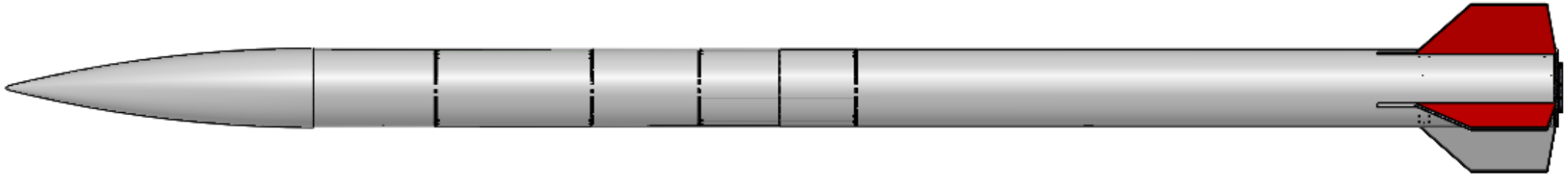
OBERON II

A Student-Developed High Power Rocket

UNIVERSITY of HOUSTON



Presented by: Alex Blick, Chief Engineer

Space City Rocket Team Overview

- Competitive student engineering team at UH
- Hosted by the AIAA-UH student branch
- Compete annually at the Spaceport America Cup

SPACE CITY ROCKETRY

SPACEPORT AMERICA® CUP

AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS
SPACE CITY STUDENT CHAPTER
UNIVERSITY OF HOUSTON

Previous Competition Vehicles

2018

PROMETHEUS

Only reached 7,200 ft

Nosecone and fins cracked upon landing

2019

OBERON

Reached 12,000 ft

Received no significant damages

2020 competition was cancelled due to COVID

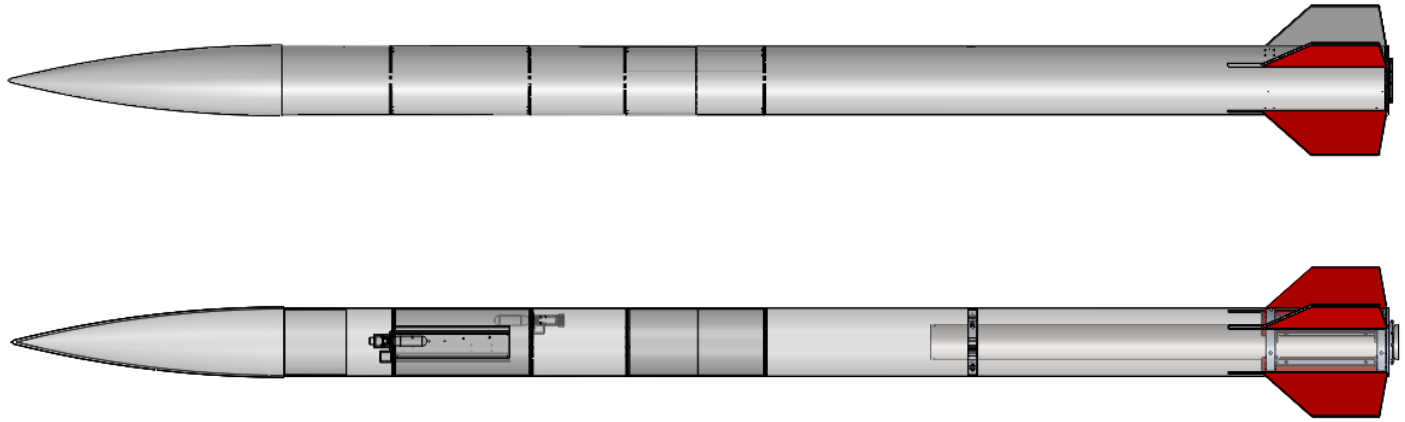
Competition Launch 2019

2021 Competition Rocket: Oberon II

- An upgraded version of the original Oberon
- Will be our third competition launch

General Specifications:

- 10 feet tall
- 6 inch diameter
- Weighs 56 lbs
- Fiberglass body



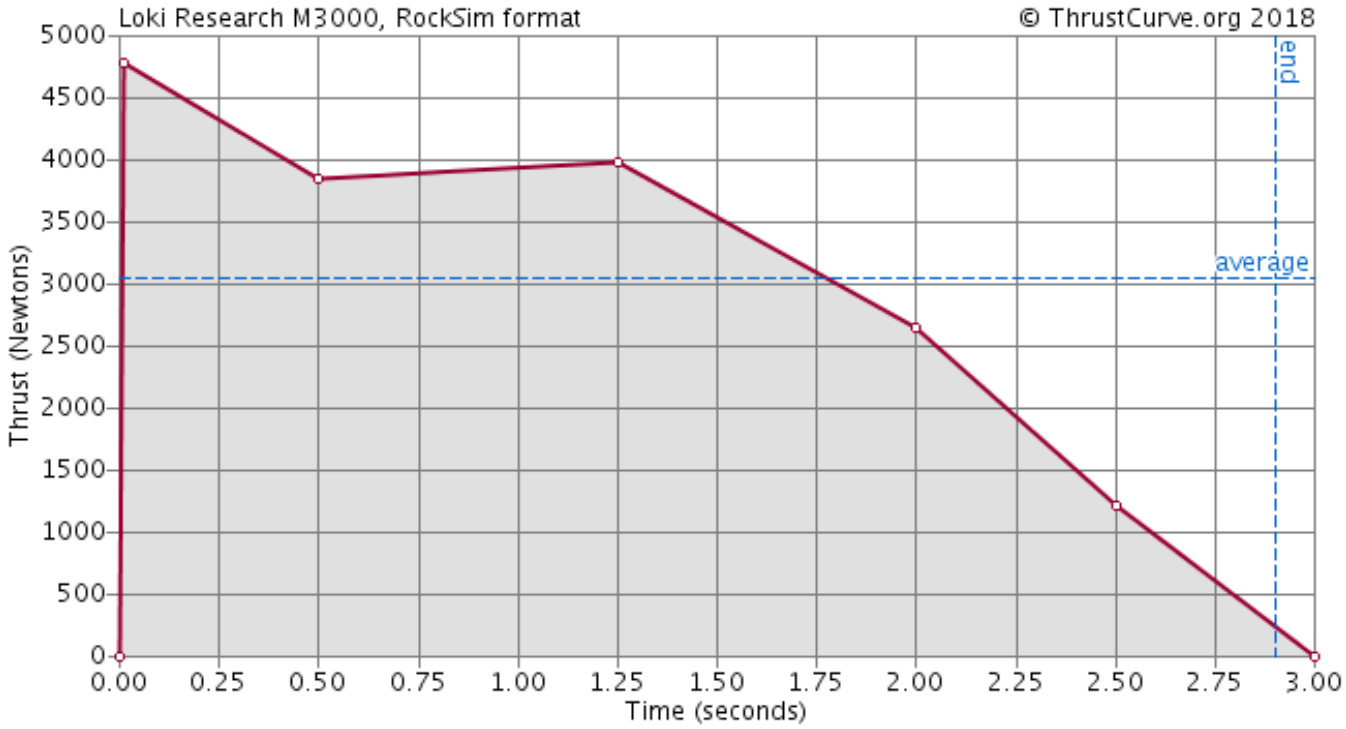
Solid–Propellant APCP Motor

Max thrust:	4780 N
Average thrust:	2946 N
Burn time:	3 seconds
Total Impulse:	8838 Ns

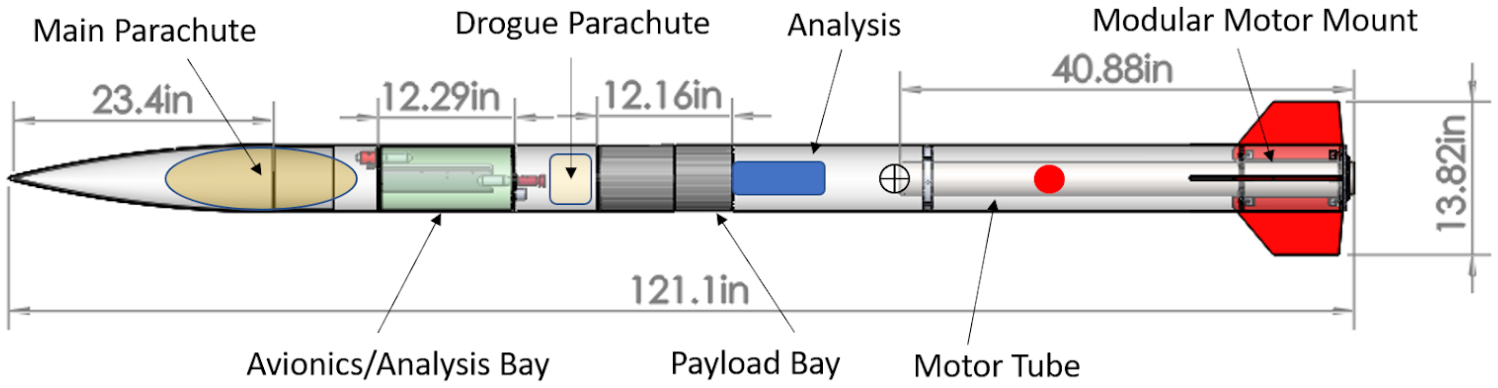
Predicted Flight Performance

Apogee:	10,700 ft
Max velocity:	313 m/s
Max accel:	183 m/s^2

Loki M3000 Motor Thrust Curve

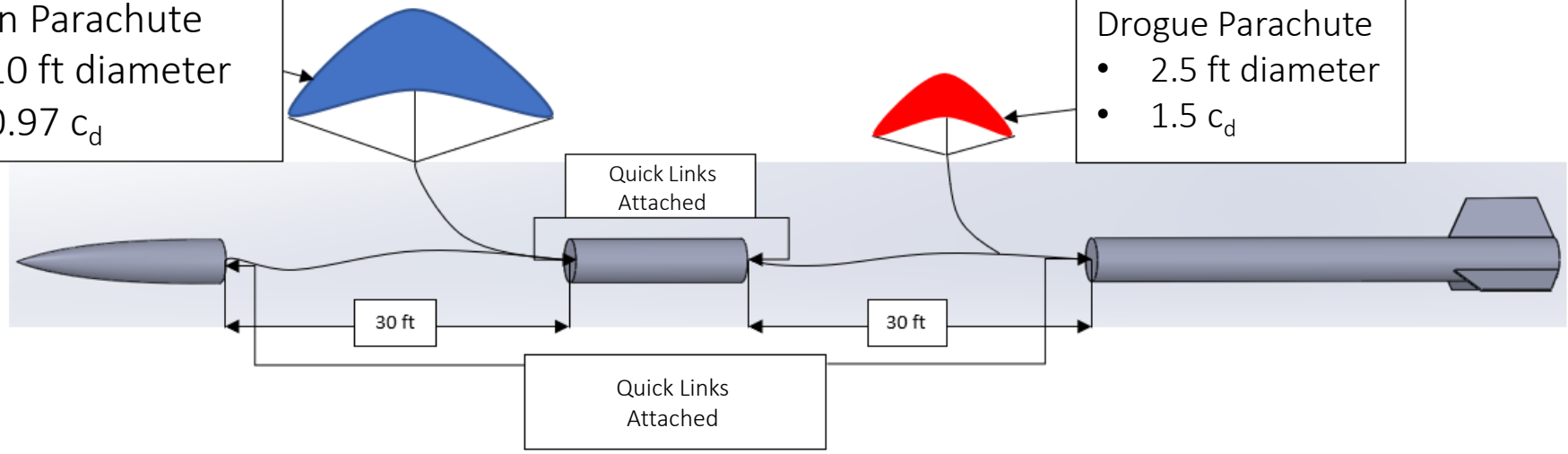


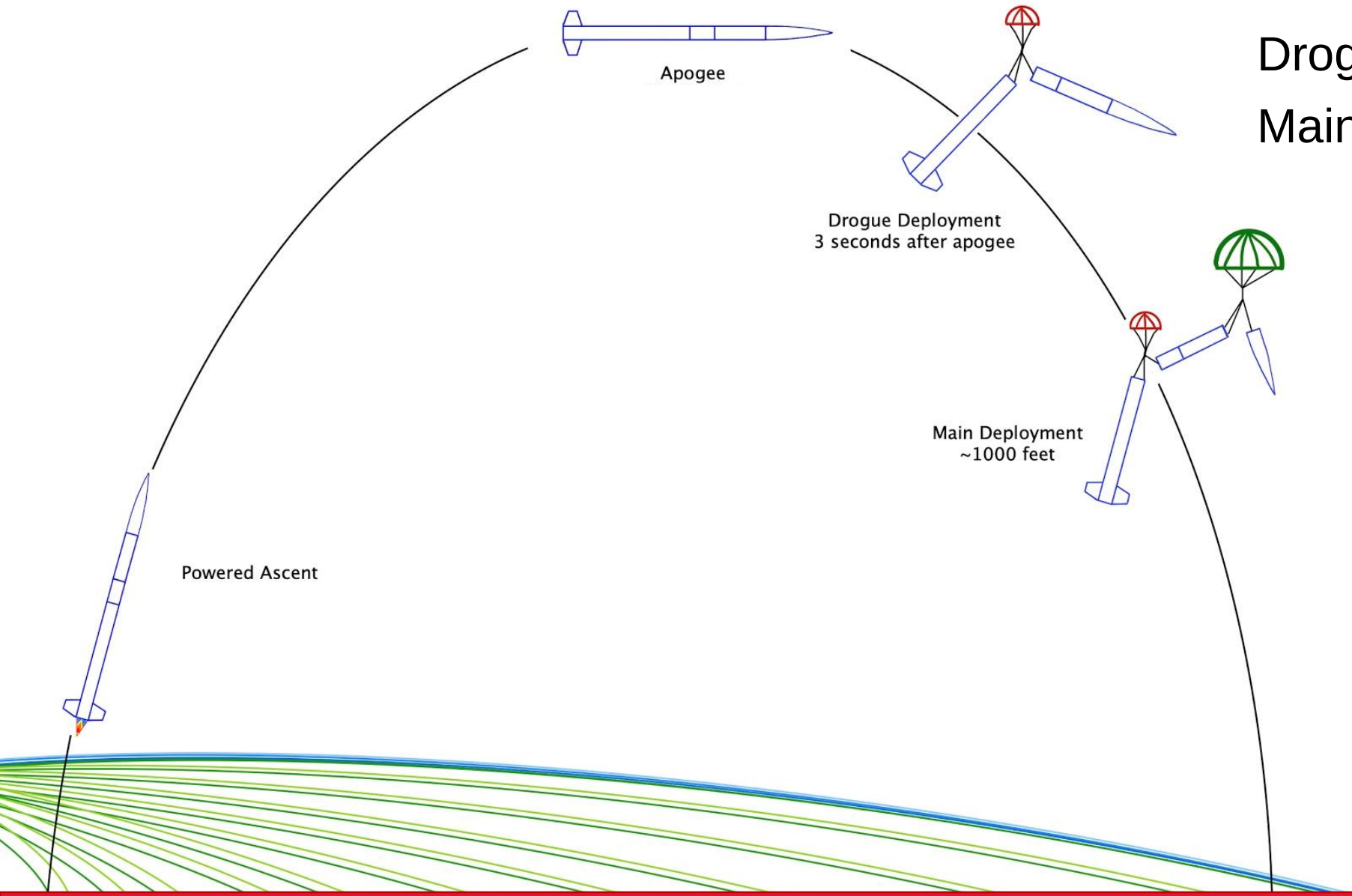
Design Overview



Main Parachute
- 10 ft diameter
- 0.97 c_d

Drogue Parachute
- 2.5 ft diameter
- 1.5 c_d





Drogue Decent: 80 ft/s

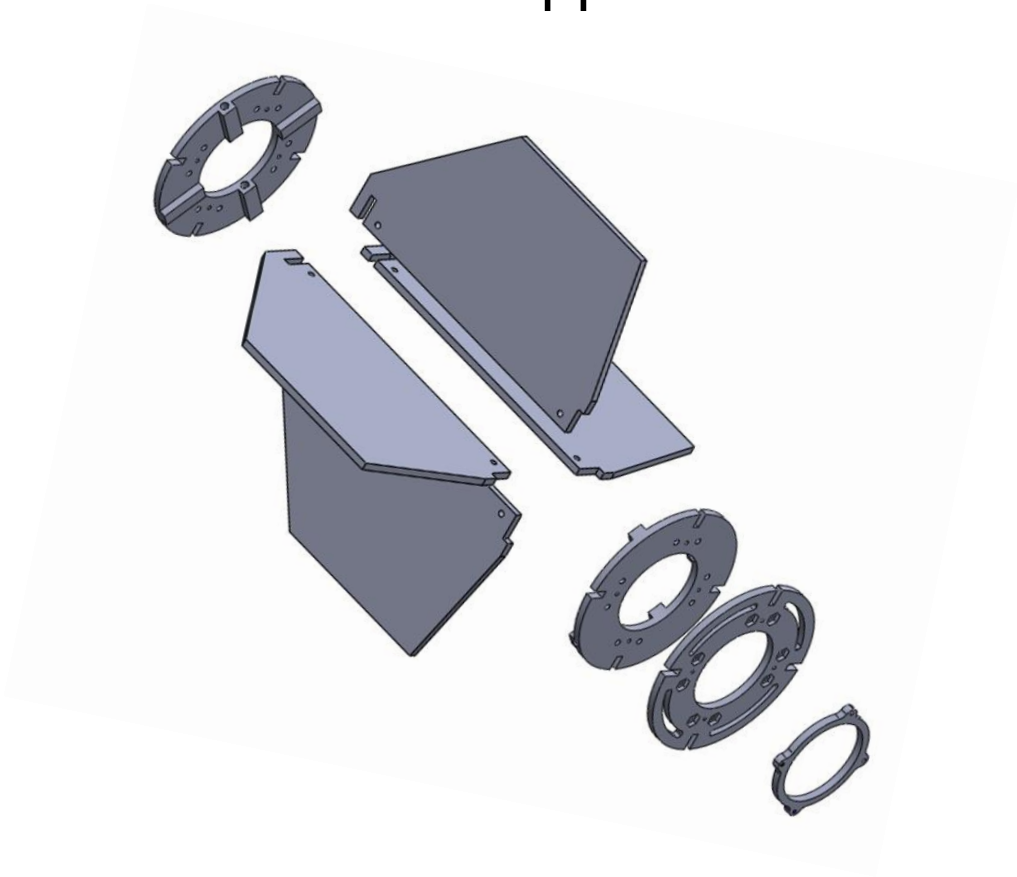
Main Decent: 23 ft/s

Black Powder Separation

The Modular Motor Mount (MMM)

Conventional Fin Installation

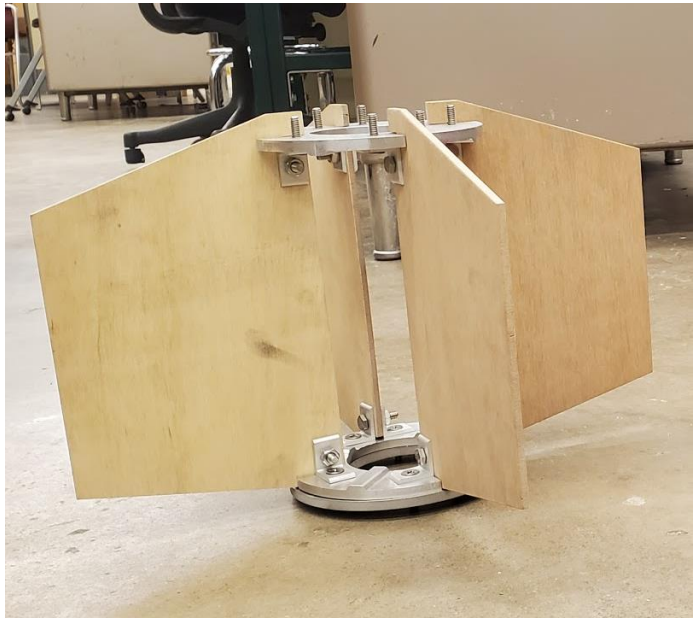
Modular Approach

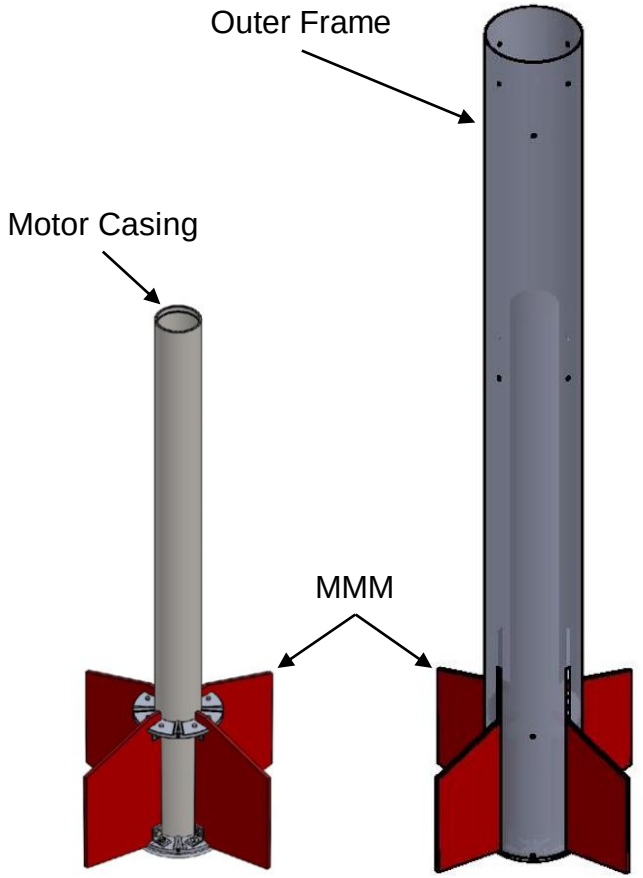


The Modular Motor Mount (MMM)

- Replaceability
- Minimal design
- Efficient Assembly

Pre-Assembled MMM





On-Board Sensor Network

Implementing sensors to measure and record various data during flight

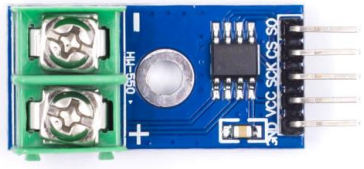
- Stress/strain in the fins
- Temperature of the motor casing
- Internal pressure of the black powder charges

Sensor Network Components

Temperature

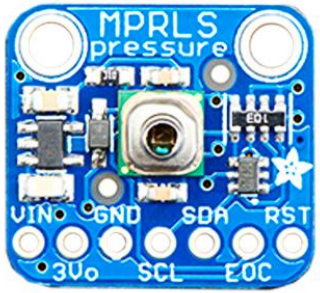
3 thermocouples

3 digital converters



Pressure

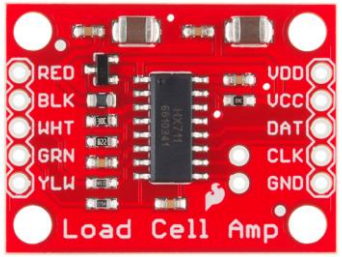
2 pressure sensors



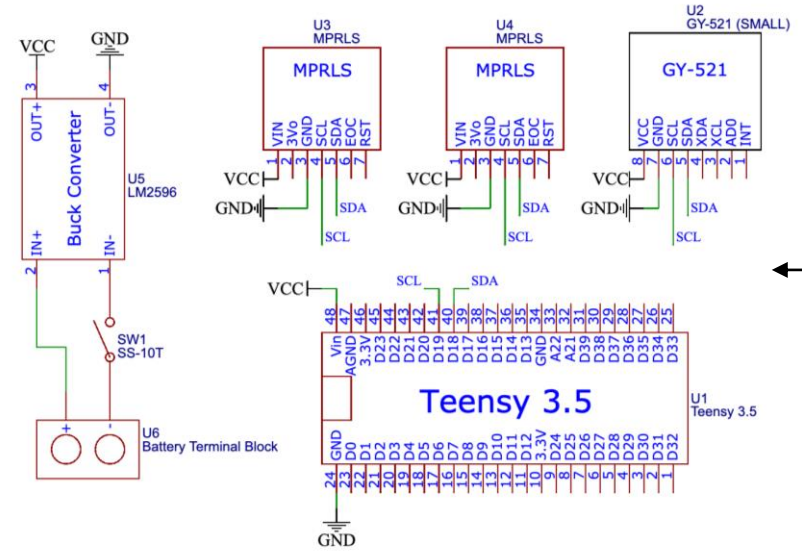
Stress/Strain

4 strain gauges

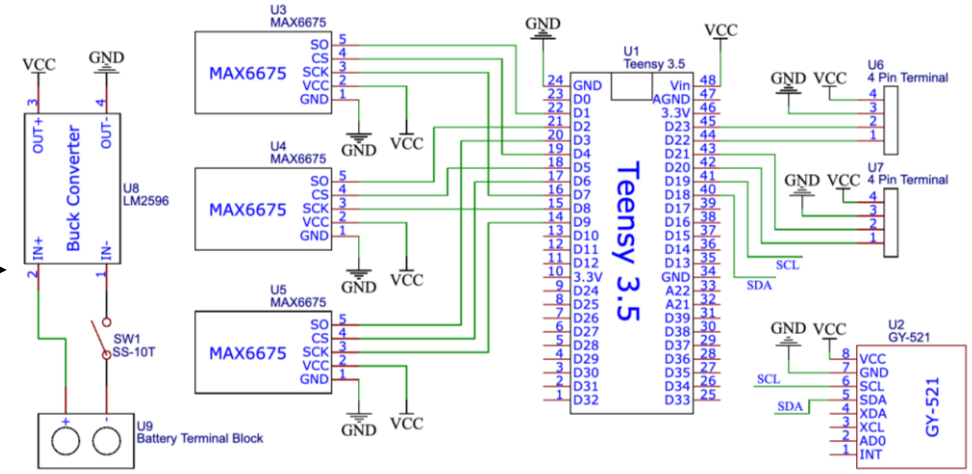
2 load cell amplifiers



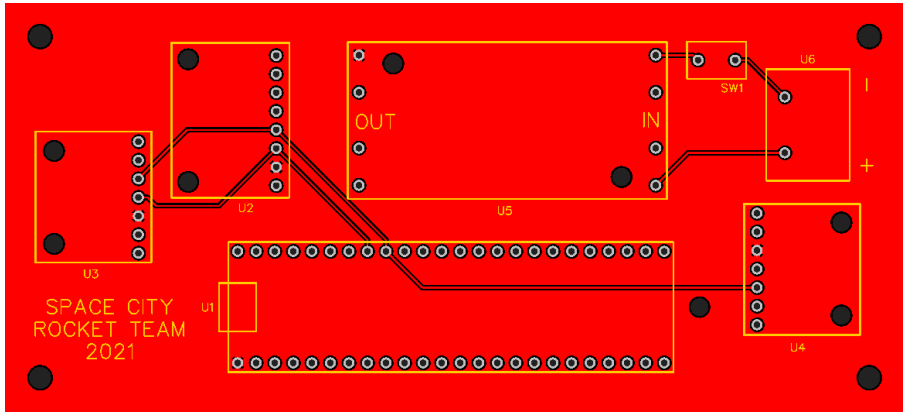
Sensor Network Circuitry

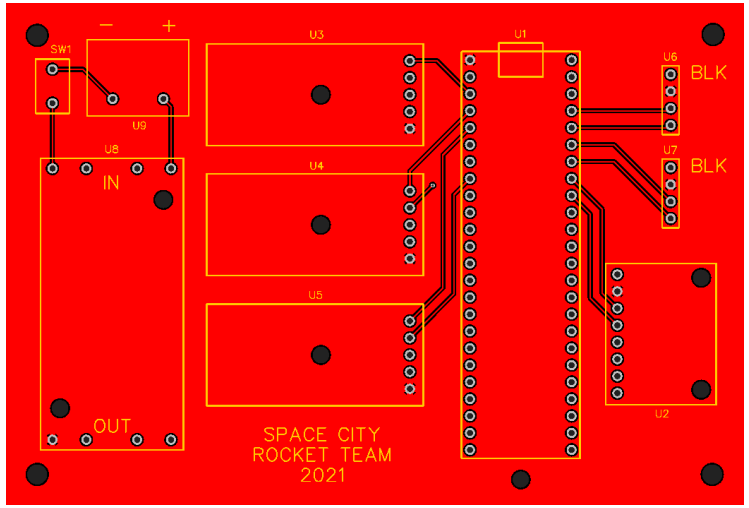


Circuit Diagrams



PCB Designs





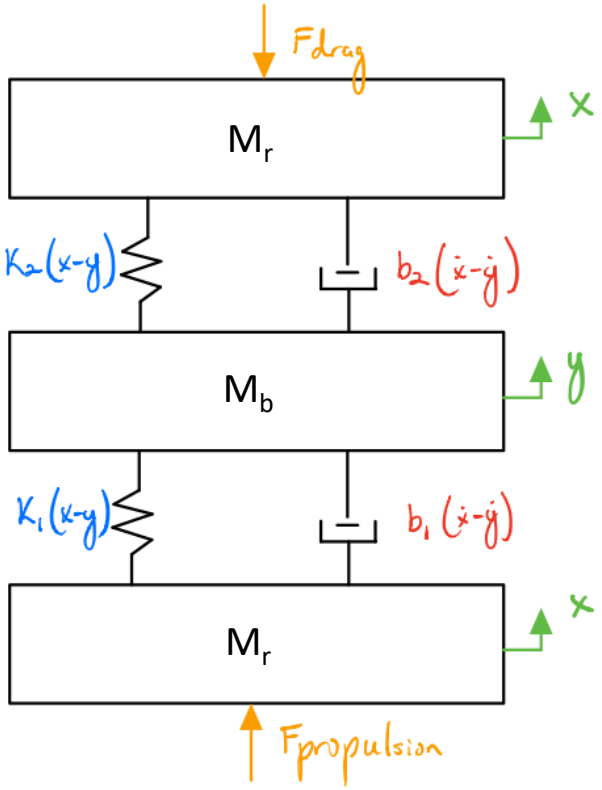
Bioengineering Experimental Payload

- Investigating the affects of high g-forces on cell growth and cell structure
- Analyzing the growth of Giant Kelp (Macrocyctis pyrifera) cells
- Cells will be recorded during flight at a microscopic level

(Concept)

Vibrational Damping System

- Reduce turbulent vibrations and dynamic loads experienced by the payload bay during flight
- Goal to facilitate the development of more accurate data
- Initial design takes form of a spring-damper system located in the payload bay

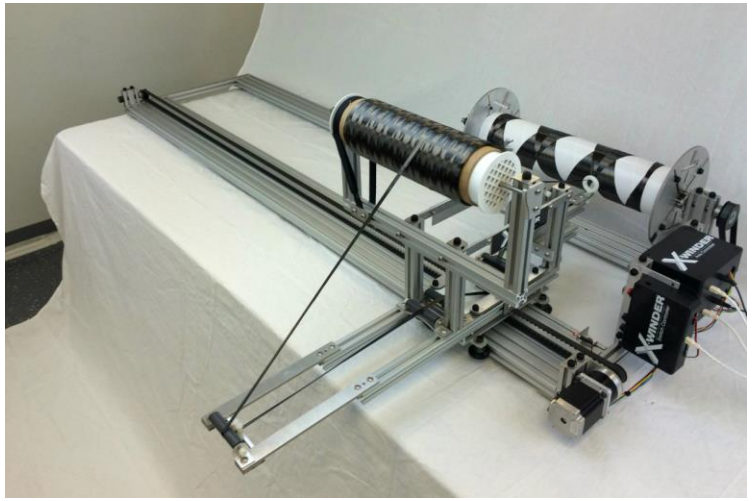


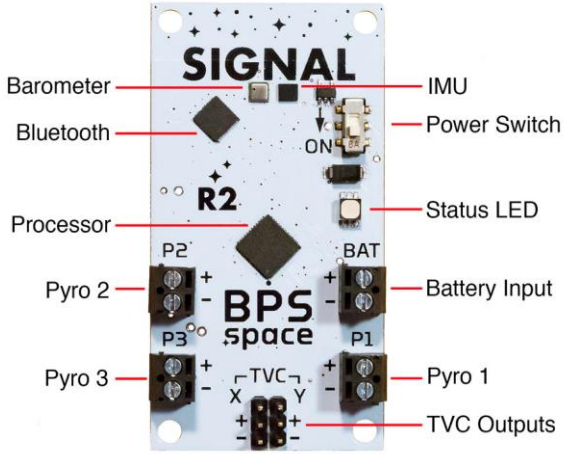
M_r = rocket mass
M_b = payload bay mass

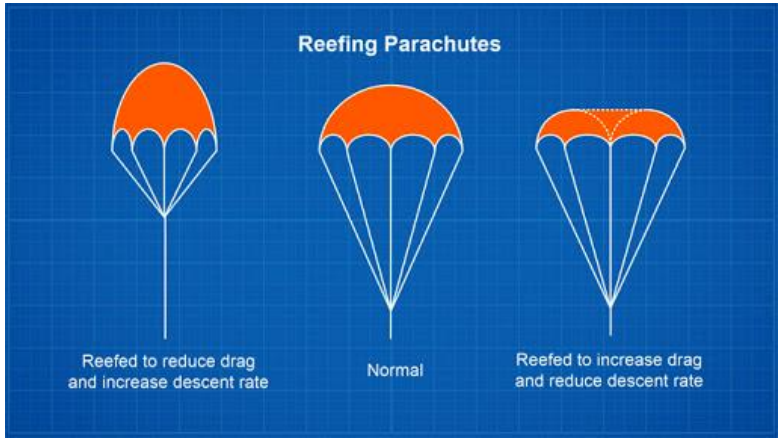
Student Research & Development

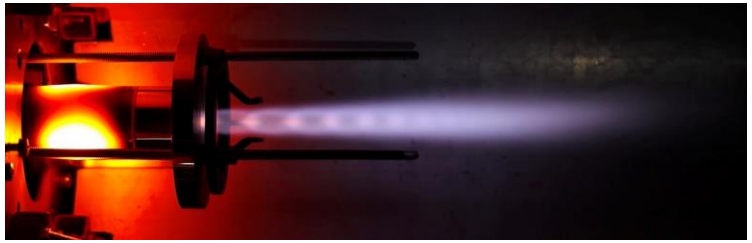
SRAD projects for Oberon II and future competition rockets:

- Programming our own flight computer from scratch
- Winding our own carbon fiber body frame
- Developing our own custom parachutes
- Begin research for creating our own solid propellant










SPACE CITY ROCKETRY