

# SailBot 2025-2026

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## Project Overview

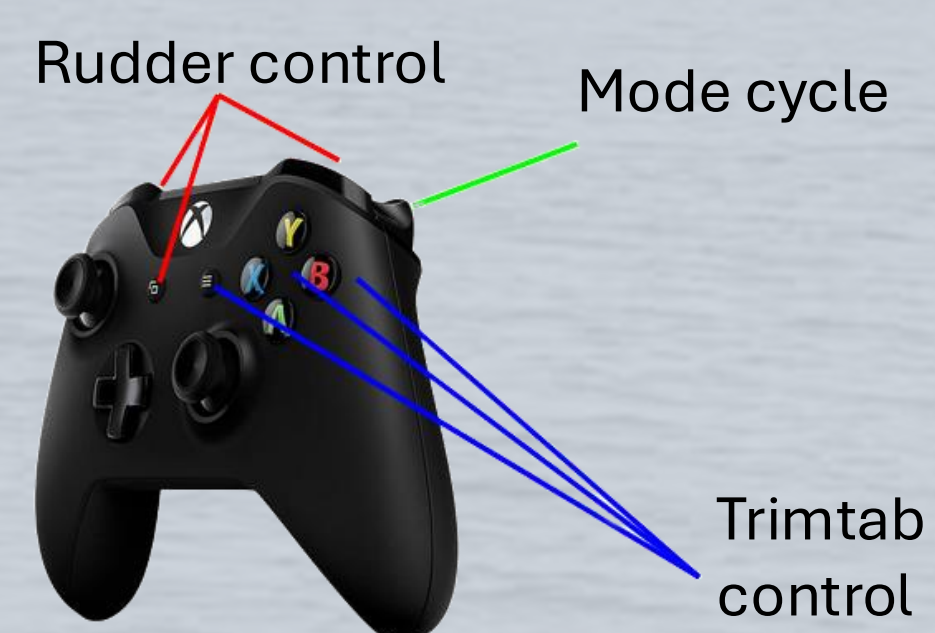
Sailbot is an annual MQP program focused on development of a 2-meter autonomous sailboat. The team competes in the International Robotic Sailing Regatta which features several events including a fleet race and a search and rescue challenge. This year's team redesigned the control application, trim-tab, vision, mast damper, rudder, and keel subsystems.

## Project Goals

- Deliver system capable of high performance in IRSR competition
- Further the research on autonomous sailing
- Simplify and document operation for future researchers

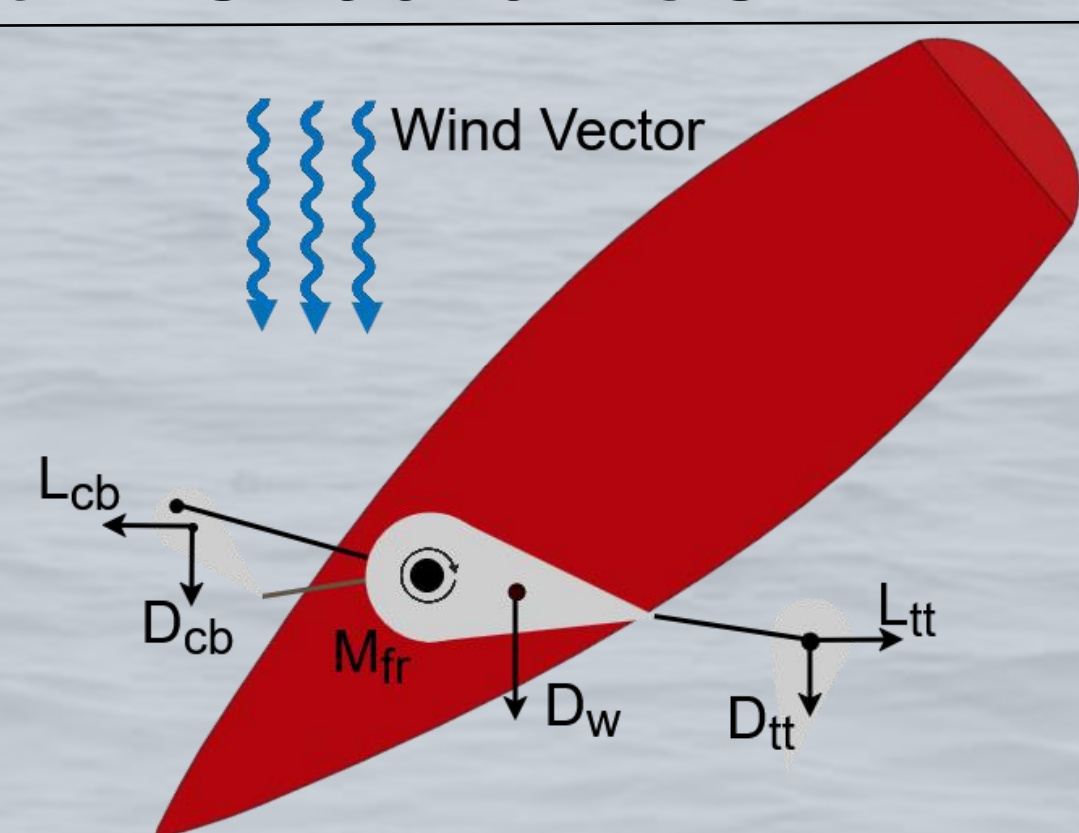
## 1 Flutter Application

- Main control interface of the boat
- Communicate through gRPC protocol
- Display data reading from various sensors
- Real time launch file & argument control
- Integrated Xbox controller



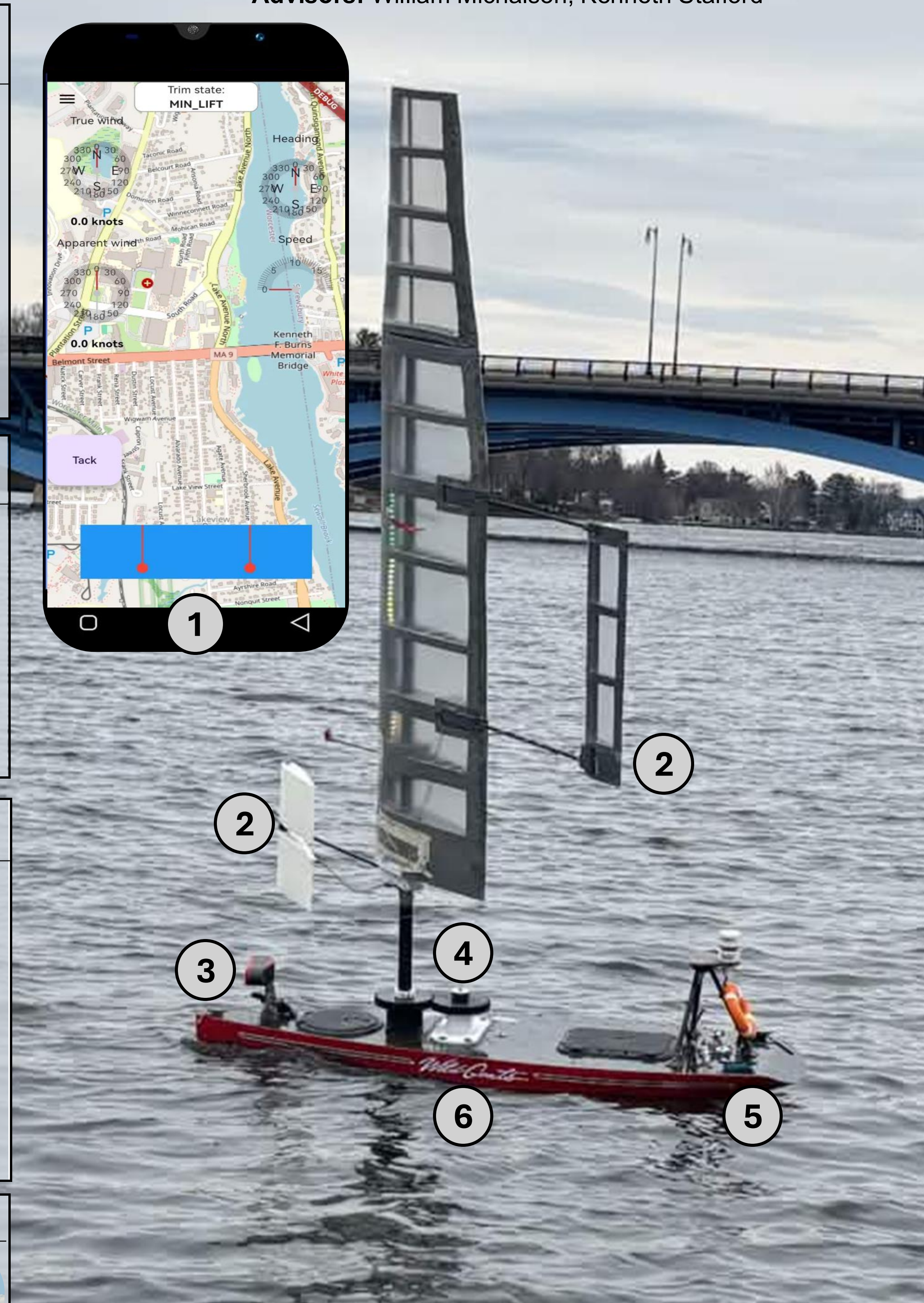
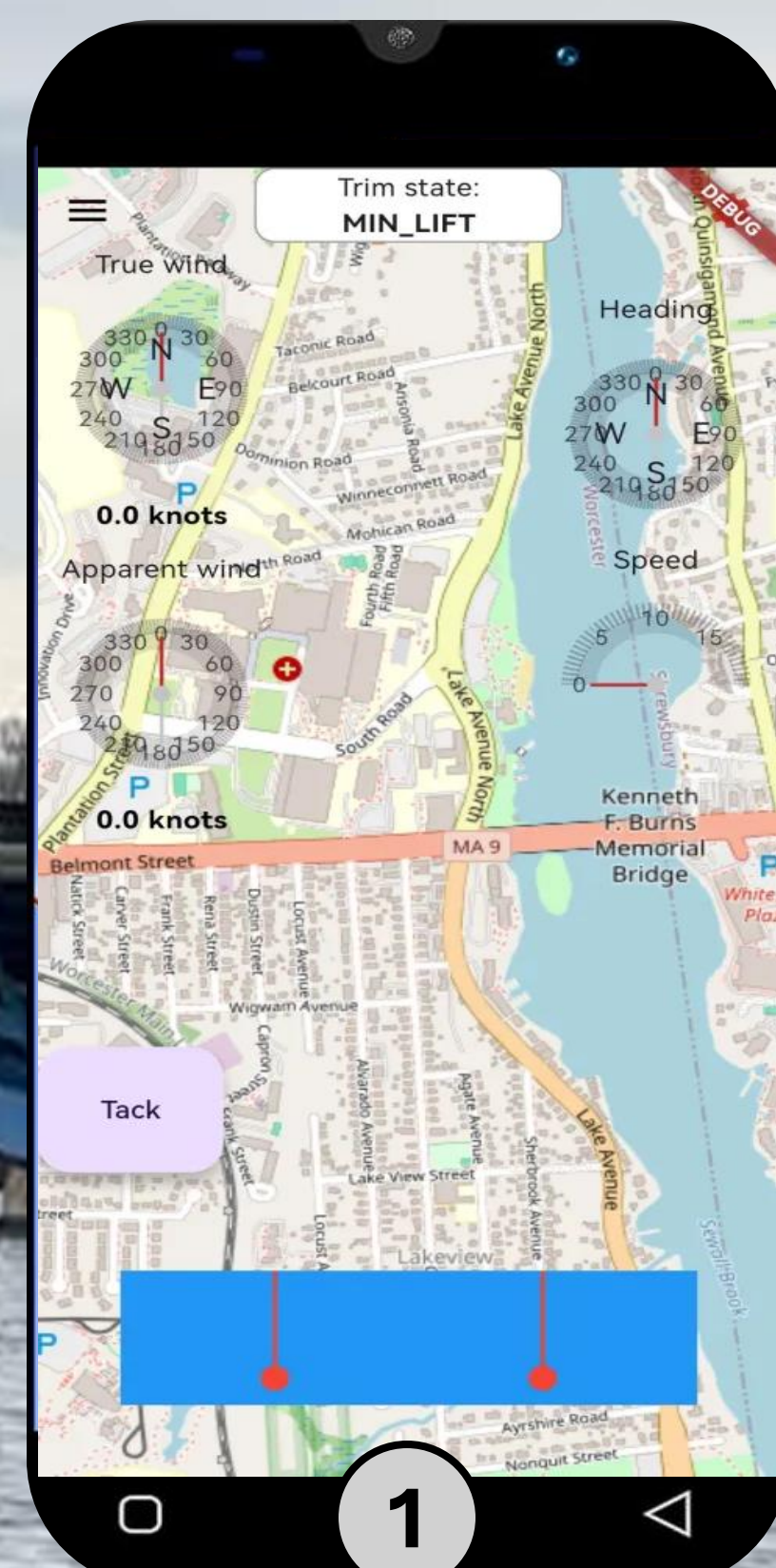
## 2 Trim Tab and Counterbalance

- Controls the angle of the sail
- Modular trim tab design
- Self-trimming airfoil counterbalance
- Reduces transportation space requirements
- Improves effective sail area by >10%



## 3 Vision

- Existing system used blob detection
- New architecture created with neural network YOLO11n model
- Remove calibration requirements
- Improved recognition performance
- Benchmarked >90% recognition at ≤10m

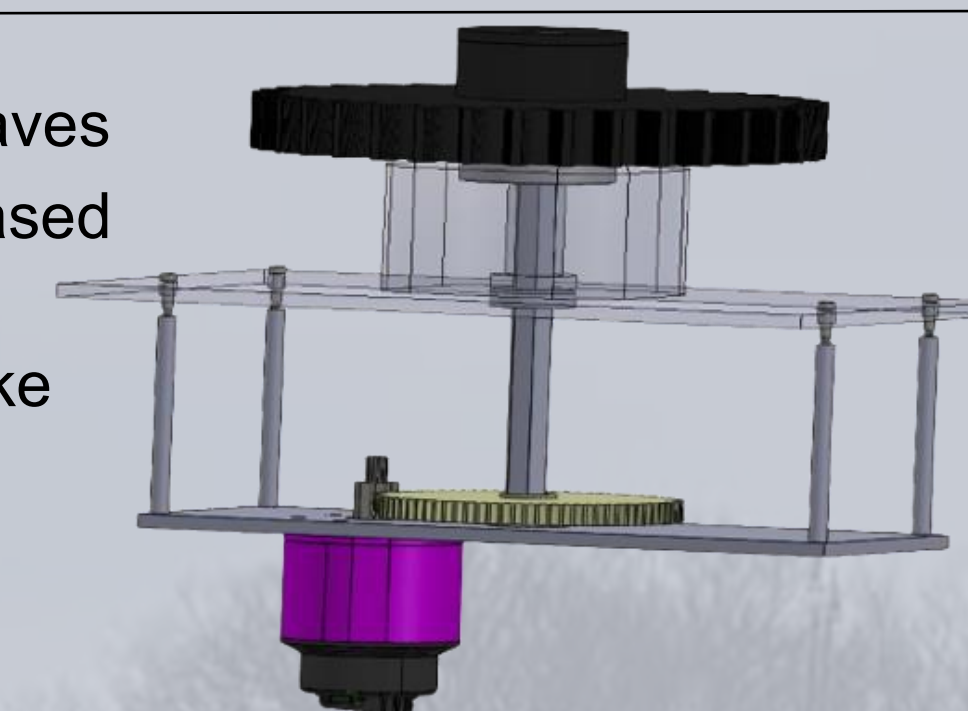


## Acknowledgements

This project was made possible through the support of our advisors Professor William Michalson and Kenneth Stafford. Additionally, we would like to thank Alexander Tucker, and the previous Sailbot MQP teams for their assistance during the process.

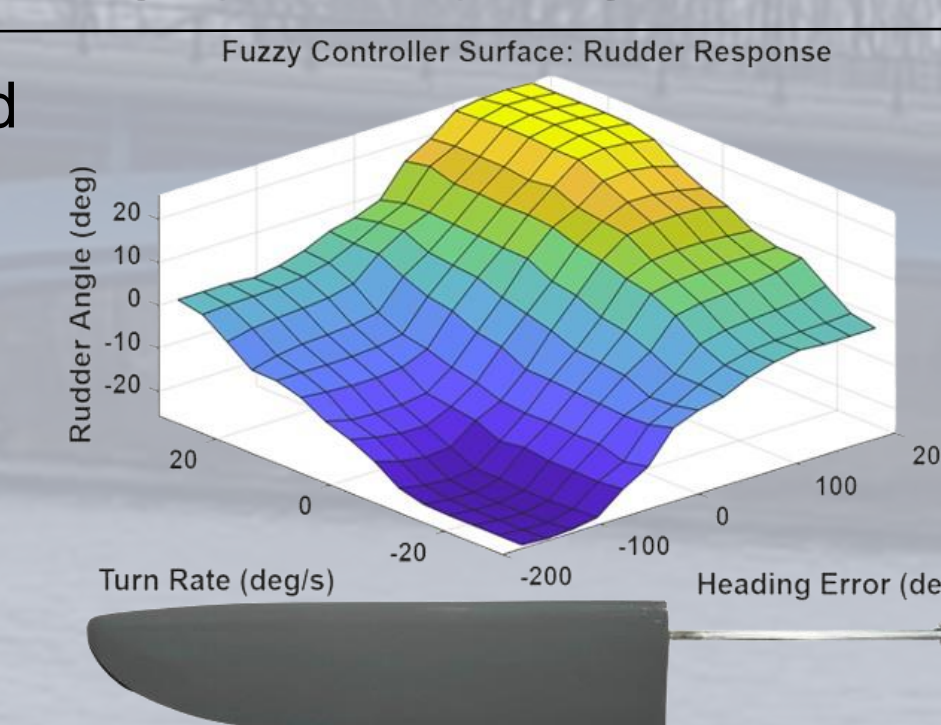
## 4 Damper

- Reduces sail oscillations caused by waves
- Shifted from a viscous fluid to motor based damper
- Powered by a Falcon500 motor in 'brake mode'
- 10:1 gear ratio



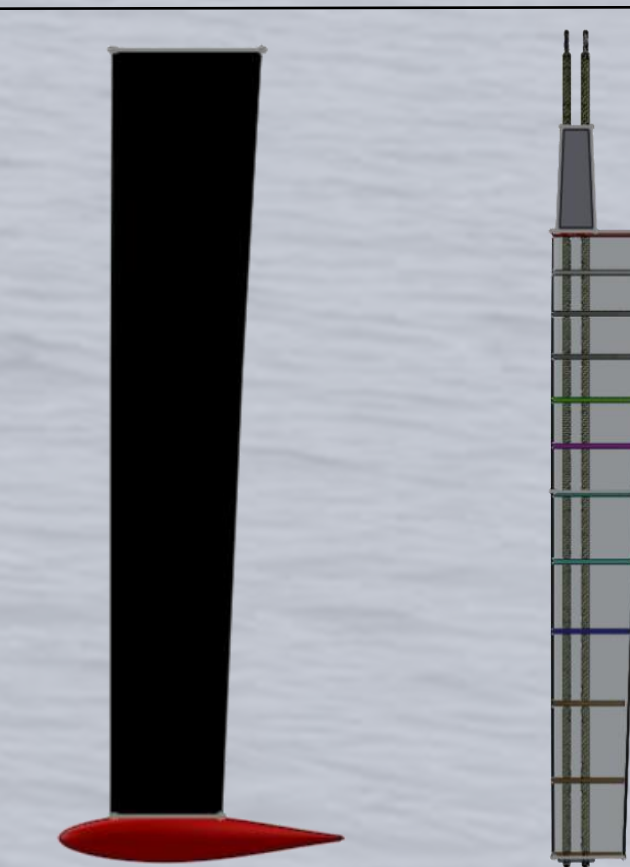
## 5 Rudder and Rudder Controller

- Preexisting rudders struggled in low wind
- Controller needed refinement
- Increased lift at low speed and higher angle of stall
- Overhauled fuzzy rudder controller for more advanced path following and easier tuning



## 6 Keel

- Generates hydrodynamic lift to counteract heeling forces and maintain course stability
- Increased keel fin from 0.97m to 1.3m maintaining righting moment
- New lead casted ballast
- Improved aspect ratio of 7.03 and taper ratio of 0.72
- Quicker mounting solution



## System Validation

- Mock search and rescue IRSR event
- Initiates a search pattern and vision model to search for and locate a buoy
- Autonomously navigate to the buoy
- Systems individually benchmarked

