NASA University Student Launch Initiative - Structures and Propulsion

The USLI competition is a NASA-sponsored, nationwide rocketry competition. This year's challenge is to fly as close as possible to a team-declared altitude and deploy an R/C rover to collect a lunar ice sample.

Mission Profile

Launch Vehicle Specifications:

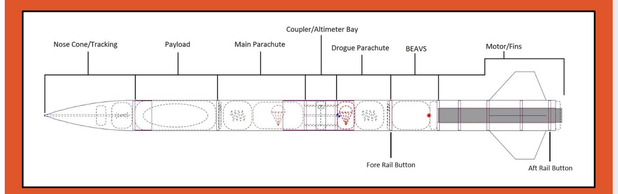
- Lenght: 119 in
- Weight: 60.9 lb
- Max Velocity: 542 ft/s
- Motor: Aerotech L2200
- T/W Ratio: 11.4
- 0 - 60 metric: 0.34 s
- Airframe materials: Fiberglass, Carbon Fiber, and Aluminum

Recovery Specifications:

- Parachute Sizes: 12 ft / 36 in
- Descent Time: 81 s
- Descent Speed: 99.1ft/s
- Impact Velocity: 13.7 ft/s
- Apogee Altitude: 4,000 ft
- Black Powder Charge Sizes: 2.6 g/6.4 g

Payload Specifications:

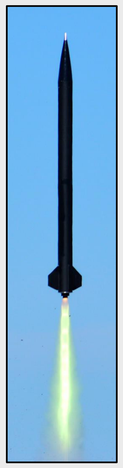
- Top Speed: 1.3 mph
- Battery Life: 5 hours
- Range: 2.8 miles
- Total Carrying Capacity: 15 mL
- Endurance: 2.115 hours
- Horse Power: 0.02



Oregon State University

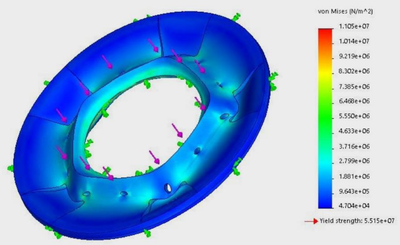
Nose Cone and Fins

- Nose cone provides aerodynamic profile for tip of launch vehicle and houses primary tracking and data recording avionics.
- Fins are needed to keep the vehicle stable during flight, but have a large effect on drag and center of pressure.
- Fins need to be able to survive forces of flight and hard landings, yet remain light.



Modeling and simulations

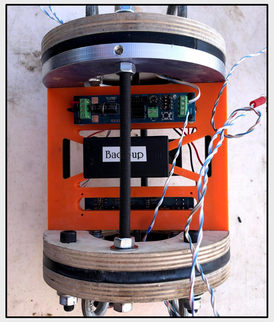
- CAD modeling utilised for design, manufacturing plans, and weight analysis of the entire launch vehicle.
- Simulations conducted on critical components verifying functionality and safety of the component when subjected to the stresses they might see during flight.

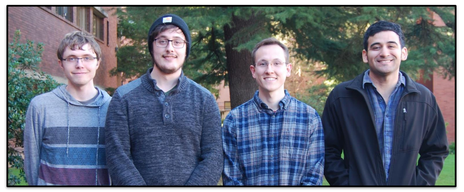


Main Coupler and Airframe

- Carbon fiber aft section, with fiberglass fore section.
- Carbon fiber maintains desirable material properties, reducing weight, while fiberglass enables communication through the airframe to the ground station.
- Airframe tubes are the main structural component of launch vehicle, protecting the payload and various other subsystems.

- Coupler connects the fore and aft sections together during flight. Transfers loading from thrust up the airframe. Allows recovery bays access to external atmospheric pressure.
- The coupler separates parachute bays, housing main and backup recovery electronics for the parachutes.





TEAM MEMBERS
Wyatt Hougham
Nathan Kentner
James Felsher
Gerardo Davila

TECHNICAL ADVISORS
Dr. Nancy Squires
Joe Bevier
John Lyngdal

PROJECT SPONSORS
NASA
The Oregon Space Grant Consortium

PROJECT STATUS

- Percent Completed: 100%
- Number of Requirements: 9
- Number of Requirements Met: 9
- Major Milestones: Sub-scale 1, Full-scale 1