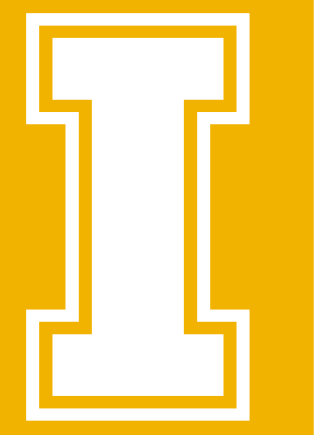


# VIABILITY OF HIGH-EFFICIENCY TAILLESS AIRCRAFT



## OBJECTIVE

Compete in the AIAA Design/Build/Fly competition using the NASA-patented PRANDTL-D wing design and to demonstrate proof of concept that this design can be self-propelled.

## BACKGROUND AND VALUE PROPOSITION

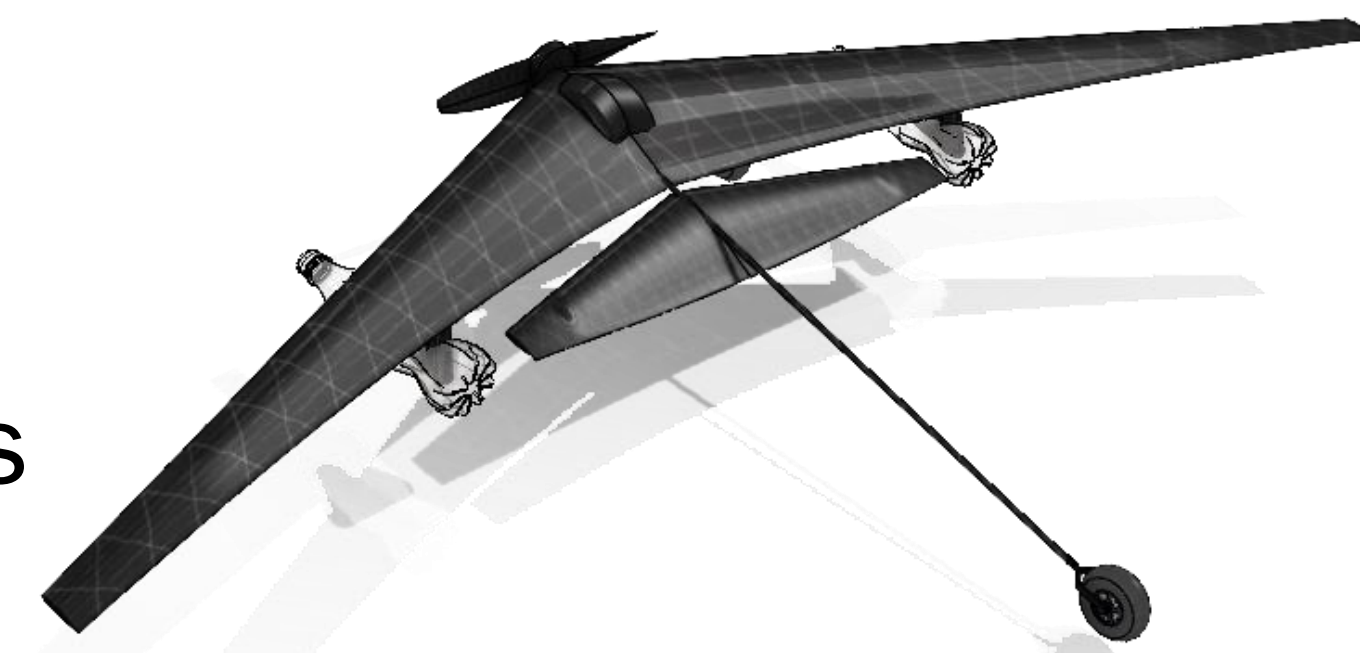
The PRANDTL-D wing, developed by Albion H. Bowers at NASA, is a flying wing design that achieves a bell-shaped lift distribution—considered the most efficient for reducing lift-induced drag. It improves the lift-to-drag ratio by **12.5%** compared to the traditional elliptical distribution, using the same amount of material. This lift distribution also eliminates the need for horizontal and vertical stabilizers by mitigating the adverse yaw phenomenon.

By competing in this event, we aim to demonstrate the viability of the PRANDTL-D design for the future of aeronautics.

## KEY REQUIREMENTS

- Wingspan less than 6 ft
- Total weight  $\leq$  55 lb
- Use PRANDTL-D Design
- Drops autonomous Glider
- Glider weight  $\leq$  0.55 lb
- Arming Plug and Radio Switch
- Compete in the AIAA DBF
- Battery Energy  $\leq$  100 Wh

## CONCEPT DEVELOPMENT



Conceptual Design



Detailed Design



Final Design



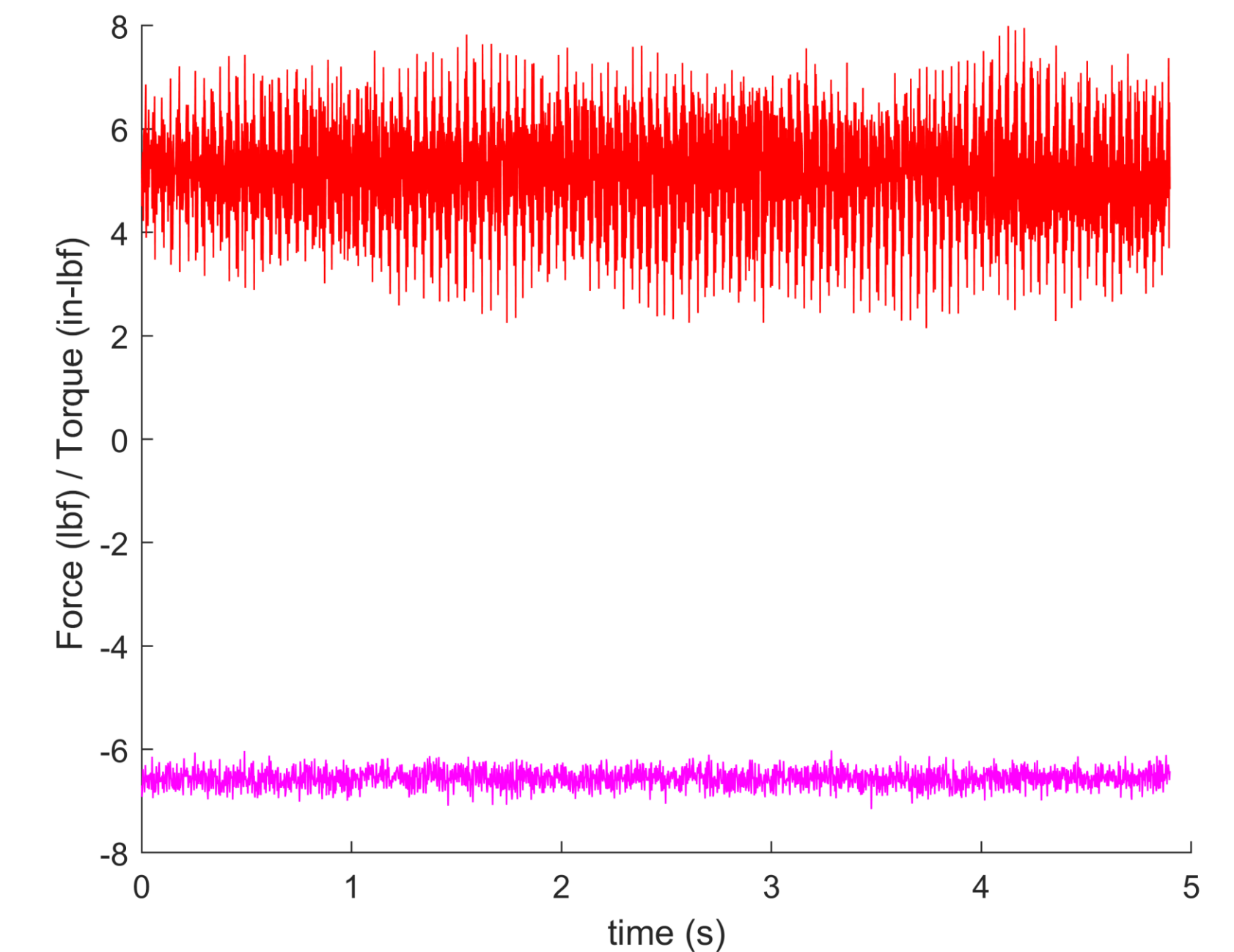
Autonomous Glider Flight Path

EE: Jake Miller, Zhewen Luo

ME: Shay Albrecht, Kyren Mesenbrink, Warren Smith

CS: Aiden Shepard, Brian Renzelman

## VALIDATION



A thrust test was performed to determine experimental thrust and torque. This was also used to validate how long it takes to exhaust the battery.

## SUMMARY

This project brought many challenges, but with our mentors' guidance, we successfully designed and built our aircraft. Although we were unable to fly at competition, we submitted a graded design proposal and report and attended the event to gain valuable insights. We placed **96<sup>th</sup>** worldwide. We leave this experience having laid a strong foundation for next year's Design/Build/Fly team.

## ACKNOWLEDGEMENTS

We acknowledge the NASA Idaho Space Grant Consortium for their generous sponsorship of our project. Our thanks go to Rodrigo Padilla, Dr. Durgesh, and Dr. Swenson for their invaluable mentorship and support throughout this endeavor. Lastly, we extend our sincere appreciation to the American Institute of Aeronautics and Astronautics (AIAA) for providing us with the incredible opportunity to participate in the Design/Build/Fly competition.



**2025 Capstone Project**