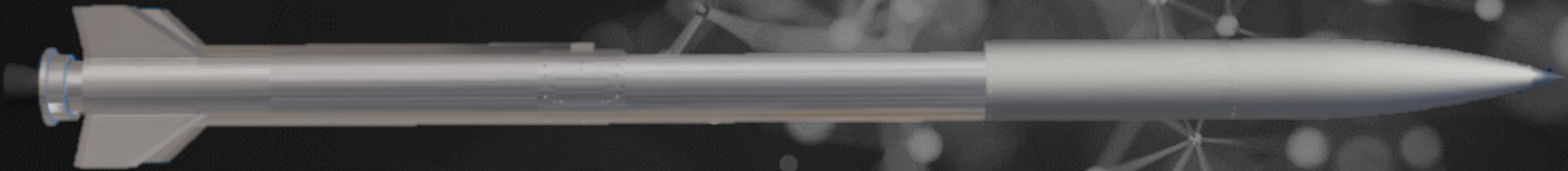


# PROJECT PORTFOLIO | SANTHOSH SANKAR

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Above: render of Clementine, MASA's Largest collegiate liquid  
bi-propellant rocket



MICHIGAN VERTICAL FLIGHT TECHNOLOGY



**MASA**  
AERODYNAMICS

The logo for MASA Aerodynamics. It features the letters "MASA" in a large, bold, dark blue sans-serif font. Below it, the words "AERODYNAMICS" are written in a smaller, dark blue sans-serif font.

# Significant Teams

MRacing

Michigan Vertical Flight Technology (MBSE)

Michigan Aeronautical Science Association

Human Powered Submarine

CubeSat Flight Lab

# MRacing

# Formula SAE



Aerodynamics  
Team Member

# MRacing – Formula SAE

Aerodynamics Team Member



- **Objective:** Analyzing Car Performance and Designing Optimal Aerodynamic Structures for Formula SAE Competition.
- **Approach:**
  - Utilized CAD and CFD software for preliminary aerodynamic analysis.
  - Transitioned to advanced tools (NX and Star CCM) for rendering aerostructures and simulating drag forces.
  - Executed over 10 carbon fiber layups employing both wet and dry methods to construct aerodynamic structures.

Image of Carbon Fiber lay up from Burcella



Image from MVFT and MBSE Leadership Labs

# Michigan Vertical Flight Technology & Model-Based Systems Engineering

Aerodynamics  
MBSE Leadership Team

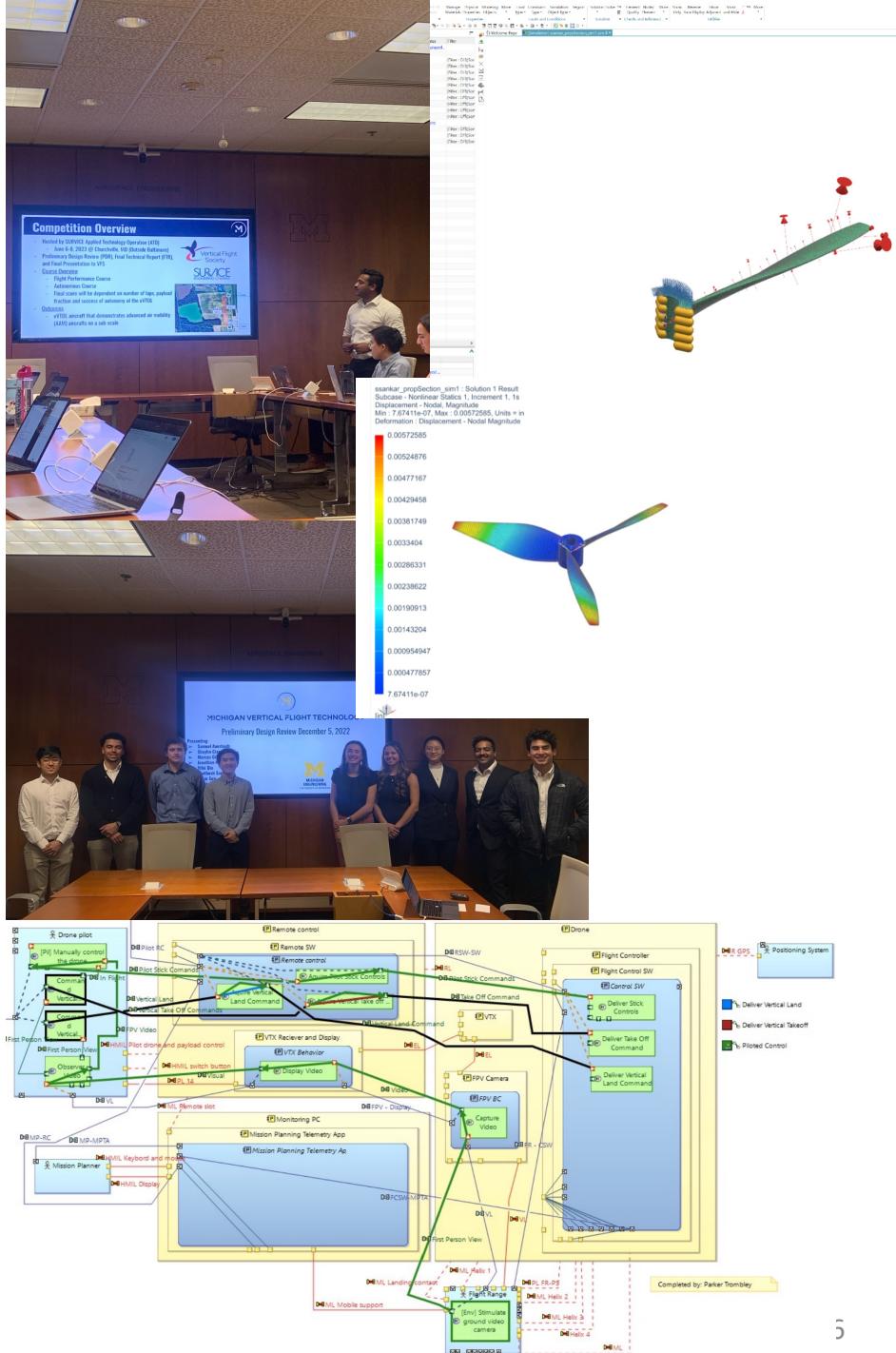
V MBSE  
LEADERSHIP LAB

# Michigan Vertical Flight Technology &

## Model Based Systems Engineering

Aerodynamics Team Member

Images of MVFT's PDR, CAD, CFD, and Systems Modeling



### • Objective:

- Team's Goal: Develop a Competitive eVTOL for Vertical Flight Society's Annual Collegiate Competition.
- Course Involvement: AEROSP 288 - Model-Based Systems Engineering and Leadership.

### • Roles and Responsibilities:

#### • Aerodynamics Team Member:

- Utilized NX, Star CCM, and Siemens Systems Modeling Workbench for modeling aerodynamic structures.

#### • Model-Based Systems Engineering (MBSE) Leadership Team Member:

- Led the development of Initial System Design Architecture.
- Conducted Systems Requirements Review and Preliminary Design Review presentations for industry experts from NASA, Lockheed Martin, Blue Origin, and Colin's Aerospace.

#### • Created and Managed:

- Project Plans
- Budgets
- Project Report Outs
- Risk Management Strategy
- Preliminary Project Plans
- Stakeholder Analysis



# Michigan Aeronautical Science Association

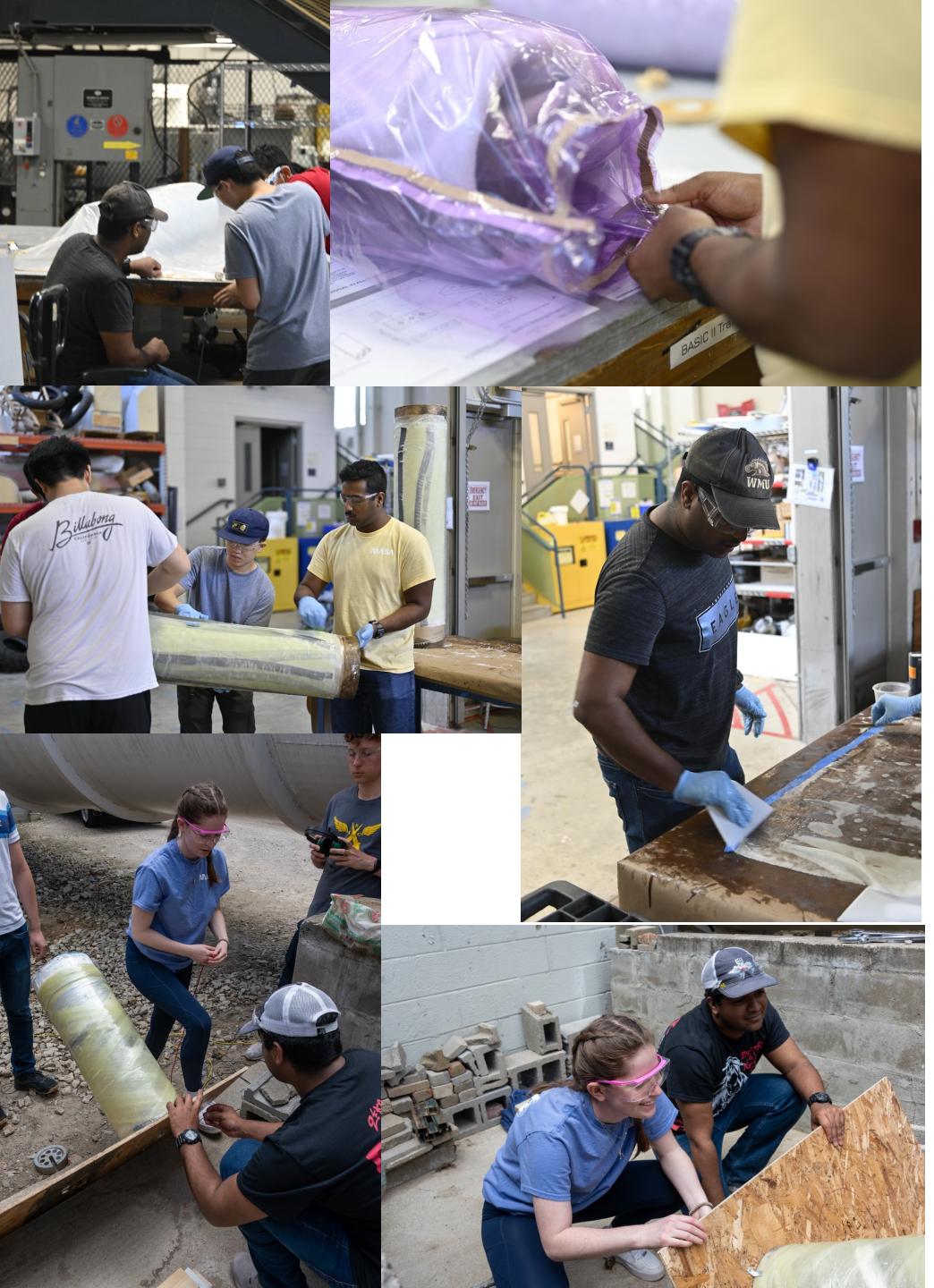
Aerodynamics & Recovery Lead

Marketing Lead

Project Lead

# MASA – General Team Member

Aerodynamics & Recovery Team Member



- **Objective:**

- Joined Team: May 2022.
- Student team building the Largest Liquid Bi-Propellant Rocket - Clementine (08/21-5/14/2023).

- **Team Achievements:**

- **Objective:** Setting Collegiate Records in Rocketry.
- Successfully managed Separation and Deployment Mechanism (SDM) using black powder and pressurized systems.
- Simultaneously Led Projects in SDM, Composites, Recovery, and Fins.

- **Key Responsibilities:**

- **Project Contributions:**

- Conducted Leak Checks during Cold Flows.
- Led 10+ Fiberglass Layups.
- Test and Redesign of SDM: Transitioned from Black Powder to Pneumatic Pressurized System.
- Fabrication: Laser Cut, Milled, and Lathed Parts for Fins, SDM, and Nosecone.
- Software Proficiency: Utilized NX, Star CCM, Teamcenter, and In-House MatLab Simulation Program (Mastran)

Images of SDM testing and Fiberglass layups – taken by Hish Kabaria

# MASA – Aerodynamics & Recovery Lead

## Aerodynamics and Recovery Sub-Team Technical Lead

Images from MASA Archives of system integration checks

### •Leadership Roles:

- **Aerodynamics & Recovery Lead:** Led the final 6 months of Clementine Design, Production, and Launch.
- **Oversight Responsibilities:** Managed all aspects of projects, including SDM, Recovery, Fins, CFD, and Rolleron R&D team.
- **Technology Management:** Oversaw Lonely Mission, a solid rocket project, focusing on passive roll control through Rollerons.

### •Administrative Contributions:

- **Safety Protocols:** Developed the new Safety Operating Procedures (SOP) system and authored over 20 SOP documents.
- **Training Initiatives:** Co-authored training modules on black powder and explosives.

### •Leadership and Team Development:

- Fostered teamwork and camaraderie through various team bonding activities.



# MASA – Marketing Lead

## Marketing Sub-Team Administrative Lead

**masa\_rockets**  
University of Michigan

Clementine is NASA's newest liquid bipropellant rocket, and is a technology demonstrator for future vehicles. From working on Clementine, we have developed a regen-cooled kerolox engine, custom avionics PCB's, seam-welded propellant tanks, custom valves, live in-flight telemetry, composite aerostructures, and more!

Standing at over 20ft tall with a 10.5" diameter, Clementine will become (to our knowledge) the largest rocket ever launched by a student team tomorrow! Clementine has allowed MASA to learn more about advanced rocketry technologies and gain familiarity with building & launching rockets of this scale. We are looking forward to implanting this new knowledge on our next vehicle!

[View insights](#) [Boost post](#)

Liked by umichaero and 283 others  
MAY 13

Add a comment...

You Retweeted

**Michigan Aerospace @MichiganAero** · May 12  
@masa\_rockets is gearing up for launch! Out in the California desert, the team has been keeping busy with preparations for their rocket launch on Saturday, May 13. After a long drive, the team has almost finished assembling the rocket & had it custom wrapped for the main event!

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RESEARCH

### UMich project team MASA successfully launches the largest liquid student built rocket

by Rebecca Lewis  
May 30, 2023



Images of MASA's collaboration outside the team about Clementine

- **Leadership Role:**

- **Marketing Lead:** Elected in annual leadership elections.

- **Social Media Management:**

- Collaborated with the team to create engaging posts across all platforms.
- Developed 20 posts across LinkedIn, X, Instagram, Facebook, and YouTube.
- Created video resources for MASA, enhancing awareness for sponsorships and recruitment.

- **Community Engagement:**

- Worked closely with Aerospace and University of Michigan communities to promote awareness of Clementine's record launch.

- **Creative Design and Branding:**

- Illustrated mission patches and branding elements for the team.

- **Video Production and Organization:**

- Orchestrated video shoots for branding and recruitment purposes.

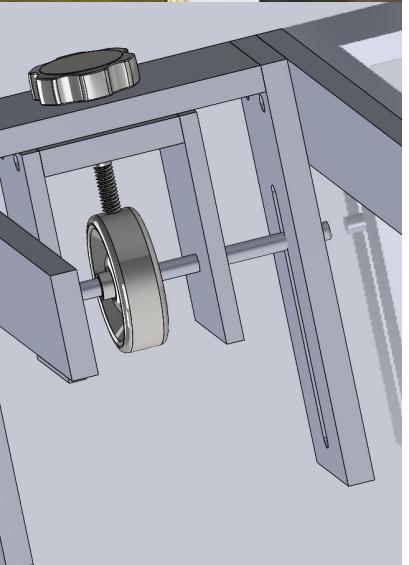
- **Impact and Results:**

- Achieved a 130% increase in LinkedIn views.
- Garnered a 305% rise in Facebook engagement.
- Secured a 46.9% increase in Instagram interactions.
- Enhanced X platform visibility by 18%.



# HUMAN POWERED SUBMARINE

CAD AND DESIGN ADVISOR



# HUMAN POWERED SUBMARINE

General Propulsion and Hull Subteam Member

- **Project Objective:**

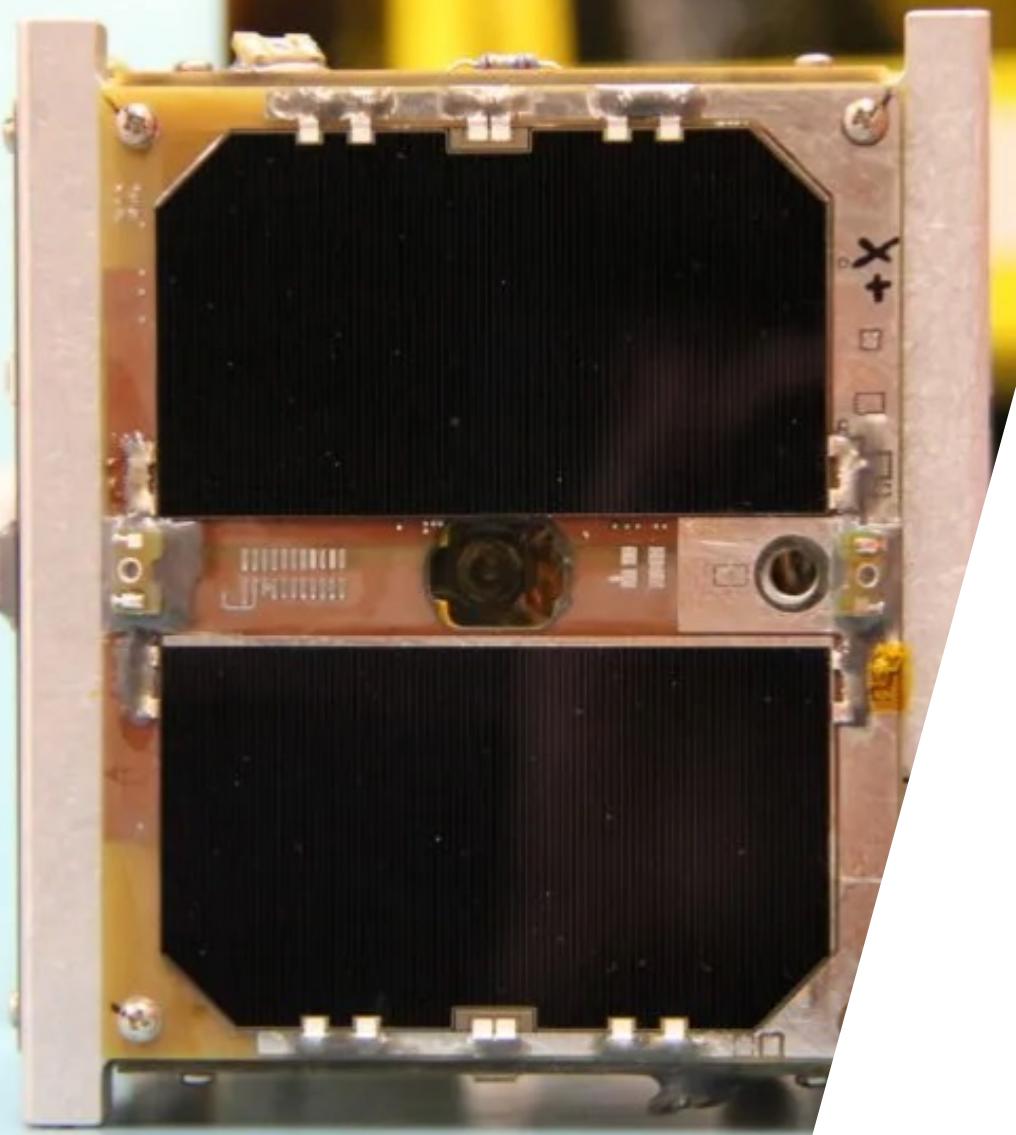
- Build, test, and innovate a human-powered submarine for the European Submarine Race in Gosport, England (Summer 2024).

- **Propulsion System Design:**

- Collaborated with the Propulsion Team to design and source parts as well as create parts using Mills and 3D Printing
- Created propeller design using AERO3P 335 and 325 notes and implementing a code which helps determine an appropriate propeller
- Utilized CAD to create an efficient and powerful pedal-based propulsion system, focusing on innovation and performance.

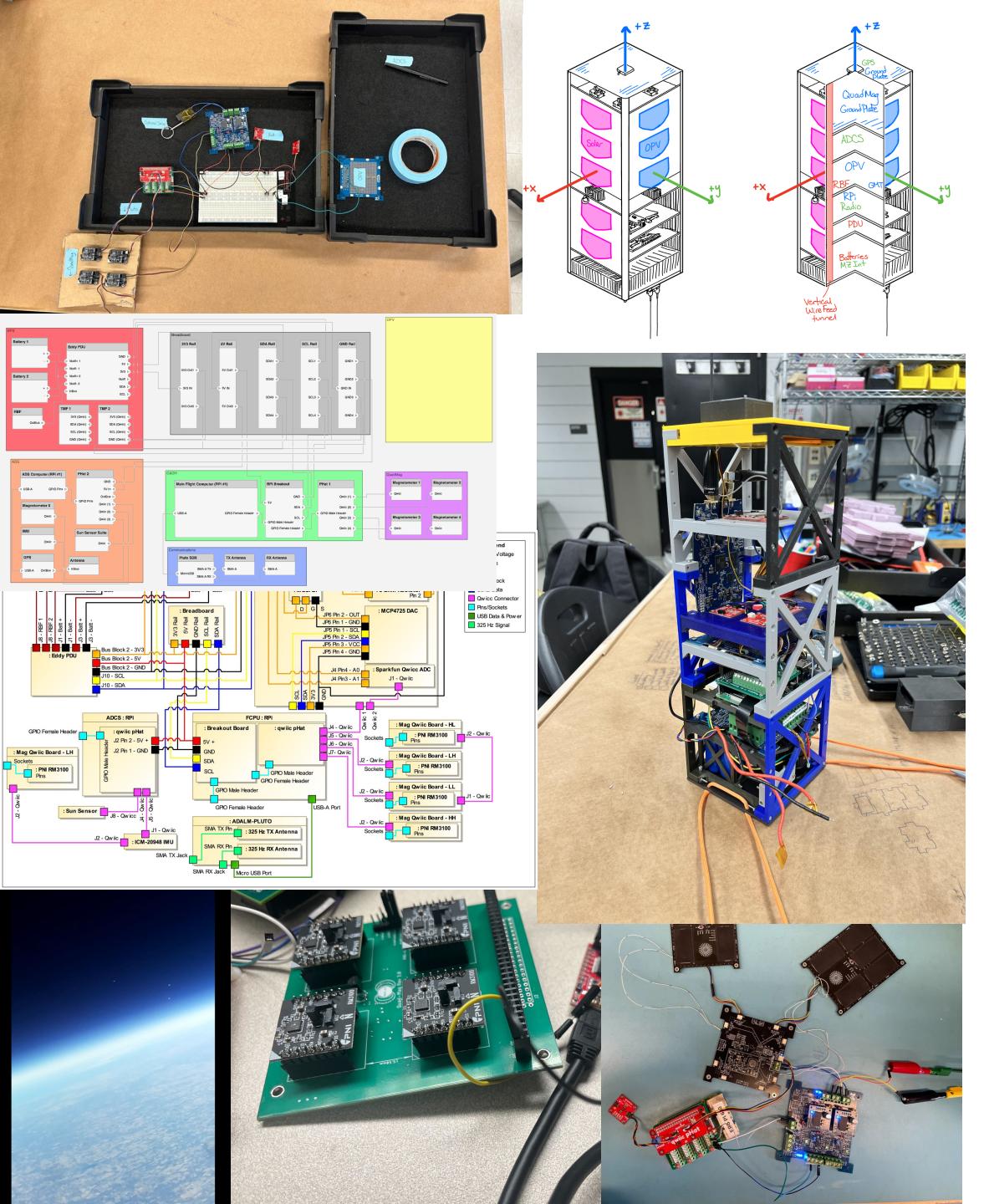
- **Submarine Hull Construction:**

- Executed a meticulous fiberglass layup to craft a hydrodynamic and maneuverable submarine hull, ensuring optimal performance in the water



# CUBESAT FLIGHT LAB

SYSTEMS ENGINEER



# CUBESAT FLIGHT LAB

## Systems Engineer

- Project Overview:

- Working alongside a class of 30 interdisciplinary majors to design, build, test, and launch Michigan's next research spacecraft carrying out 3 different research experiments aboard MC-10.
- Created a series of prototypes such as FlatSats and StratoSats carrying Quad Magnetometers and Organic Photo Voltaic cells using the Systems V design process to better understand developing technologies in spacecraft.
- Integrated a Raspberry Pi-based flight computer and payloads with an in-house EPS system to be mounted onto the 3D-printed structure for StratoSat Prototypes.

- Role: Systems Engineer

- Requirements Management:

- Developed comprehensive requirement documents and ensured ongoing communication with the team to maintain document organization.

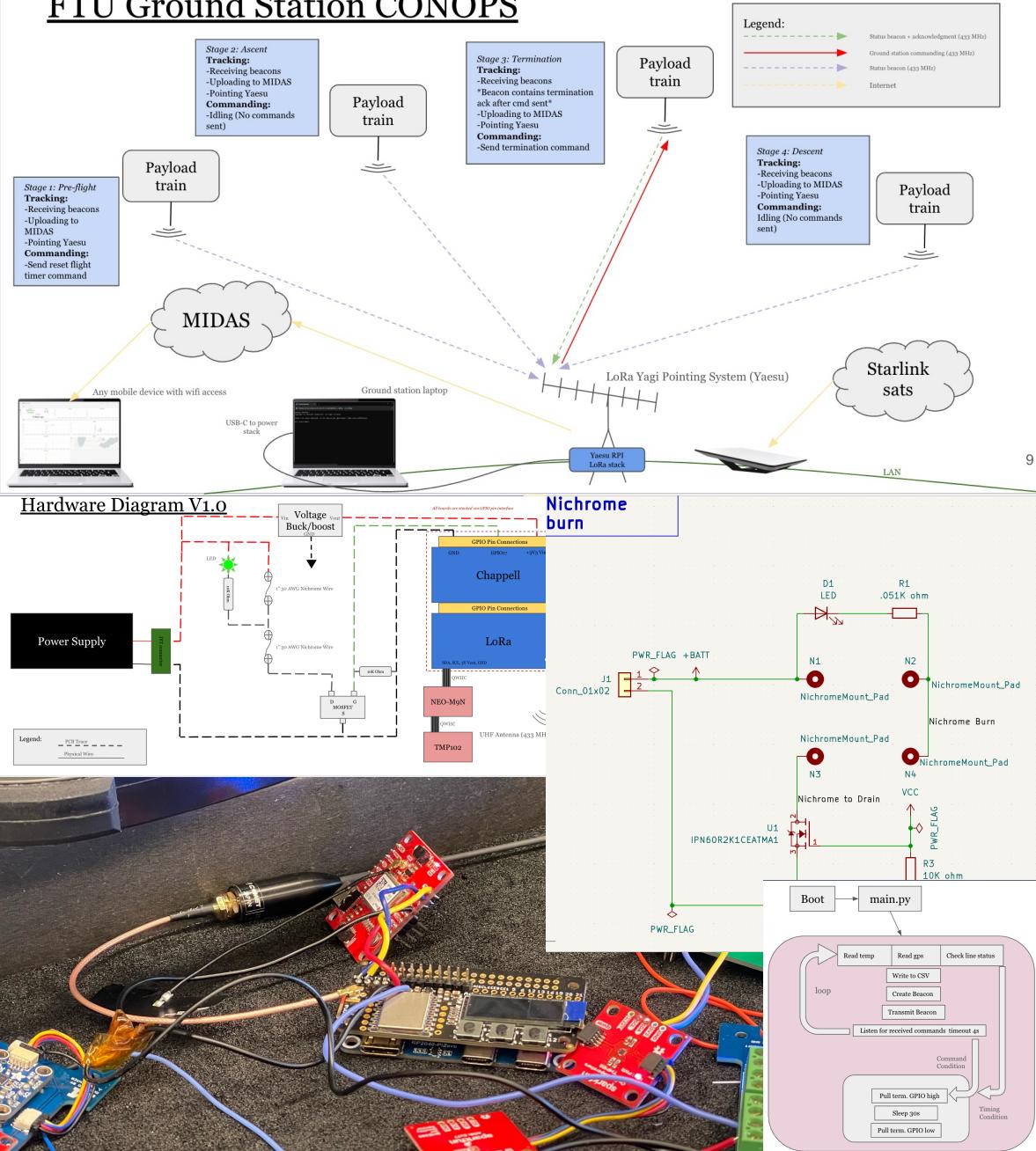
- Architectural Design:

- Created high-level and sub-team level architectural block diagrams, ensuring seamless integration within subsystems and redundancy compliance with CubeSat guidelines.

- Design Reviews:

- Conducted and presented realistic design reviews following industry standards.
- Implemented design updates to maintain clear documentation and consistency with established requirements.

## FTU Ground Station CONOPS



# CUBESAT FLIGHT LAB

## Flight Termination Unit

- Project Overview

- Designed a flight termination unit to terminate High-Altitude Balloon (HAB) StratoSat flights to avoid undesired landing areas such as forests, lakes, trees, and populated areas.
  - Conducted trade studies among various microcontrollers and communication methods to determine the best architecture.
  - Created requirements and systems - level documents to document the flight termination unit and the operations of the flight termination unit.
  - Wrote software to integrate an RP2040 with a LoRa Adafruit module utilizing the SX1276 chip by Samtech to set up a half-duplex command and data handling system which allowed for controlled termination commands sent by a ground station LoRa module

# THANK YOU



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