OBERON II
A Student-Developed High Power Rocket

UNIVERSITY of HOUSTON

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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
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/s²
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
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 (Macrocystis pyrifera) cells
- Cells will be recorded during flight at a microscopic level
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

\[ M_r = \text{rocket mass} \]
\[ M_b = \text{payload bay mass} \]
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