xChute Release</p> <p>Recovery Prototype Ejection & Release Testing (Dec. 13 - Dec. 22) Tests: Pyrodex charges, 2xStratologgerCF, Arming Mechanism & Circuitry, Ejection Redundancy, Drogue & Main Ejection AND Main Chute Deployment, 2xChute Release, Release Redundancy System</p> <p>Full-Scale Ejection Testing (Jan. 25 - Feb. 7) Tests: Actual full-scale vehicle, Pyrodex charges, 2xStratologgerCF, Arming Mechanism & Circuitry, Ejection Redundancy, Drogue & Main Ejection, Shearing and Separation AND Main Chute Deployment, 2xChute Release, Release Redundancy</p>
Sub-scale Test Flights	<p>The team will conduct a minimum of two (2) sub-scale flight tests (Dec. 1 - Dec. 12). The current sub-scale vehicle will be a 1:3.4 scale of the full-scale vehicle and use a vented F15-0 motor in order to facilitate testing by members who do not have a NAR/TRA certification. The sub-scale tests will test the two flight StratologgerCF altimeters (on separate flights) for deployment, apogee reporting and data acquisition, the full-scale vehicle drogue (as a main), and the two flight chute releases (on separate flights) as well as validate ejection and shear pin sizing calculation methods, apogee prediction models, and coefficient of drag estimates.</p>
Full-scale Test Flights	<p>The team will conduct a minimum of two (2) full-scale flight tests (Feb. 2 - Mar. 4). The test flights will be used to validate all mission ascent and descent performance predictions including apogee predictions and drift distance for the specific launch day wind conditions. The full-scale tests will utilize the final recovery system configuration to validate performance as designed. The final full-scale test flight will be used as the <i>demonstration flight</i> after which the vehicle properties will be frozen until competition launch day. At least one flight will carry the actual rover payload for payload launch, recovery and deployment testing.</p>

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Additional Comments