Milestone Review Flysheet 2017-2018

Institution	The University of Toledo

Milestone	CDR

Vehicle Properties

Total Length (in)	86.97
Diameter (in)	5
Gross Lift Off Weigh (lb.)	25.1
Airframe Material(s)	Fiberglass
Fin Material and Thickness (in)	Fiberglass, 0.187
Coupler Length/Shoulder Length(s) (in)	4

Motor Properties

Motor Brand/Designation	AeroTech / K1000T-P
Max/Average Thrust (lb.)	256.28 / 227.51
Total Impulse (lbf-s)	561.34
Mass Before/After Burn (lb.)	5.675 / 3.069
Liftoff Thrust (lb.)	256.28
Motor Retention Method	Aeropack Retainer

Stability Analysis

Center of Pressure (in from nose)	65.91 in.
Center of Gravity (in from nose)	55.12 in.
Static Stability Margin (on pad)	2.15
Static Stability Margin (at rail exit)	2.775
Thrust-to-Weight Ratio	9:01
Rail Size/Type and Length (in)	1515 / 96
Rail Exit Velocity (ft/s)	70.7

Ascent Analysis

Maximum Velocity (ft/s)	645
Maximum Mach Number	0.575
Maximum Acceleration (ft/s^2)	304
Predicted Apogee (From Sim.) (ft)	5223

Recovery System Properties
Drogue Parachute

Manufacturer/Model	SkyAngle
Size/Diameter (in or ft)	32 in
Altitude at Deployment (ft)	5223
Velocity at Deployment (ft/s)	1.98
Terminal Velocity (ft/s)	55.94
Recovery Harness Material	Tubular Nylon
Recovery Harness Size/Thickness (in)	0.5
Recovery Harness Length (ft)	25
Harness/Airframe Interfaces	1/4-20 Forged Eyebolts and Quick Links

Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	679.89	413.81	N/A	N/A

Recovery System Properties
Main Parachute

Manufacturer/Model	SkyAngle
Size/Diameter (in or ft)	80 in.
Altitude at Deployment (ft)	700
Velocity at Deployment (ft/s)	55.94
Terminal Velocity (ft/s)	19.4
Recovery Harness Material	Tubular Nylon
Recovery Harness Size/Thickness (in)	0.5
Recovery Harness Length (ft)	25
Harness/Airframe Interfaces	1/4-20 Forged Eyebolts and Quick Links

Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	70.18	11.59	49.77	N/A

Recovery Electronics

Altimeter(s)/Timer(s) (Make/Model)	Stratologger CF
Redundancy Plan and Backup Deployment Settings	Second, Independent Strattologger CF. Backup drogue ejection charge with 1 sec delay, backup main ejection charge with 50 ft delay.
Pad Stay Time (Launch Configuration)	1+ Hours

Recovery Electronics

Rocket Locators (Make/Model)	AltusMetrum TeleGPS	
Transmitting Frequencies (all - vehicle and payload)	433MHz	
Ejection System Energetics (ex. Black Powder)		Black Powder
Energetics Mass - Drogue Chute (grams)	Primary	2g
	Backup	3g
Energetics Mass - Main Chute (grams)	Primary	2g
	Backup	3g
Energetics Masses - Other (grams) - If Applicable	Primary	
	Backup	

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Payload	
	Overview
Payload 1 (official payload)	The payload chosen is the Deployable Rover. The rover will be integrated into the rocket in the Payload Bay where it will be hosed during flight. The rover itself will be comprised of a body, gear wheels, servos, and on-board electronics which will control the rover. The rocer will be deployed via two systems. The first system is a CO2 ejection system which will eject the Payload Bay from the rest of the body. The second system is a set of gear wheels which will run along a track to move the vehicle out. Once out of the rocket, the vehicle will travel 5-feet and then deploy a solar panel. Once the rover is activated, data about the rover's position and solar panel output will be remotely sent to the team. Mission success will constitute fully traveling the required 5-feet and receiving solar panel output data.
	Overview
Payload 2 (non-scored payload)	N/A

Test Plans, Status, and Results	
Ejection Charge Tests	Test Plan: Ground testing will occur with the three systems integrated into the vehicle: Drogue Chute Ejection, Main Chute Ejection, and Payload Bay Ejection. These three tests will be conducted on the ground in order to verify the appropriate black powder charge has been calculated and that the CO2 canister system will be able to eject from the Payload Bay. The test setup will involve setting up the required interfaces in the same manner as in the vehicle. The items will be placed on a test stand in order to ensure that the ground will not interfere (Excluding the payload bay ejection test) and video will be taken in order to ensure that proper documentation is taken. Status: Incomplete; Testing will be performed once the materials used in the full scale model have arrived from the supplier. Results: Unknown; Testing incomplete
Sub-scale Test Flights	Test Plan: A Sub-Scale Model of the rocket will be constructed in order to simulate the full scale design. This sub-scale design will keep key components such as fin size, body diameter, body length, and motor performance in scale while other components, such as the parachute sizes, out of scale. The sub-scale rocket will be designed to be flown on a NAR Level 1 Motor in order to simulate High Powered Rocketry. The rocket will fly on an H195 Motor and will have a single deployment recovery system. Flight Data such as altitude, velocity, and acceleration will be recorded in order to compare to with full-scale simulation data. Status: Complete; The sub-scale launch has been sucessfully completed. Results: A successful flight have been recorded and documented, showing the Altitude reached, Max Velocity achieved, and Max Acceleration achieved. No damage was incurred upon recovery deployment or landing. The flight, visually, proved to be a straight, textbook-like flight that will allow the team to compare results with the full scale simulations and draw conclusions about the predicted flight.
Full-scale Test Flights	Test Plans: A Full Scale test vehicle will be constructed that will match what is intended to fly during the competition. This vehicle will fly with all sub systems setup in the same manner as to what will be flown in the competition. This will allow for the team to have an accurate representation of the flight that will be performed and any sub system flaws can be worked out. All onboard electronics will be engaged and recording data such as altitude, velocity and acceleration. The GPS system will be engaged and transmitting information as well. The team will also carry out a preliminary test of the payload deployment and operating procedure to ensure that all systems are working as expected. This vehicle will be flown before the FRR on a tentative launch date of February 17, 2018. Status: Incomplete; Testing will be performed once the full scale model has been completed Results: Unknown; Testing Incomplete

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Additional Comments

No Additional Comments