Experimental Sounding Rocket

Background and Objective

Experimental Sounding Rocket (EXSR) is known for developing high-powered model rocketry. Each semester, the team is given a set of goals that must be accomplished. This can vary from deploying certain payloads to gather data, reaching certain altitudes, and coordinating a launch with Spaceport officials.

This semester, the goals for EXSR were to create a spherical payload that can measure pressure, altitude, GPS tracking, and acceleration to characterize the spherical payload parachute. In addition, EXSR assembled an off-the-shelf rocket, and launched the rocket at Spaceport America on April 10th, 2021.

Objectives for Spring Launch:

- Redesign and build functioning payload ejection system that fits in current rocket kit.
- Test door system for the payload on a large scale and finish coding for communication with the system and AIMS flight computer.

Spring 2021 Team

Team Lead: Victoria DuPriest

Team Members: Seth Sisneros, Chris Padilla, Austin Petring, David Avalos-Violante, Melanie Deeble (P.O.), Brad Williams (S.O), Lukas Peterson, Casper Huang

Acknowledgements

Dr. Michael Hargather (Faculty Advisor)

Spaceport America

Payload Task Group

The Payload task group has assembled the payload sphere and instrumentation. The payload sphere contains tungsten pellets and two batteries in the lower hemisphere of the payload. There are also shock cords for proper parachute attachment. The payload instrumentation includes a circuit board with multiple components to record flight data and communicate its location via an Arduino based code.

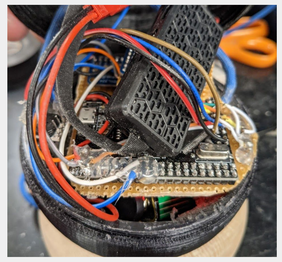

Figure 1: *Open Payload sphere with all components*

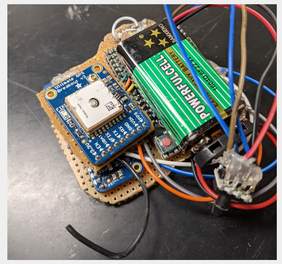

Figure 2: *Payload circuit board*

Avionics Task Group

Avionics focused on the Payload Deployment and Separations System. This system was responsible for deploying the payload at apogee and deploying the parachutes for recovery.
A unconventional dual deploy parachute system was implemented due to space constraints. A breech plate was used to allow a drogue parachute to separate the 1st and 2nd stages.

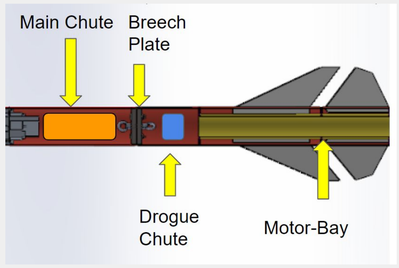

Figure 3: Stage separation configuration

Airframe Task Group

Airframe was responsible for designing and assembling the rocket and choosing a motor. The rocket was assembled from a modified kit. Several aluminum plates were designed and machined to connect the payload bay to the rest of the rocket, and to allow separation for the parachutes to deploy. The Cesaroni M1450 motor was selected due to its high power, which necessitated an aluminum thrust plate to transfer the thrust to the Airframe. The centers of gravity and pressure were calculated to ensure stability.

Figure 4: Full rocket assembly

Launch Data

Our on-board flight computer was able to successfully map the trajectory of the rocket, as pictured. Data within the payload mirrored that of the flight computer. Payload was successful in retrieving pressure, temperature, altitude, and acceleration from flight.