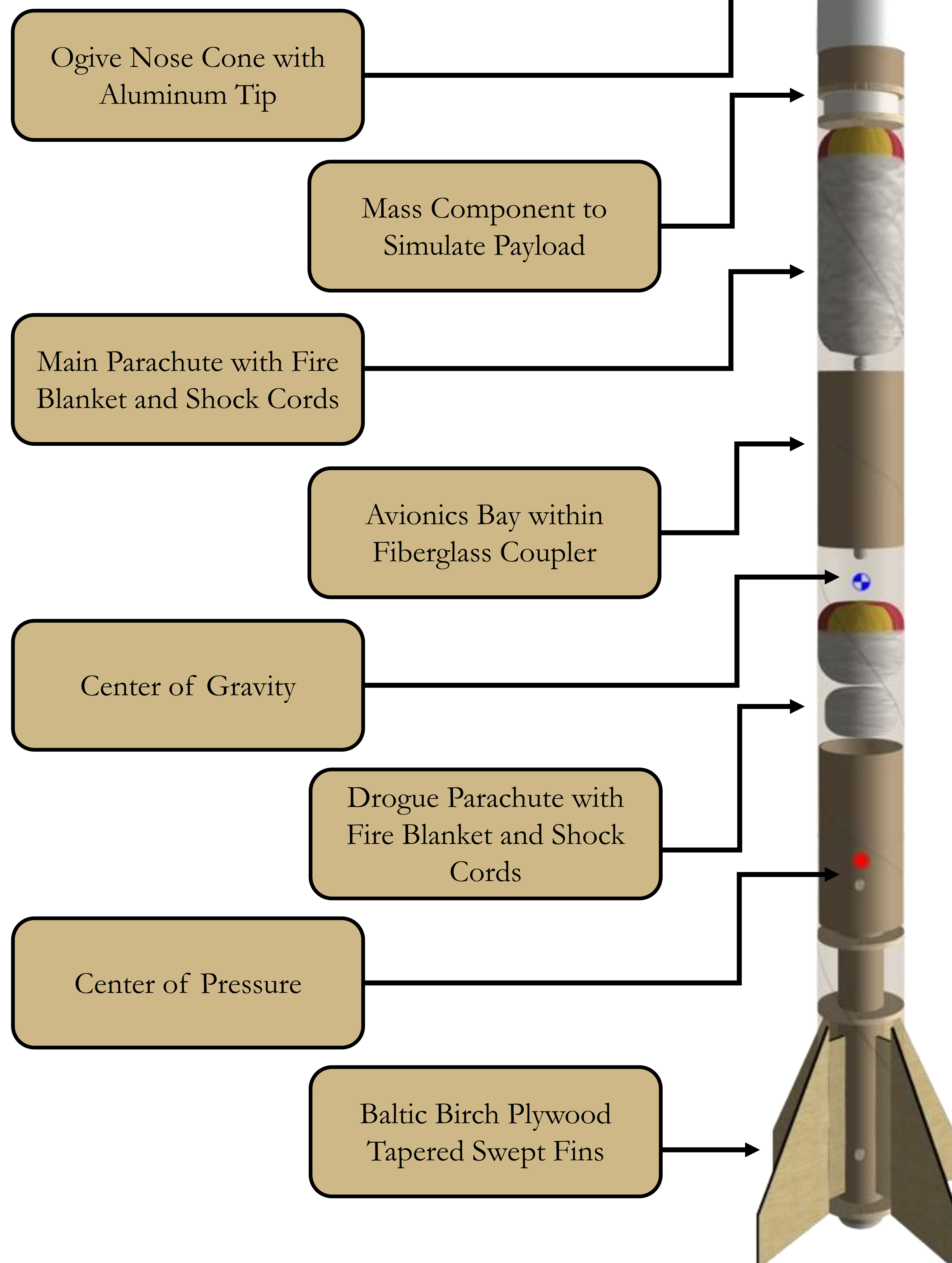


Abstract

This project is based off the requirements from the 2024-2025 NASA USLI competition. The team is tasked with building a reusable Level 2 rocket that will fly to an apogee within a preset range while carrying a payload and four STEMnauts and returning to the ground safely.

Vehicle Components



Results

Subscale flights are done to predict how the full-scale vehicle will behave during its' flight. Our first subscale flight was on February 1st, 2025 where the projected versus actual values are listed below:

Objective	Data
Projected Apogee	2400 ft
Actual Apogee	1843 ft
Projected Landing Distance	605 ft
Actual Landing Distance	580.8 ft

As shown, the actual apogee was at a 40% error in respect to the projected apogee. It was found that some of the weights were incorrect in the simulation. These weights were corrected.

The subscale vehicle was flown again on March 1st, 2025. These results are listed below:

Objective	Data
Projected Apogee	1915 ft
Actual Apogee	1903 ft
Projected Landing Distance	504 ft
Actual Landing Distance	475 ft

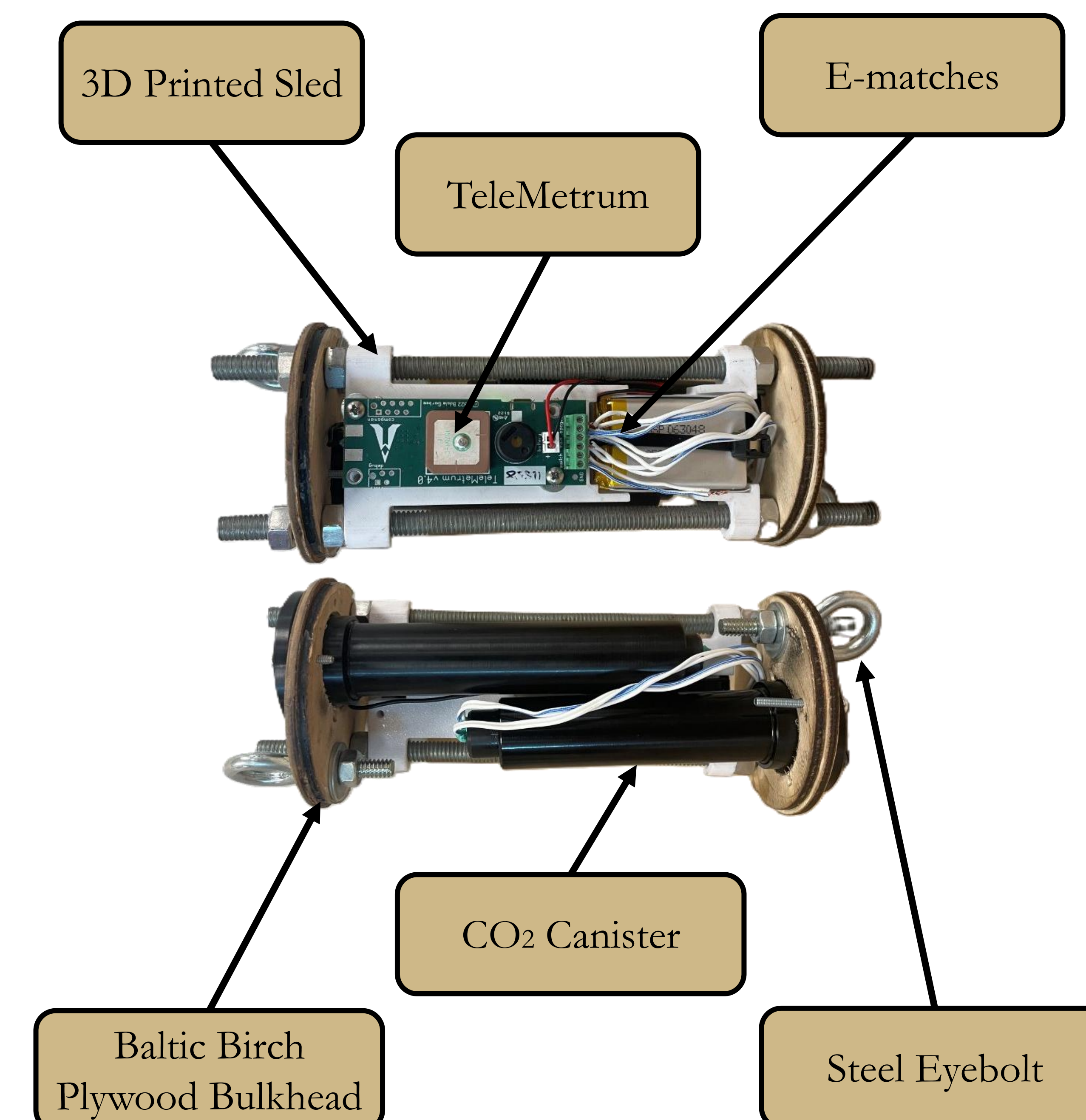
As shown, the projected values and actual values were much closer this time which show that the incorrect weights were the only issue for our first flight.

References

NASA. (2024). *2025 Student Launch I Handbook*. NASA Student Launch Challenge.
<https://www.nasa.gov/learning-resources/nasa-student-launch/>

National Association of Rocketry. (2024). *FAA Regulations*.
<https://www.nar.org/FAARegulations>

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Next Steps

Our next steps in this project is to build our full-scale rocket that will be 9.75 ft long and reach an apogee between 4000 and 6000 feet. This full-scale vehicle will also carry a video camera on its' exterior to film the flight. We will need to construct, test, and fly this vehicle and it will carry a payload that will be designed, built, and tested by our payload team.

From there, we will evaluate and analyze the results of the flight and make adjustments as needed in order to meet all of our targets and metrics for this project.

At the end of the Summer of 2025, the flight(s) of the full-scale rocket and its' results will be presented at our final senior design presentation.