Team 24: Designing and Flying an Experimental Sounding Rocket

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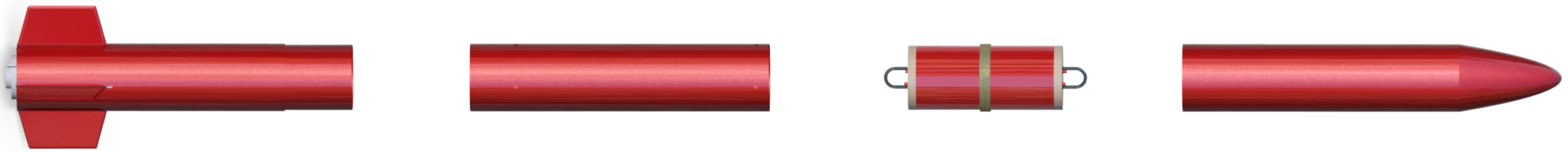

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Project Scope

Design and construct a rocket capable of carrying an experimental payload to be launched and safely recovered within the parameters of the 2017 Intercollegiate Rocket Engineering Competition hosted by the Experimental Sounding Rocket Association.

Design Requirements

Payload

- 8.8 lb minimum
- 10cm x 10cm x 11.35cm (CubeSat)
- Scientific experiment or technology demo

Recovery

- Dual Deployment required for vehicles 1,500+ ft
- Drogue: 70-150 ft/s
- Main: < 30ft/s

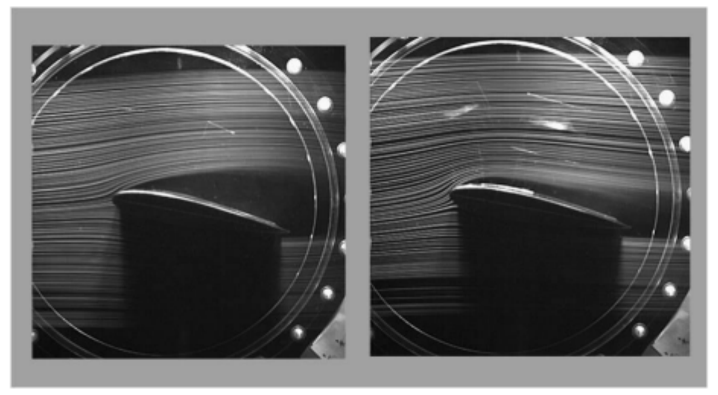
Electronics

- 1 COTS altimeter
- Redundant electronics
- GPS module

Flow Control Payload

Theory

- Measure the effect of injecting fluid into the surrounding air.
- Injecting fluid can be used to reduce or create drag on a surface



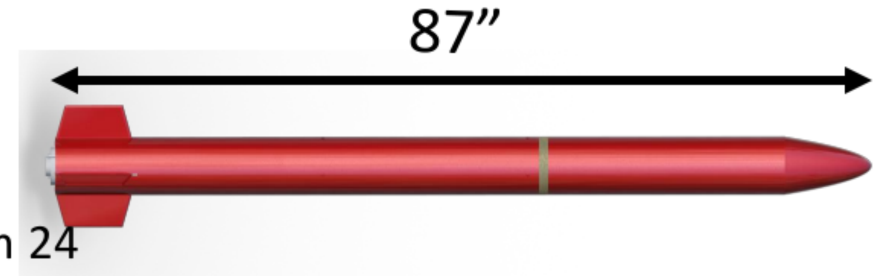
Application

- Most parachute failures occur due to improper alignment
- Alignment of rocket can be controlled through active flow control
- Through using micro-jets in the nose cone of the rocket, a more reliable parachute deployment event can hypothetically be created.

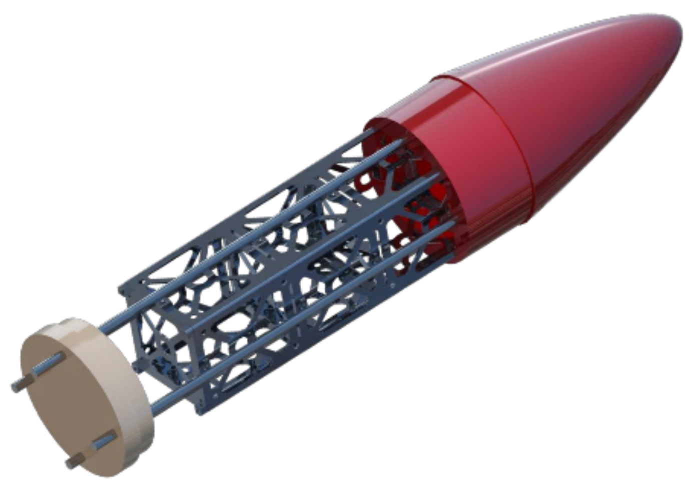
Rocket Design

Overview

- 54 lb
- 6 inch diameter
- Fiberglass body
- 4 main compartments
- Fully recoverable
- Manufactured by Team 24



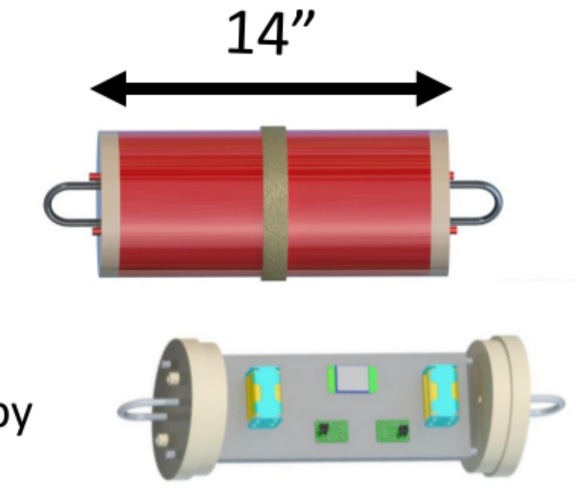
Nose Cone and Payload Housing



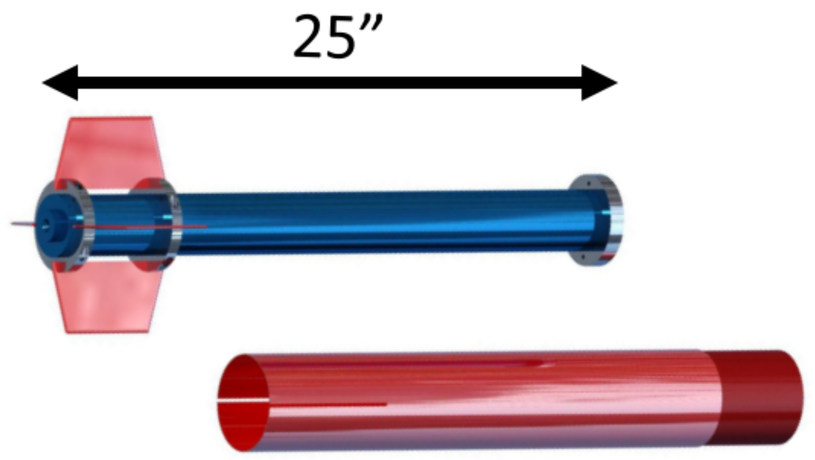
- 3U CubeSat removable payload housing
- Aluminum payload frame
- Parabolic none cone shape for minimal drag
- 3D printed nose cone with incorporated coupler section
- 3D printed mounting rings for anchoring CubeSat unit
- Easily accessible for quick payload removal and replacement

Avionics Coupler

- StratoLoggerCF avionics system
- S.R.A.D backup avionics
- Redundant power supplies
- Duplicate critical wiring harness
- 3D printed mounting platform
- Sealed endcaps for protection
- Exposed center lip for sensor packages
- Heavy duty U-Blots for parachute mounting
- GPS module a transceiver
- Nichrome igniters controlled by flight computer



Booster Segment



- Fin-through-body design for secure fin and motor mounting
- Removable fin setup for fin shape experimentation
- High strength aluminum motor housing
- Removable design for interchangeable motors

Simulation Results

OpenRocket [6]

Data	Value
Apogee	10,082 ft
Max. Velocity	794 ft/s
Max. Acceleration	214 ft/s^2
Center of Gravity	57.5 in
Center of Pressure	65 in

In-House Simulation

Data	Value
Apogee	10,025 ft
Max. Velocity	799 ft/s
Max. Acceleration	215 ft/s^2

Motor Selection

Using both an in-house and an industry standard simulation software, Team 24 was able to select the ideal motor for theoretical weight and flight characteristics.

Aerotech M1845
Total Impulse: 1867 lb/s
Burn Time: 4.4s
Max Thrust: 543.68 lbd

Summary

Team 24 has designed, and intends to fly, a large 54lb rocket for the purpose of competing in the ERSA IREC competition in late June. Based on the data shown, we are confident that our design can execute a successful flight and land safely. It is our hope that our rocket is competitive and is capable of scoring well.

References:

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