Milestone Review Flysheet 2017-2018

Institution	University of Akron

Milestone	CDR

Vehicle Properties	
Total Length (in)	97.75
Diameter (in)	5.25
Gross Lift Off Weigh (lb.)	38.6
Airframe Material(s)	Fiberglass, Carbon Fiber
Fin Material and Thickness (in)	0.125 Fiberglass
Coupler Length/Shoulder Length(s) (in)	10, 15

Motor Properties	
Motor Brand/Designation	Cesaroni L1050
Max/Average Thrust (lb.)	271.7/235.2
Total Impulse (lbf-s)	837.9
Mass Before/After Burn (lb.)	7.60/3.91
Liftoff Thrust (lb.)	250
Motor Retention Method	Hardware fastened to body tube

Stability Analysis	
Center of Pressure (in from nose)	73.37
Center of Gravity (in from nose)	60.55
Static Stability Margin (on pad)	2.44
Static Stability Margin (at rail exit)	2.5
Thrust-to-Weight Ratio	6.56
Rail Size/Type and Length (in)	144
Rail Exit Velocity (ft/s)	64.9

Ascent Analysis	
Maximum Velocity (ft/s)	591
Maximum Mach Number	0.53
Maximum Acceleration (ft/s^2)	199
Predicted Apogee (From Sim.) (ft)	5,285

Recovery System Properties Drogue Parachute				
Manufacturer/Model			Elliptical Handmade	
Size/Diameter (in or ft)			17.5 in.	
Altitude at Deployment (ft)			5285 (Apogee)	
Velocity at Deployment (ft/s)			0	
Terminal Velocity (ft/s)			120	
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 quick-link.		
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	4233.6	3463.2	n/a	n/a

Recovery System Properties Main Parachute				
Manufacturer/Model			Toroidal Handmade	
Size/Diameter (in or ft)			112 in.	
Altitude at Deployment (ft)			500	
Velocity at Deployment (ft/s)			120	
Terminal Velocity (ft/s)			15.5	
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 quick-link.		
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	70.62	57.82	n/a	n/a

Recovery Electronics	
Altimeter(s)/Timer(s) (Make/Model)	RRC3 Sport Altimeter System by Missile Works
Redundancy Plan and Backup Deployment Settings	Dual RRC3 Sport Altimiters, with individual 2-Pole Rotary Switch and 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	2
	Backup	2.5
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.
	Overview
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 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 was on January 7th. The launch took place at the team mentor, Jerry Appenzeller's field (Amherst, OH) with seven students. This launch was ideally to be done with a student-wound nosecone and body tube, however timeline constraints required that the team use commercial body tube and nose cone. In addition, the subscale rocket allowed for avionics to confirm distances and signal strength for compatibility with material choices. All variations between the subscale and fullscale material or design choices are recorded and analyzed in the CDR report.
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