12/03/24 Senior Design 1: Final Presentation

# Antenna Pointer


University of Central Oklahoma
School of Engineering, College of Mathematics and Science

**Team 3 Members:**

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**Faculty Advisor:** Dr. Tej Lamichhane

**Faculty Co- Advisor:** Dr. Evan Lemley

**Faculty Co-Advisor:** Dr. Nesreen Alsbou

**Industry Contact:** Jonathan Adams (FAA)

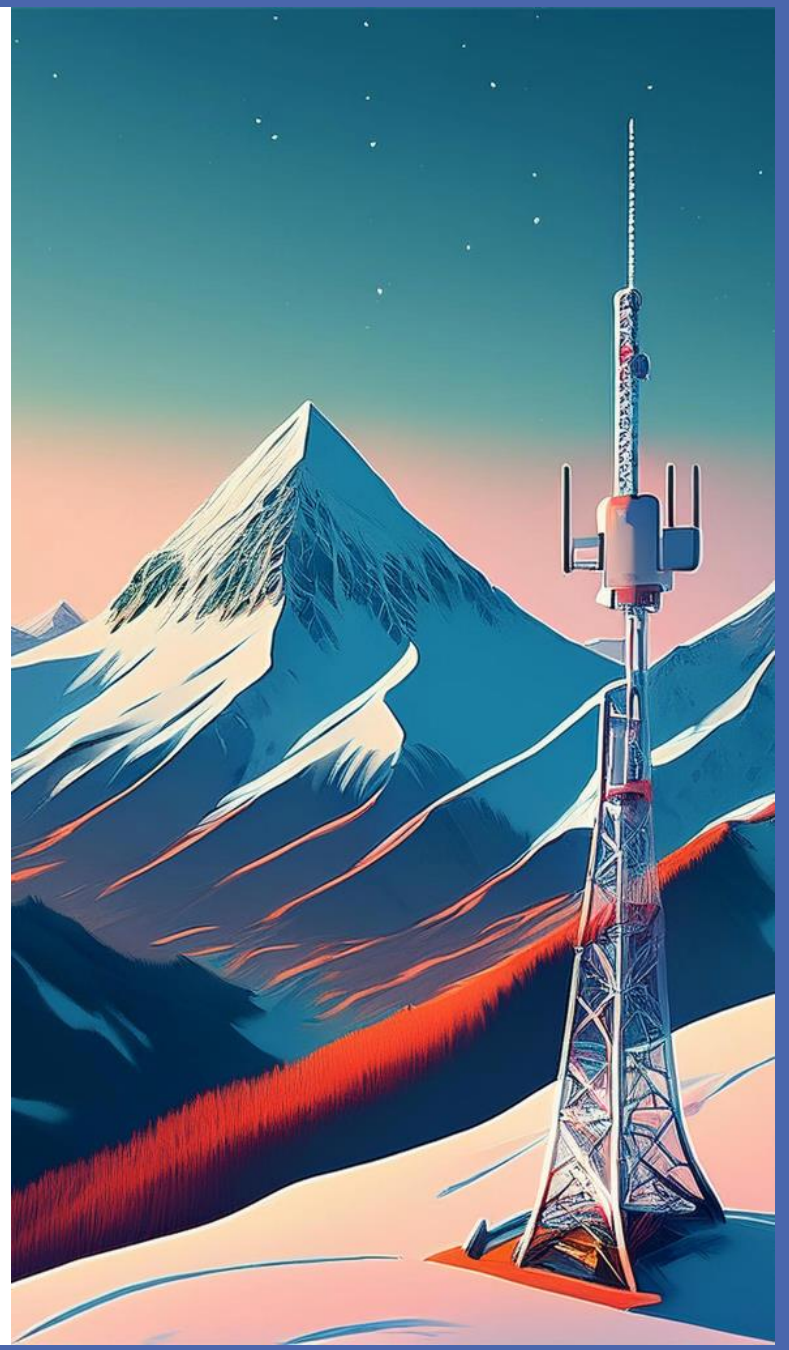
# Introduction

ASTI team with FAA

Setup antennas at FAA supported airports

- Point at geostationary satellites
- No hardline communication

Use compass and plumb bob for orientation



# Proposed Solution

**Digital Handheld Device**

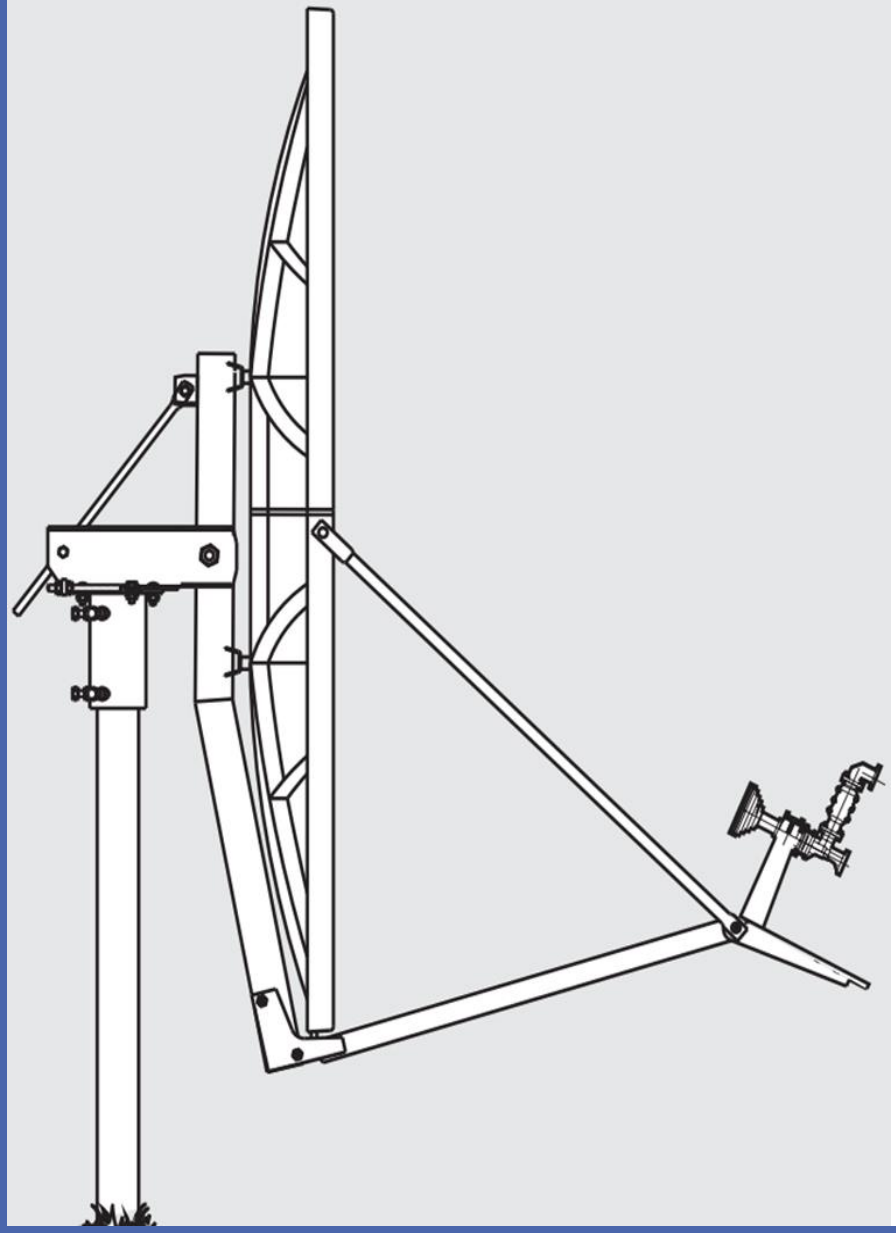
- Outputs current antenna orientation
- Battery powered, usable in cold weather

**User Manual**

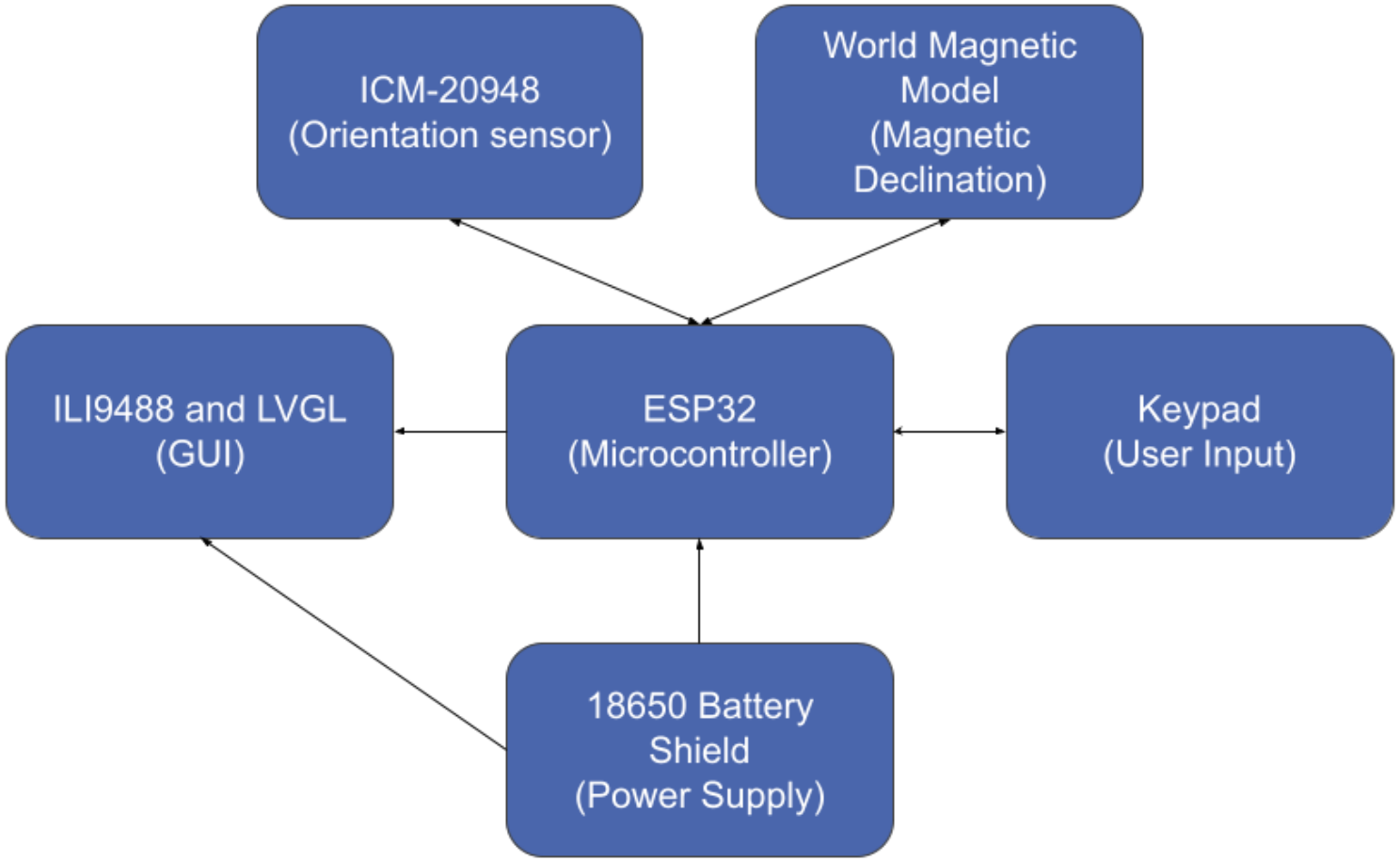
- How to use

**Design Documentation**

- CAD Models
- Wiring Diagrams
- Software

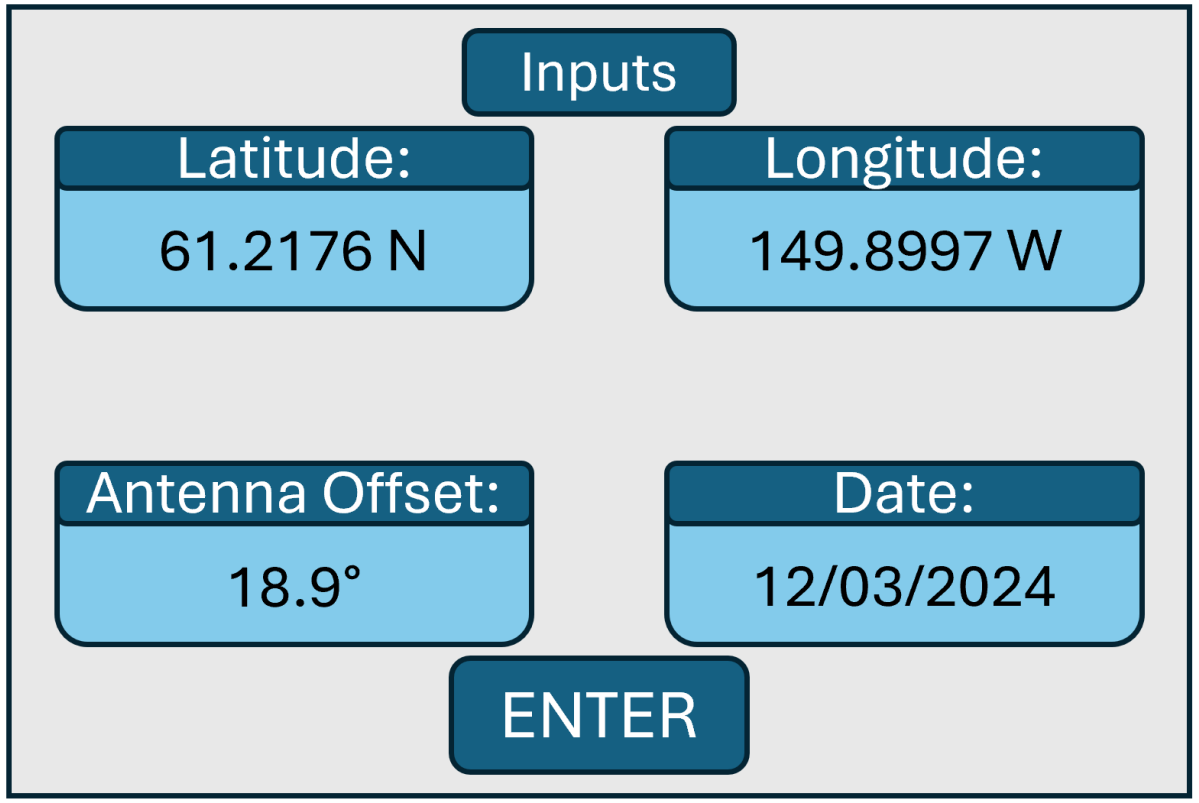


# Technical Structure

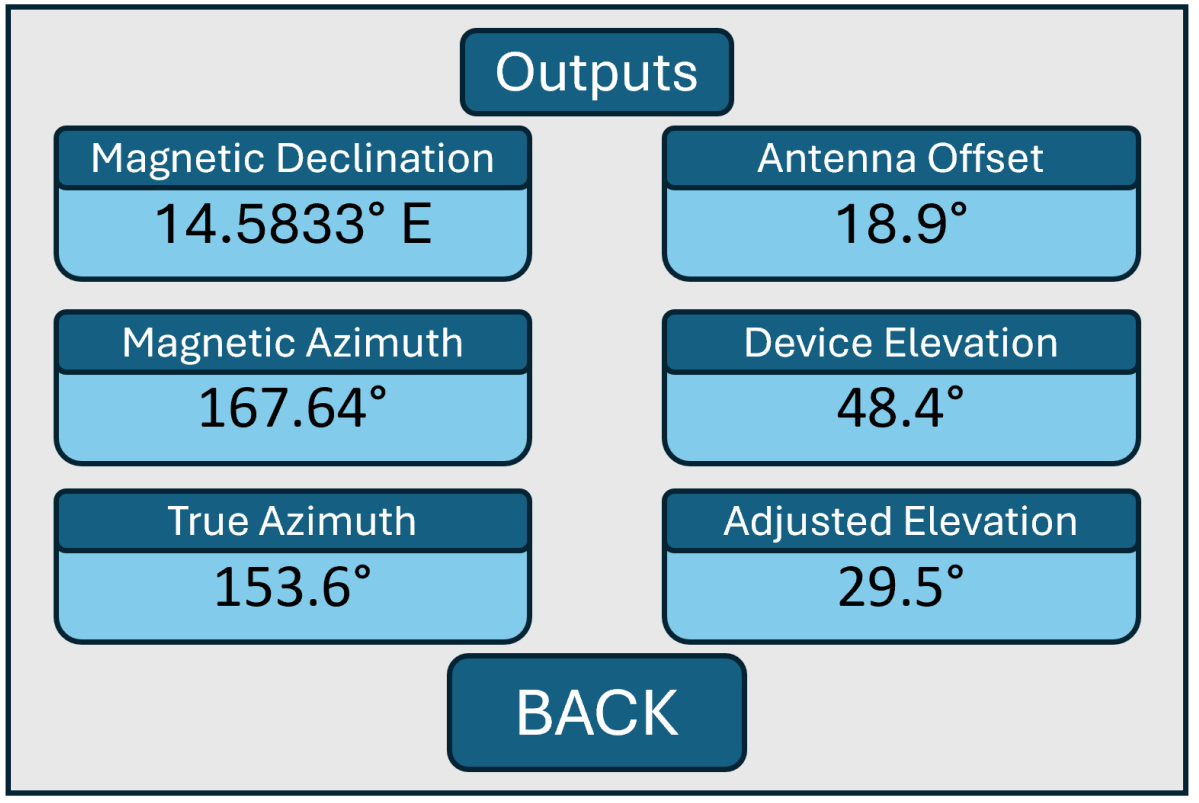


# User Interface Prototype

## Input

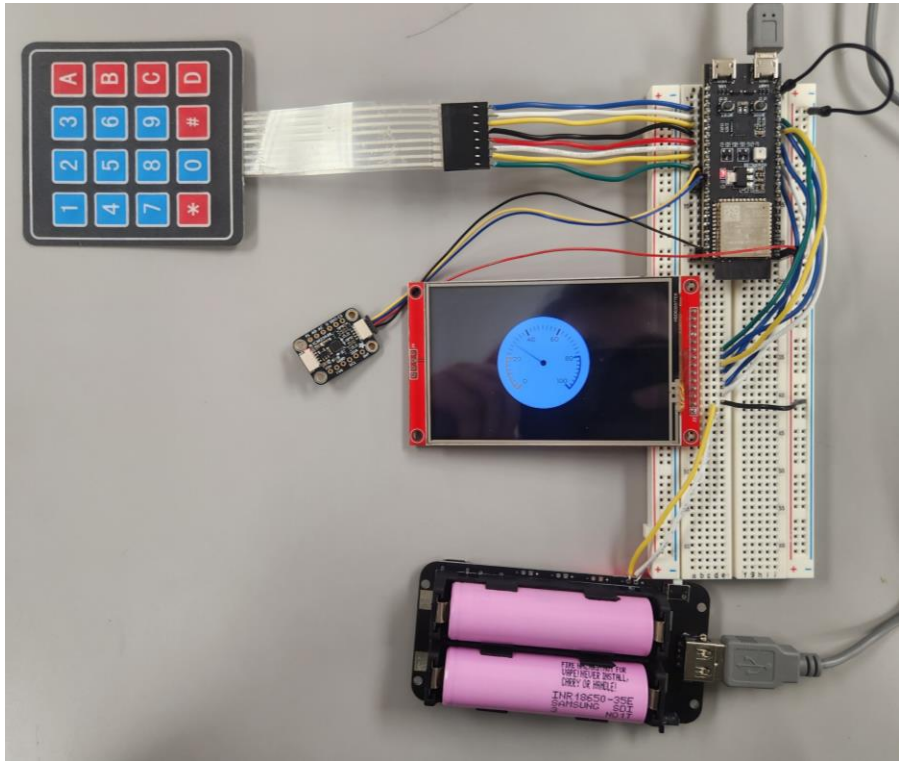



## Output



# Electrical Prototype

## Circuit Layout




## Outputs

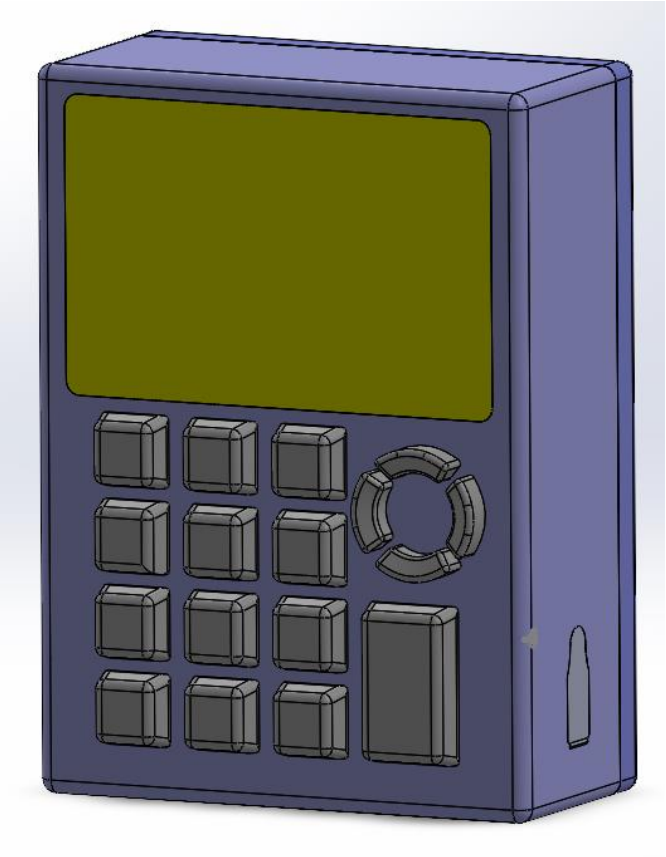
```
icm test: Azimuth: 80.749901 degrees
icm test: Elevation: 11.916349 degrees
```

```
BUTTON TEST: BTN0: BUTTON_PRESS_DOWN
BUTTON TEST: BTN0: BUTTON_PRESS_UP[220]
BUTTON TEST: BTN0: BUTTON_SINGLE_CLICK
```

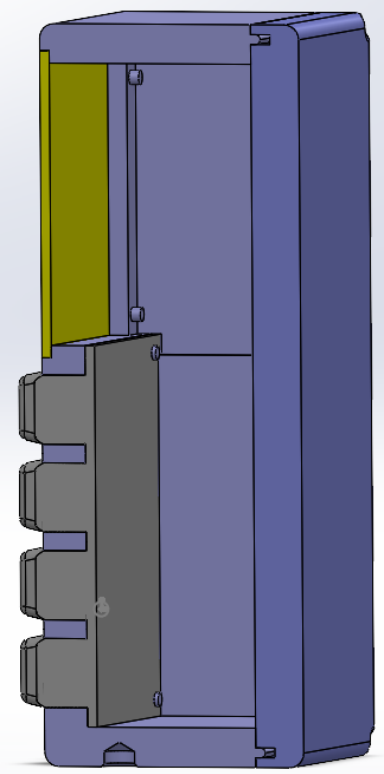
GitHub repository:
UCO_SD_TEAM3_AntennaPointer [1]

# Antenna Pointer Device Shell

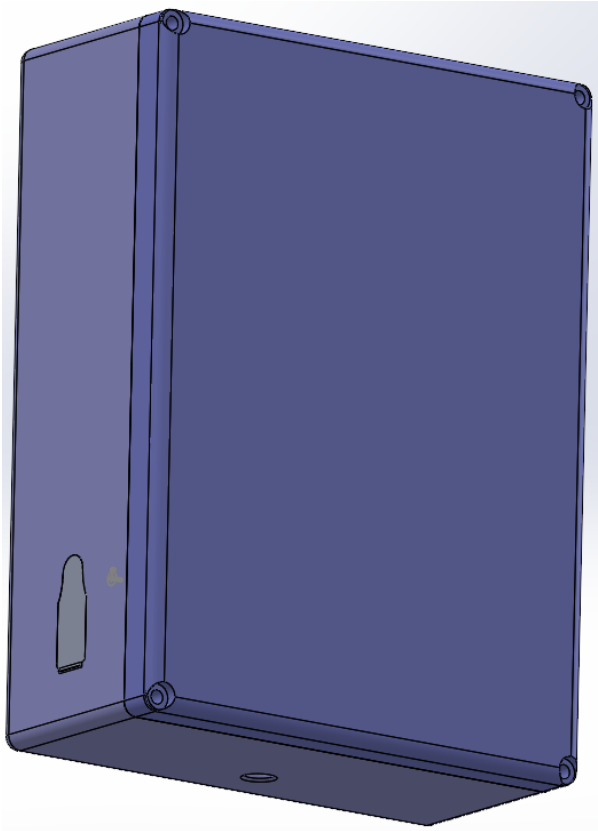
**Keypad**

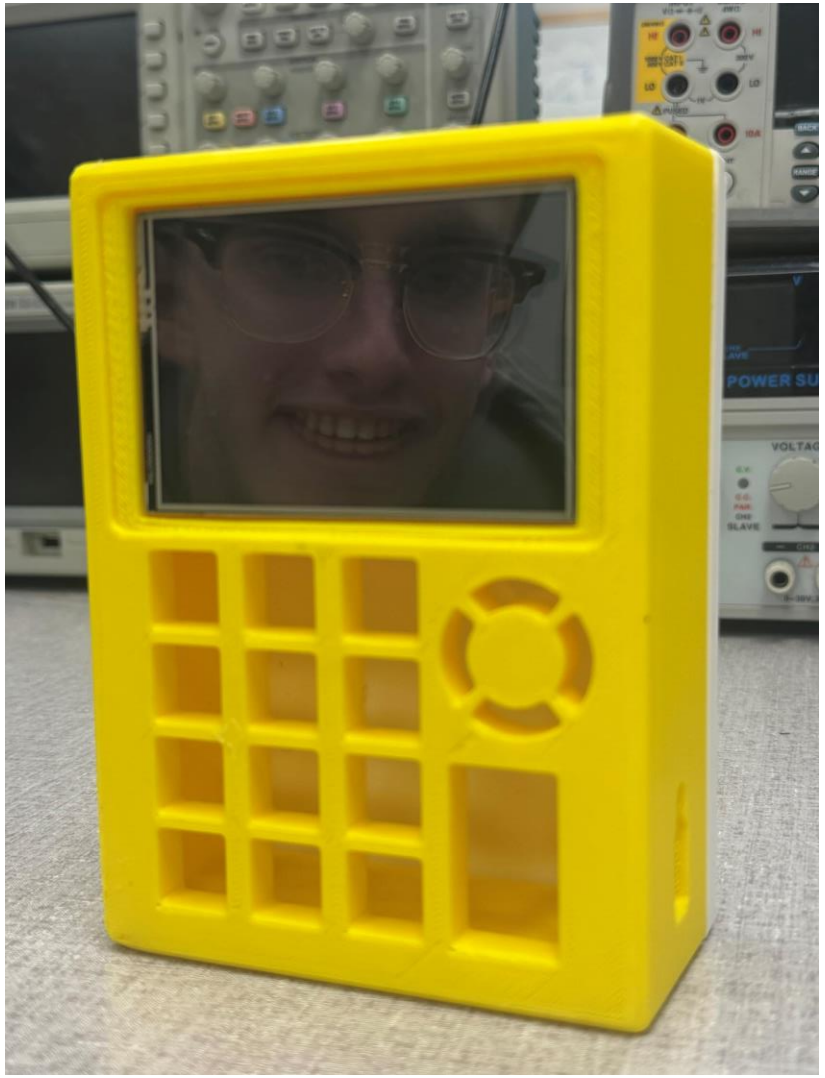


**Inside**



**Backplate**





# ANTENNA POINTER PROTOTYPE

# Impacts

**Social**

- Communication is critical
- ATC and pilot communication
- Weather data
- Supports aircraft operations

**Economic**

- Lower maintenance costs
- Device is relatively cheap

# Project Standards

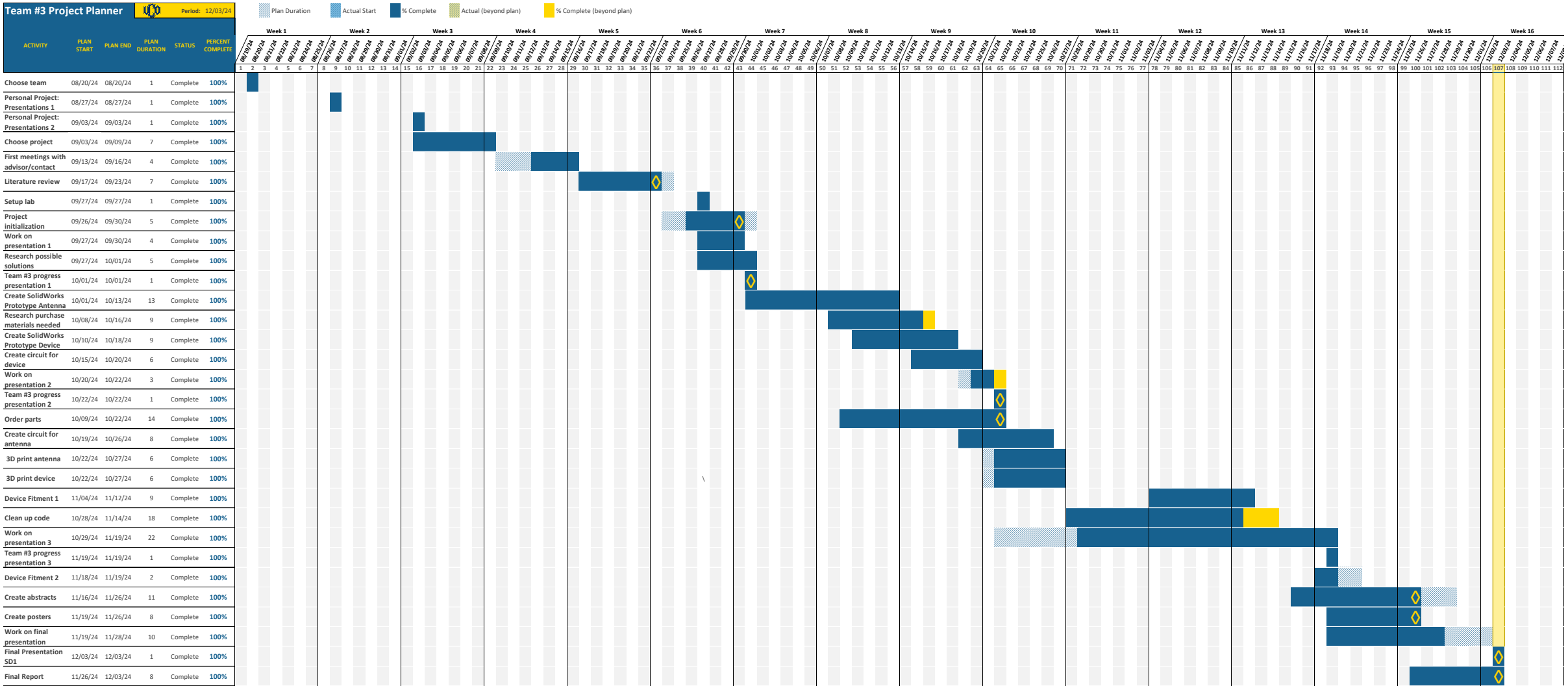
**Mechanical**

- ASME Y14.5:
  Dimensioning and Tolerancing

**Electrical**

- IEEE 315:
  Graphical Symbols for Electrical and Electronic Diagrams
- IEEE P145:
  IEEE Draft Standards for Definition of Terms for Antennas

# Timeline

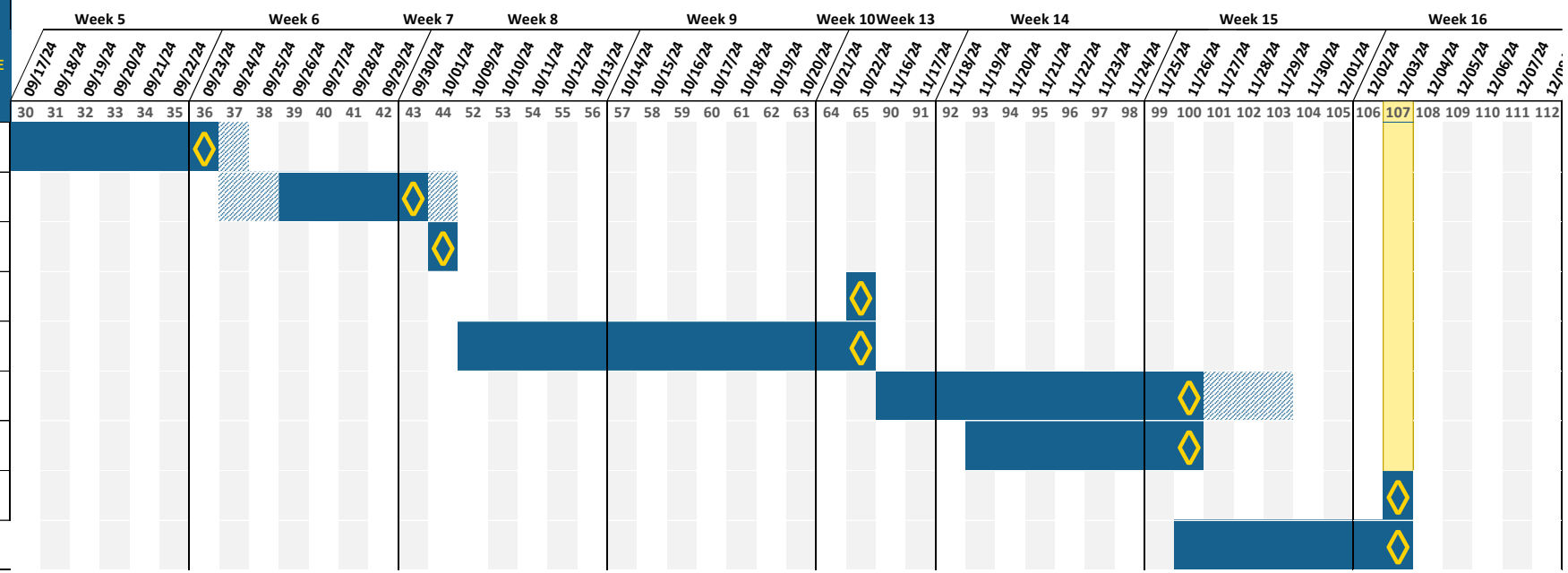


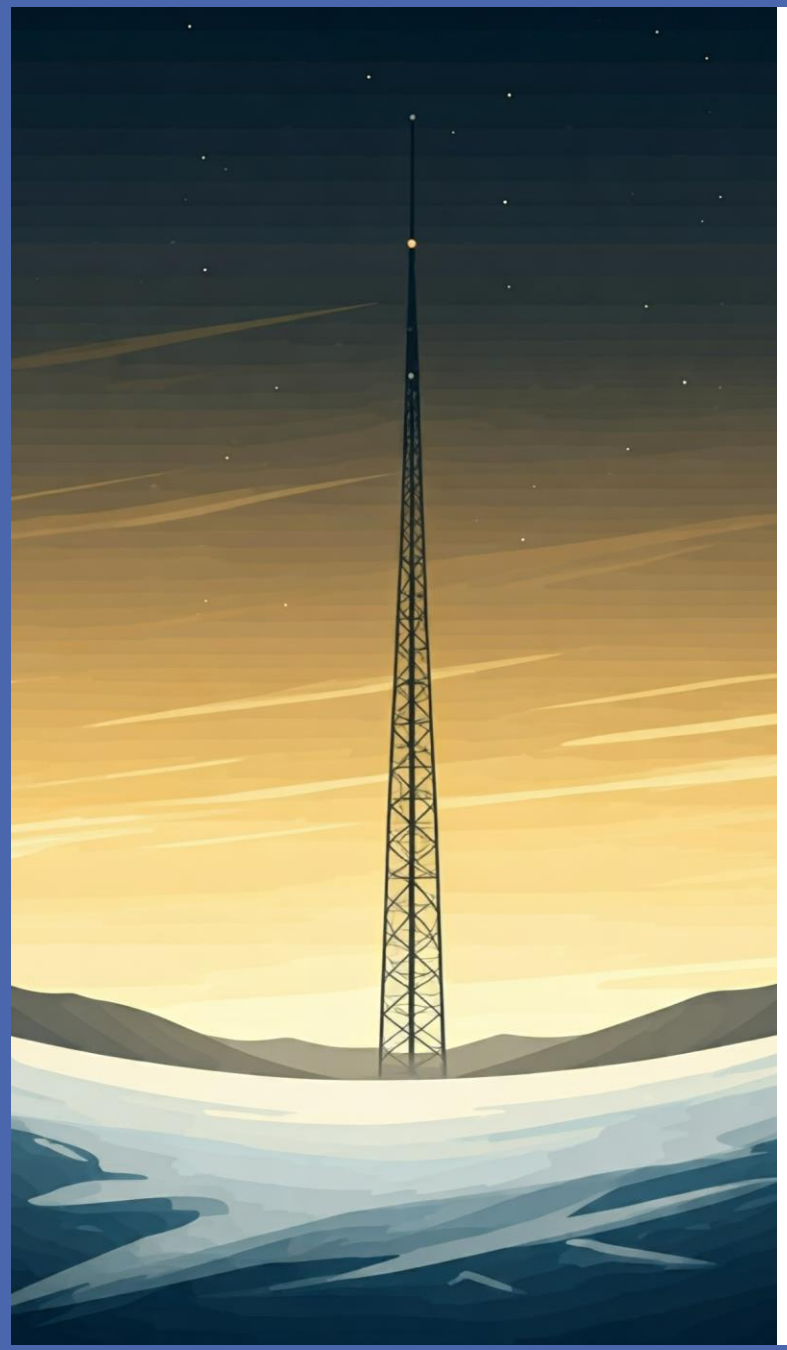

| ACTIVITY | PLAN START | PLAN END | PLAN DURATION | STATUS | PERCENT COMPLETE |
|---|---|---|---|---|---|
| Choose team | 08/20/24 | 08/20/24 | 1 | Complete | 100% |
| Personal Project: Presentations 1 | 08/27/24 | 08/27/24 | 1 | Complete | 100% |
| Personal Project: Presentations 2 | 09/03/24 | 09/03/24 | 1 | Complete | 100% |
| Choose project | 09/03/24 | 09/09/24 | 7 | Complete | 100% |
| First meetings with advisor/contact | 09/13/24 | 09/16/24 | 4 | Complete | 100% |
| Literature review | 09/17/24 | 09/23/24 | 7 | Complete | 100% |
| Setup lab | 09/27/24 | 09/27/24 | 1 | Complete | 100% |
| Project initialization | 09/26/24 | 09/30/24 | 5 | Complete | 100% |
| Work on presentation 1 | 09/27/24 | 09/30/24 | 4 | Complete | 100% |
| Research possible solutions | 09/27/24 | 10/01/24 | 5 | Complete | 100% |
| Team #3 progress presentation 1 | 10/01/24 | 10/01/24 | 1 | Complete | 100% |
| Create SolidWorks Prototype Antenna | 10/01/24 | 10/13/24 | 13 | Complete | 100% |
| Research purchase materials needed | 10/08/24 | 10/16/24 | 9 | Complete | 100% |
| Create SolidWorks Prototype Device | 10/10/24 | 10/18/24 | 9 | Complete | 100% |
| Create circuit for device | 10/15/24 | 10/20/24 | 6 | Complete | 100% |
| Work on presentation 2 | 10/20/24 | 10/22/24 | 3 | Complete | 100% |
| Team #3 progress presentation 2 | 10/22/24 | 10/22/24 | 1 | Complete | 100% |
| Order parts | 10/09/24 | 10/22/24 | 14 | Complete | 100% |
| Create circuit for antenna | 10/19/24 | 10/26/24 | 8 | Complete | 100% |
| 3D print antenna | 10/22/24 | 10/27/24 | 6 | Complete | 100% |
| 3D print device | 10/22/24 | 10/27/24 | 6 | Complete | 100% |
| Device Fitment 1 | 11/04/24 | 11/12/24 | 9 | Complete | 100% |
| Clean up code | 10/28/24 | 11/14/24 | 18 | Complete | 100% |
| Work on presentation 3 | 10/29/24 | 11/19/24 | 22 | Complete | 100% |
| Team #3 progress presentation 3 | 11/19/24 | 11/19/24 | 1 | Complete | 100% |
| Device Fitment 2 | 11/18/24 | 11/19/24 | 2 | Complete | 100% |
| Create abstracts | 11/16/24 | 11/26/24 | 11 | Complete | 100% |
| Create posters | 11/19/24 | 11/26/24 | 8 | Complete | 100% |
| Work on final presentation | 11/19/24 | 11/28/24 | 10 | Complete | 100% |
| Final Presentation SD1 | 12/03/24 | 12/03/24 | 1 | Complete | 100% |
| Final Report | 11/26/24 | 12/03/24 | 8 | Complete | 100% |

# Timeline

**Team #3 Project Planner** — Period: 12/03/24 — % Complete (beyond pla

| ACTIVITY | PLAN START | PLAN END | PLAN DURATION | STATUS | PERCENT COMPLETE |
|---|---|---|---|---|---|
| Literature review | 09/17/24 | 09/23/24 | 7 | Complete | 100% |
| Project initialization | 09/26/24 | 09/30/24 | 5 | Complete | 100% |
| Team #3 progress presentation 1 | 10/01/24 | 10/01/24 | 1 | Complete | 100% |
| Team #3 progress presentation 2 | 10/22/24 | 10/22/24 | 1 | Complete | 100% |
| Order parts | 10/09/24 | 10/22/24 | 14 | Complete | 100% |
| Create abstracts | 11/16/24 | 11/26/24 | 11 | Complete | 100% |
| Create posters | 11/19/24 | 11/26/24 | 8 | Complete | 100% |
| Final Presentation SD1 | 12/03/24 | 12/03/24 | 1 | Complete | 100% |
| Final Report | 11/26/24 | 12/03/24 | 8 | Complete | 100% |





# Future Work

**Nathaniel:**

- Integrate all components
- Program GUI
- Calibrate sensor data (challenge)
- Custom button board

**Joshua:**

- Design device clamp
- Experiment with extending IMU sensor
- Test device – orientation/accuracy

**Cesar:**

- Design waterproof buttons
- Test material – resistance
- Redesign user interface

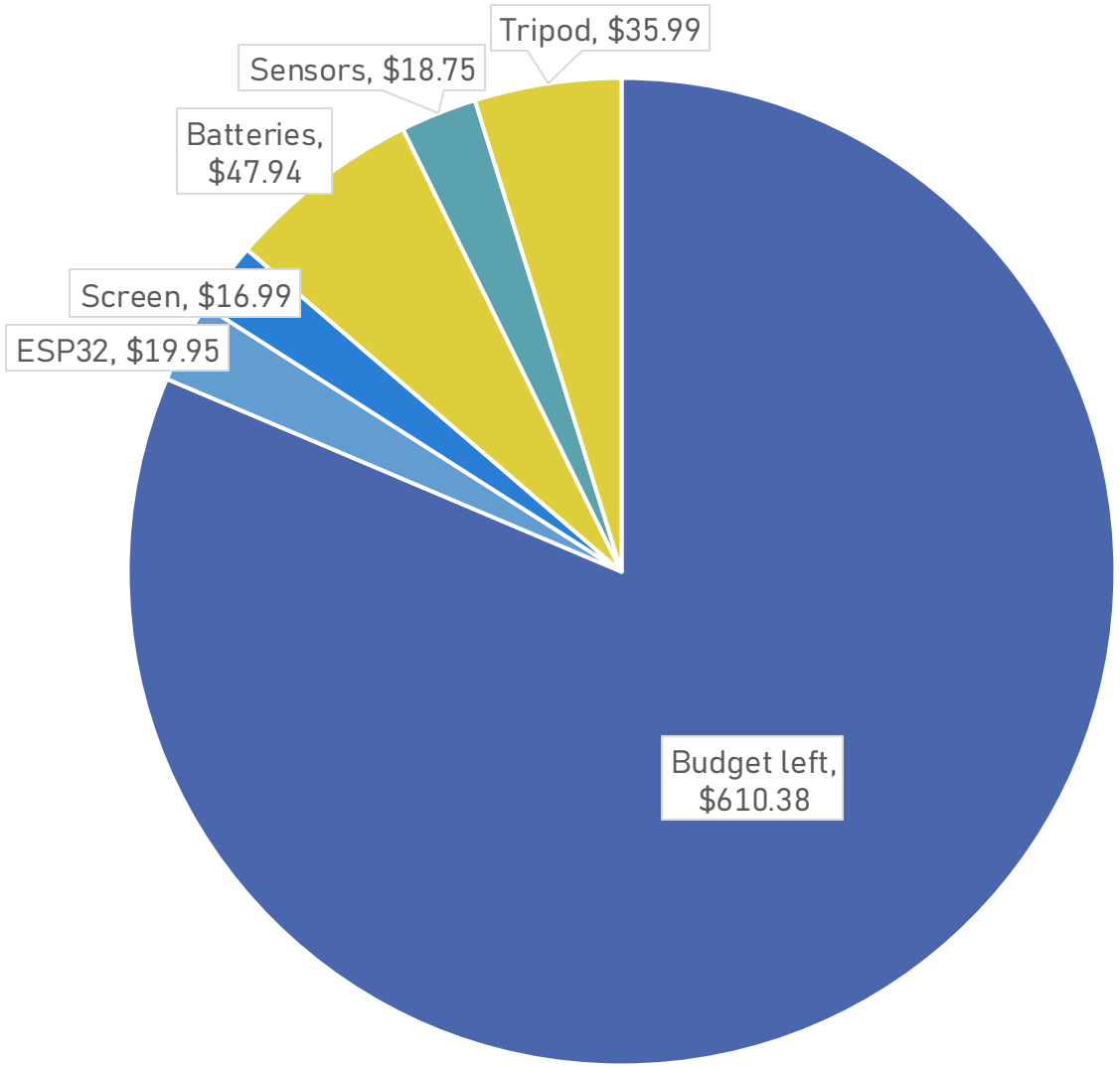
# Budget

**Spent so far:**

- $139.62 spent
- $610.38 left

**Possible Future Costs:**

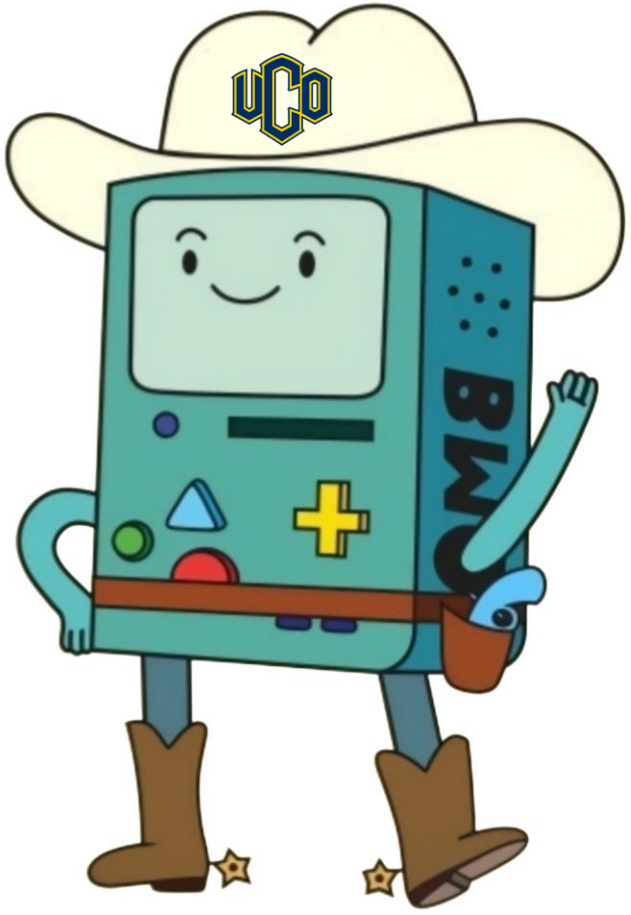
- Custom keypad PCB, switches
- $2.99 Satellite Finder App
- $349.00 Silicone 40A Resin [2]
- Ceramic coated fabric
- Hardware



# Conclusion

- Improve installation time and cost of antennas

- Digital device that accurately determines antenna orientation



# REFERENCES


- [1] https://github.com/zzAstro03/UCO_SD_TEAM3_AntennaPointer
- [2] https://formlabs.com/store/materials/silicone-40a-resin/

# QUESTIONS?

# Thank you