Milestone Review Flysheet 2017-2018

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Vehicle Properties

Total Length (in)	83
Diameter (in)	5.25
Gross Lift Off Weigh (lb.)	45.8
Airframe Material(s)	Fiberglass, Carbon Fiber
Fin Material and Thickness (in)	0.125 Fiberglass
Coupler Length/Shoulder Length(s) (in)	10, 16

Motor Properties

Motor Brand/Designation	Cesaroni L1350
Max/Average Thrust (lb.)	303.4/376.0
Total Impulse (lbf-s)	958.4
Mass Before/After Burn (lb.)	7.87/3.67
Liftoff Thrust (lb.)	328.2
Motor Retention Method	Hardware fastened to body tube

Stability Analysis

Center of Pressure (in from nose)	60.436
Center of Gravity (in from nose)	48.677
Static Stability Margin (on pad)	2.2
Static Stability Margin (at rail exit)	2.24
Thrust-to-Weight Ratio	7.16
Rail Size/Type and Length (in)	144
Rail Exit Velocity (ft/s)	70.2

Ascent Analysis

Maximum Velocity (ft/s)	587.2
Maximum Mach Number	0.52
Maximum Acceleration (ft/s^2)	218.2
Predicted Apogee (From Sim.) (ft)	5,298

Recovery System Properties

Drogue Parachute

Manufacturer/Model	Elliptical Handmade
Size/Diameter (in or ft)	15
Altitude at Deployment (ft)	5298 (Apogee)
Velocity at Deployment (ft/s)	0
Terminal Velocity (ft/s)	150
Recovery Harness Material	Tubular Webbed Nylon
Recovery Harness Size/Thickness (in)	3/4
Recovery Harness Length (ft)	10.94
Harness/Airframe Interfaces	Quick link of shock cord to U-bolt through carabiner.

Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	9393.75	5276.25	n/a	n/a

Recovery System Properties

Main Parachute

Manufacturer/Model	Toroidal Handmade
Size/Diameter (in or ft)	142 in.
Altitude at Deployment (ft)	725
Velocity at Deployment (ft/s)	150
Terminal Velocity (ft/s)	13.4
Recovery Harness Material	Tubular Webbed Nylon
Recovery Harness Size/Thickness (in)	3/4
Recovery Harness Length (ft)	24
Harness/Airframe Interfaces	Quick link of shock cord to U-bolt through carabiner.

Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	74.99	42.07	n/a	n/a

Recovery Electronics

Altimeter(s)/Timer(s) (Make/Model)	Missile Works RRC3+
Redundancy Plan and Backup Deployment Settings	Dual Altimeters with individual 9 Volt batteries
Pad Stay Time (Launch Configuration)	(2 hours) Both altimeters and the GPS must be turned on before launch

Recovery Electronics

Rocket Locators (Make/Model)	Missile Works RTx GPS	
Transmitting Frequencies (all - vehicle and payload)	902-928 MHz (alternative option is big red bee at ~400 MHz which will have less interference than a higher frequency but requires a ham radio license)	
Ejection System Energetics (ex. Black Powder)		Black Powder
Energetics Mass - Drogue Chute (grams)	Primary	3.5
	Backup	3.5
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

	Overview
Payload 1 (official payload)	Deployable Two-Wheeled self-balancing autonomous rover. To be pushed from Payload Bay using a spring loaded system once rocket nosecone is ejected via black powder charge. This rover will recognize it's location relative to rocket electronics bay and plot an "away course" to travel a minimum of 10ft. Will use IR and Ultrasonic sensors for obstacle avoidance while traversing terrain. Will deploy solar panels via spring loaded panel once predetermined distance is reached.
Payload 2 (non-scored payload)	

Test Plans, Status, and Results

Ejection Charge Tests	Ejection charge tests will be conducted upon the completion and/or modification of any or all of the following rocket systems: the rocket airframe and the parachute. Additionally, tests will be conducted prior to all subscale and full scale test launches, as well as all competion launches. The initial ejection tests will used to help identify the ideal amount of black powder to use to successfully have a recovery separation with full clearance. All other tests will be to ensure that the system works in its entirety before the rocket has been loaded onto its lauch rail. Each test will be led by the members of the recovery subsystem with assistance from the recovery leads, a member from the electronics subsystem, a member from the aerostructure subsytem, and the safety office.
Sub-scale Test Flights	The Sub-scale flight will be on December 16th, with a backup flight day on December 17th, and 23rd. This allows for time to anaylze the results, and confirm the design will function as intended. In addition, this flight will allow us to compare model and simulation results with real life results, as we will record the launch conditions, as well as atmospheric conditions at time of launch. This launch will take place at the team mentor, Jerry Appenzeller's field (Amhers, OH) with as many team members as can safely attend. This launch will ideally be done with a student-wound nosecone and body tube, however timeline constraints may require that the team use bought body tube and nose cone. In addition, the subscale rocket will allow for avionics to confirm distances and signal strength for compatibility with material choices. Any variation between the subscale and fullscale material or design choices will be recorded and analyzed.
Full-scale Test Flights	The full-scale test flight will be mid-February (tentatively February 16th with backups of 17th, or 18th) depending upon lead times for components. This flight will take place at our mentors property in Amherst, Ohio with a lower impulse motor that was chosen for competition. Effort will be made to chose a motor that matches thrust conditions with the competition motor. All team members that are available and able to safely attend will be there for this launch. In addition, it will be recorded from multiple angles, to allow for analysis post flight. Full-scale flight will show the stability of the full-scale design, as well as allow for simulation and models to be compared against real life manufactured objects and results. In addition, the full-scale will be launched early enough that redesign and another launch could be completed if nessecary for additional data. The vehicle has been designed for robustness, to allow for this level of testing. Futhermore, the full-scale will allow for payload durability testing and for the functionality of airbrakes and the completion of the programming required for the most accurate competition apogee possible.

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Additional Comments