Experimental Sounding Rocket

Industrial Sponsor: White Sands Research and Developers LLC (WSRDs)

Background and Objective

The Fall 2019 Team and WSRDs developed an interchangeable payload bay for the Mustang 6C rocket. The Mustang 6C will fly higher and faster than previous designs and will carry an experimental payload designed to deploy four parachutes. The aerial experiments will be used to derive performance characteristics of the parachutes.

Objectives for Fall 2020 Launch:

- Machine ejection tubes and test large scale release of payloads.
- Test door system for the payload on a large scale and finish coding for communication with the system and AIMS
- Develop an instrumentation package capable of capturing pressure data, acceleration, and live GPS position.

Spring 2020 Team

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Electrical Task Group

Electrical team has completed early testing of the barometric sensor and radio module and will begin assembling parts for final testing. Coding for the payload and AIMS are now being compiled with the objective of **A)** having communication with the onboard system and **B)** having the AIMS control the payload ejection sequence once the rocket reaches apogee.

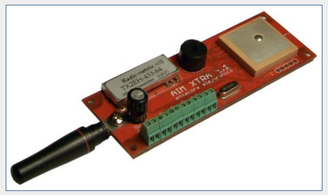

Figure 1 (above): *Barometric Sensor Wind Tunnel Test*
Figure 2 (below): *Onboard AIMS unit*

Rail Task Group

The launch rail will adjust the rocket's azimuth and elevation in the beginning phase of the launch. We modeled and picked out parts for the rail this semester. We planned to build it this summer for the launch but were unable to due to the COVID19 pandemic; however, WSRDs still needs the rail, so they will build it this summer.

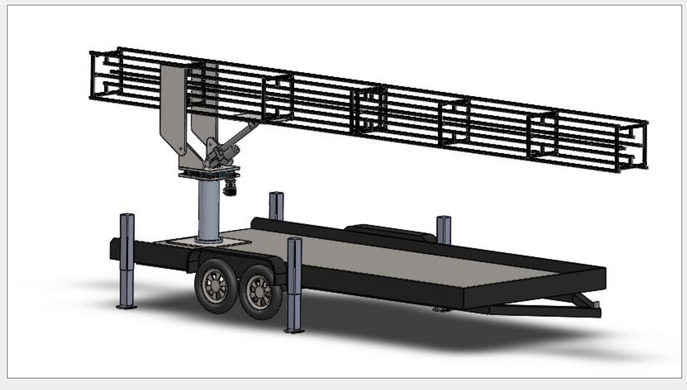

Figure 3: *Rail design using a 24" stroke actuator*

Mechanical Task Group

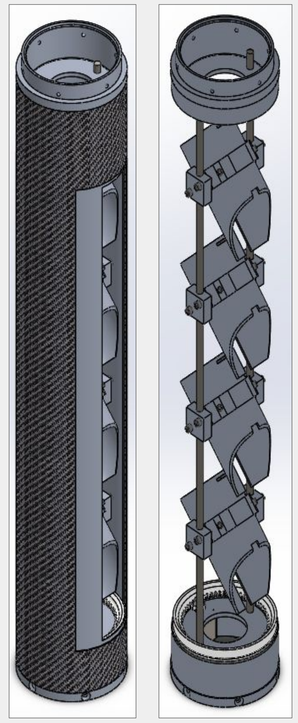

Figure 4: *Payload Bay (Skin Omitted, Right)*

The ejection of the payloads will be executed using a large diameter custom compression spring. Each payload will be secured using a Kevlar rope--payloads will be released at apogee using a nichrome system to 'burn' the rope open.

Each tube (pictured left) is oriented at 45° to optimize internal packing volume and ensure that the ejected payload do not impact rocket body once released.

The payload door will be actuated using a stepper motor and ring gear located at the bottom of the payload section.

Future Work

- Fully integrate mechanical deployment system with on-board avionics instrumentation.
- Thoroughly test each subsystem and integration for mission critical functions
- Finish fabrication of payload section, payloads, and deployment subsystems
- Develop new, payload-specific launch procedures.
- Perform a successful launch recovering the entire launch system and all four payloads with appropriate performance data.