11/19/24 Progress Presentation 3

Antenna Pointer

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

Team 3 Members:

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Cesar Vasquez, M.E.

Faculty Advisor: Dr. Tej Lamichhane

Faculty Co- Advisor: Dr. Evan Lemley

Faculty Co-Advisor: Dr. Nesreen Alsbou

Industry Contact: Jonathan Adams (FAA)

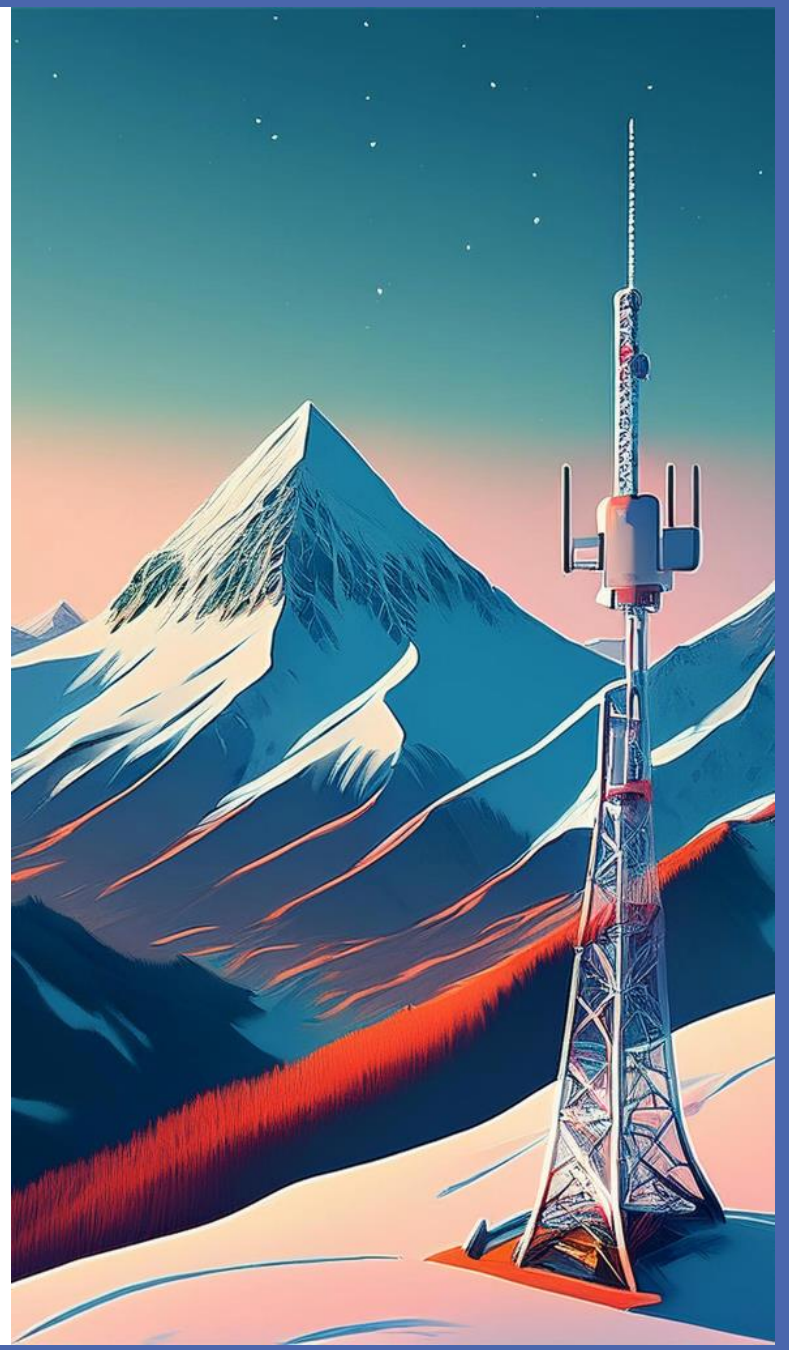
Introduction

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

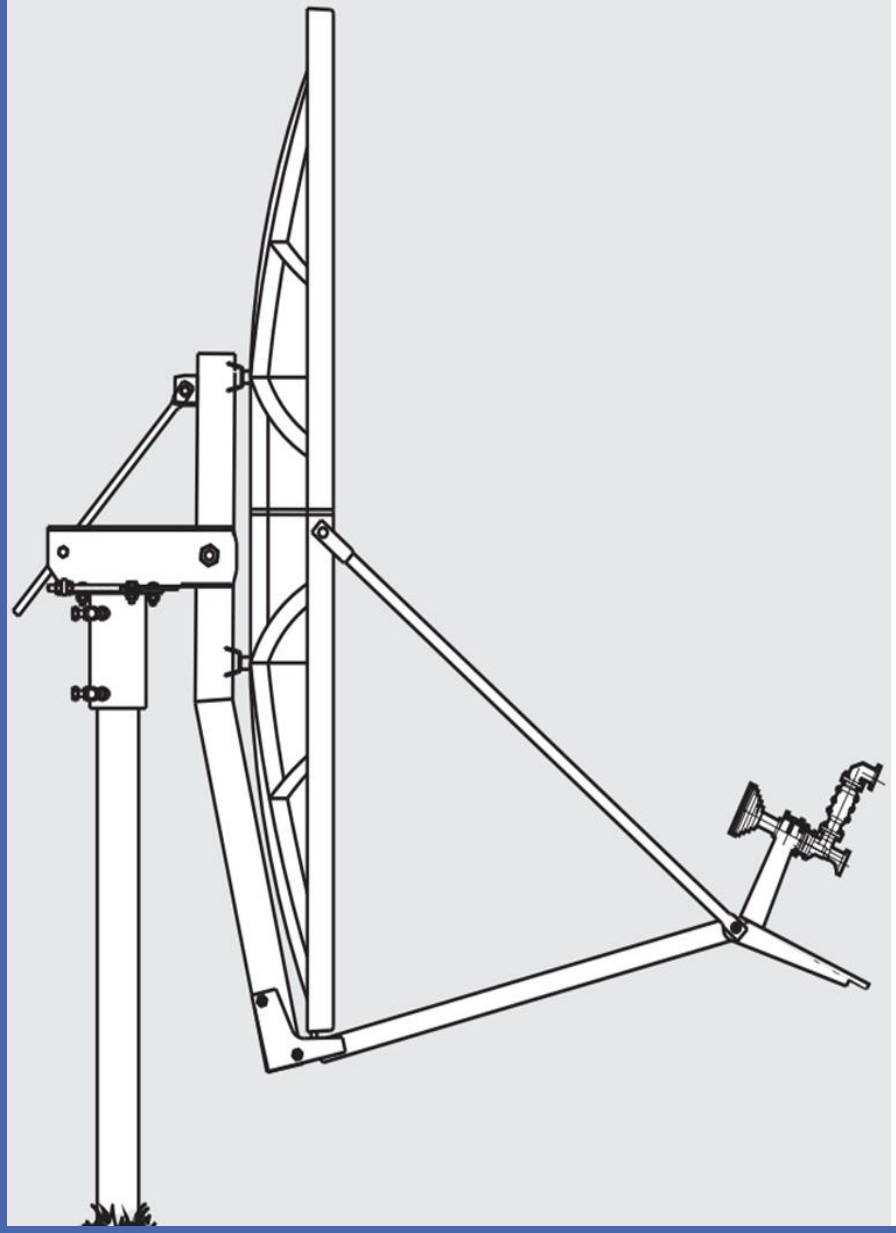
- Outputs current antenna orientation
- Battery powered, usable in cold weather

User Manual

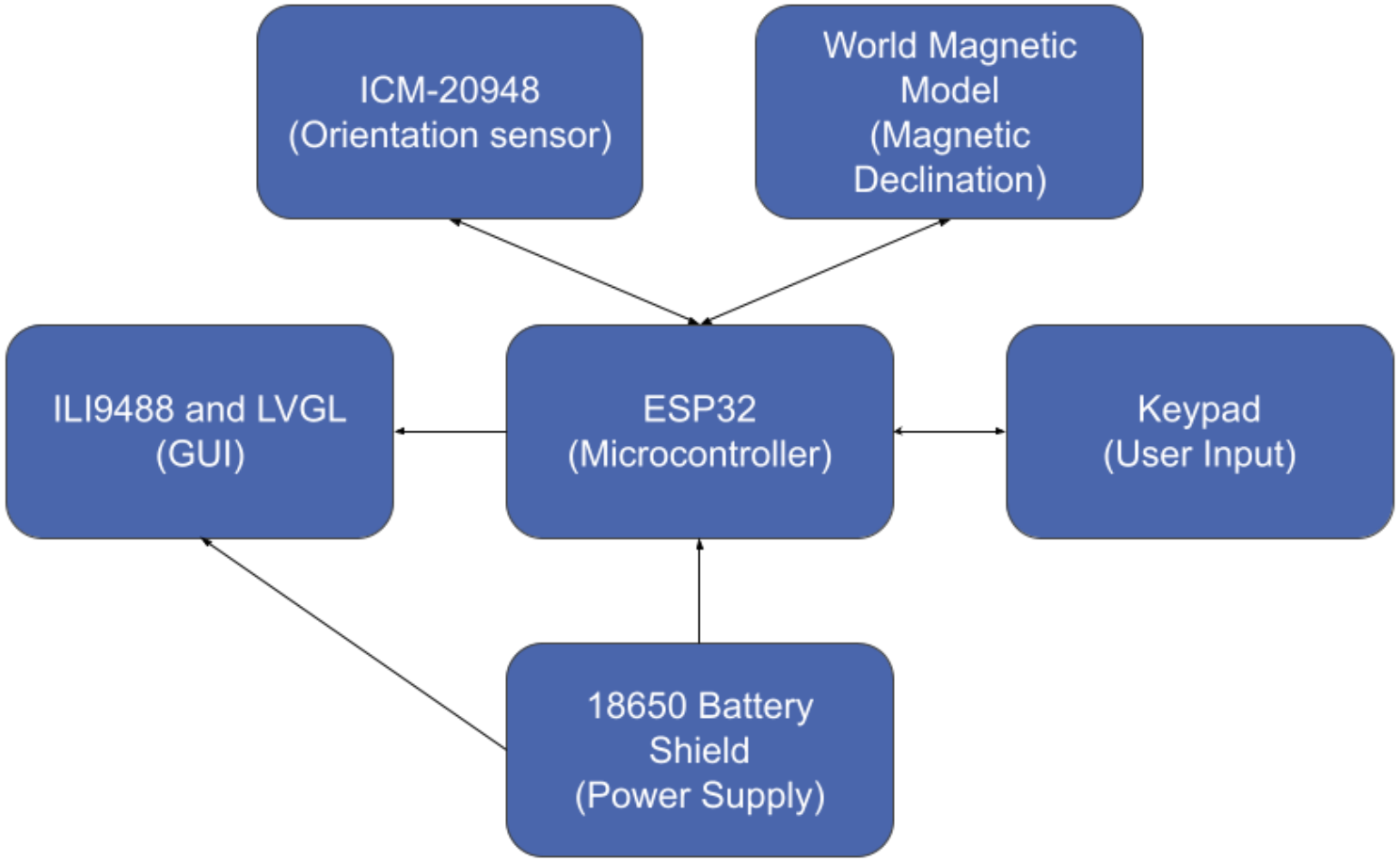
- How to use

Design Documentation

- CAD Models
- Wiring Diagrams
- Software

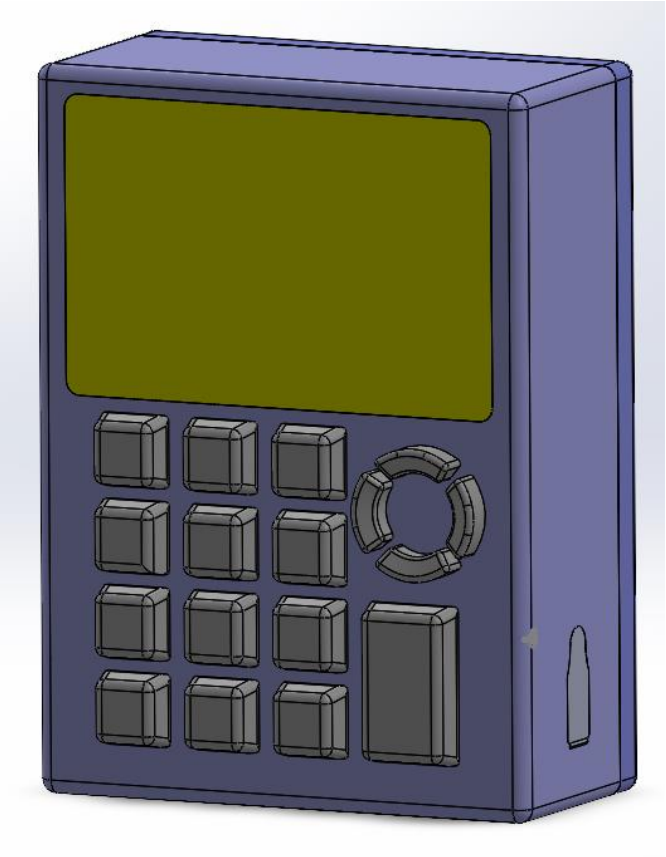


Technical Structure

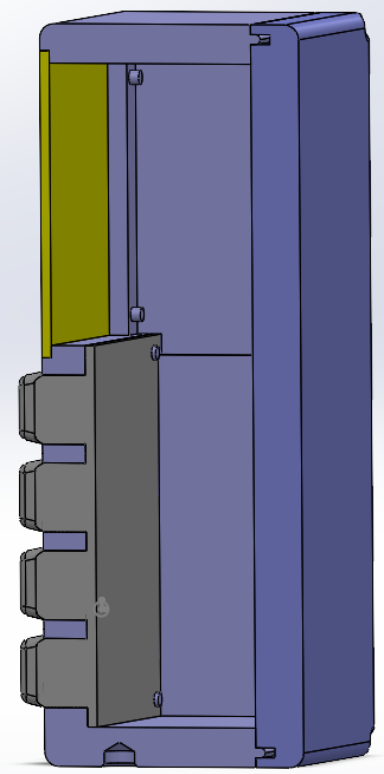


Antenna Pointer Device Shell

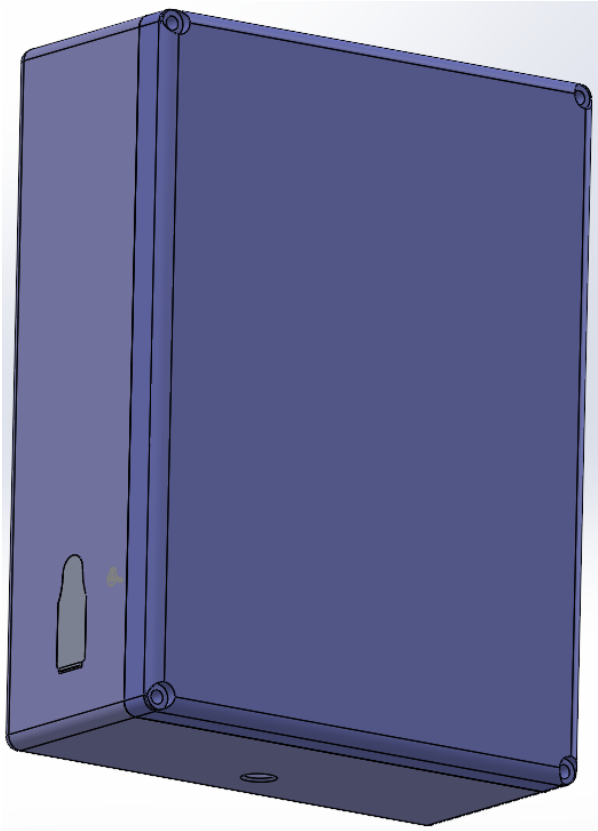
Keypad



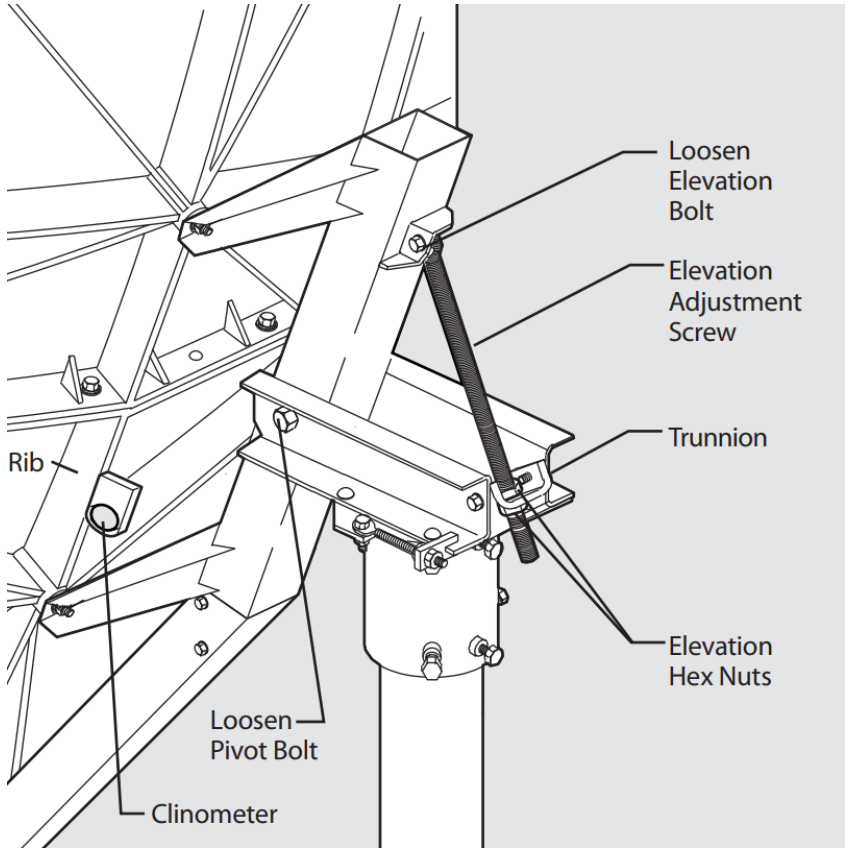
Inside

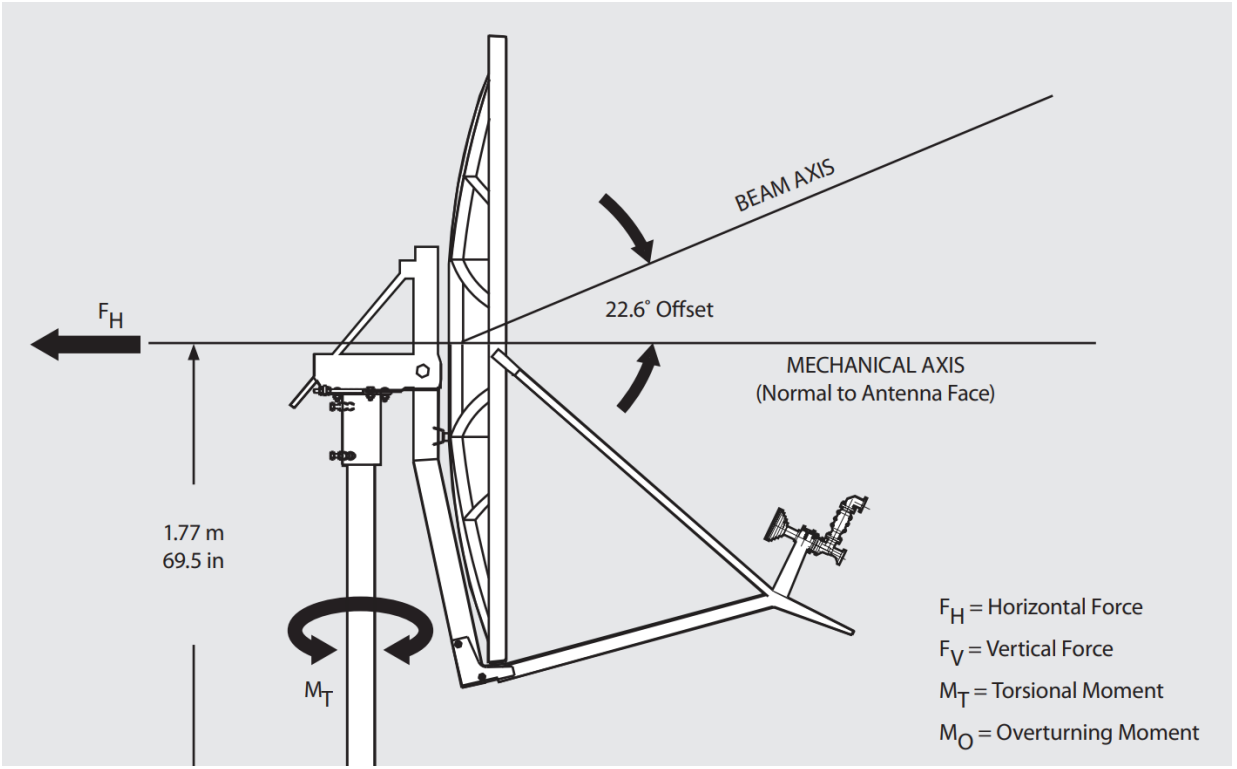


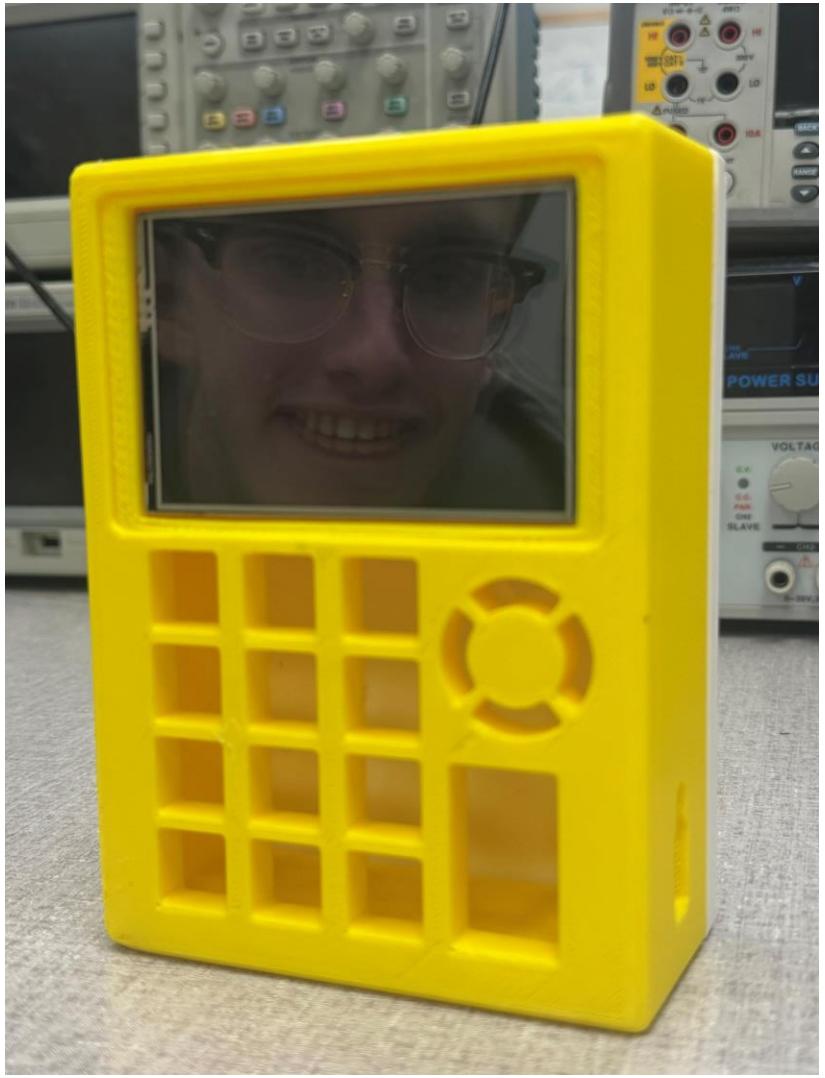
Backplate



Schematics


Loosen
Elevation
Bolt
Elevation
Adjustment
Screw
Trunnion
Rib
Elevation
Hex Nuts
Loosen
Pivot Bolt
Clinometer

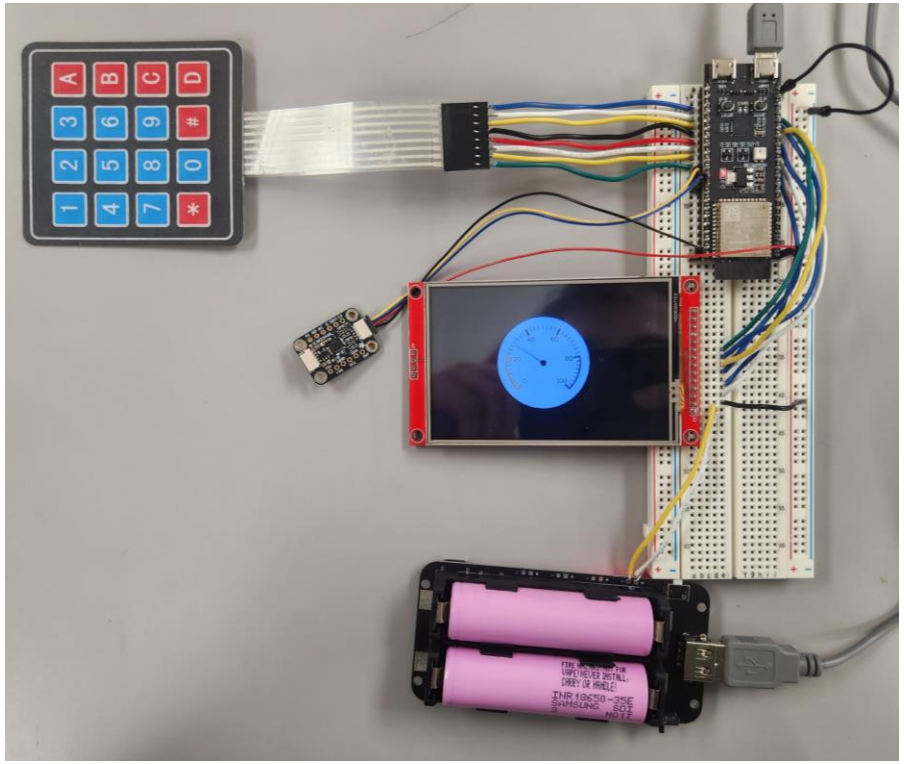

BEAM AXIS
22.6° Offset
F_H
MECHANICAL AXIS
(Normal to Antenna Face)
1.77 m
69.5 in
M_T
F_H = Horizontal Force
F_V = Vertical Force
M_T = Torsional Moment
M_O = Overturning Moment



ANTENNA POINTER PROTOTYPE

Electrical Prototype

Circuit Layout



Outputs

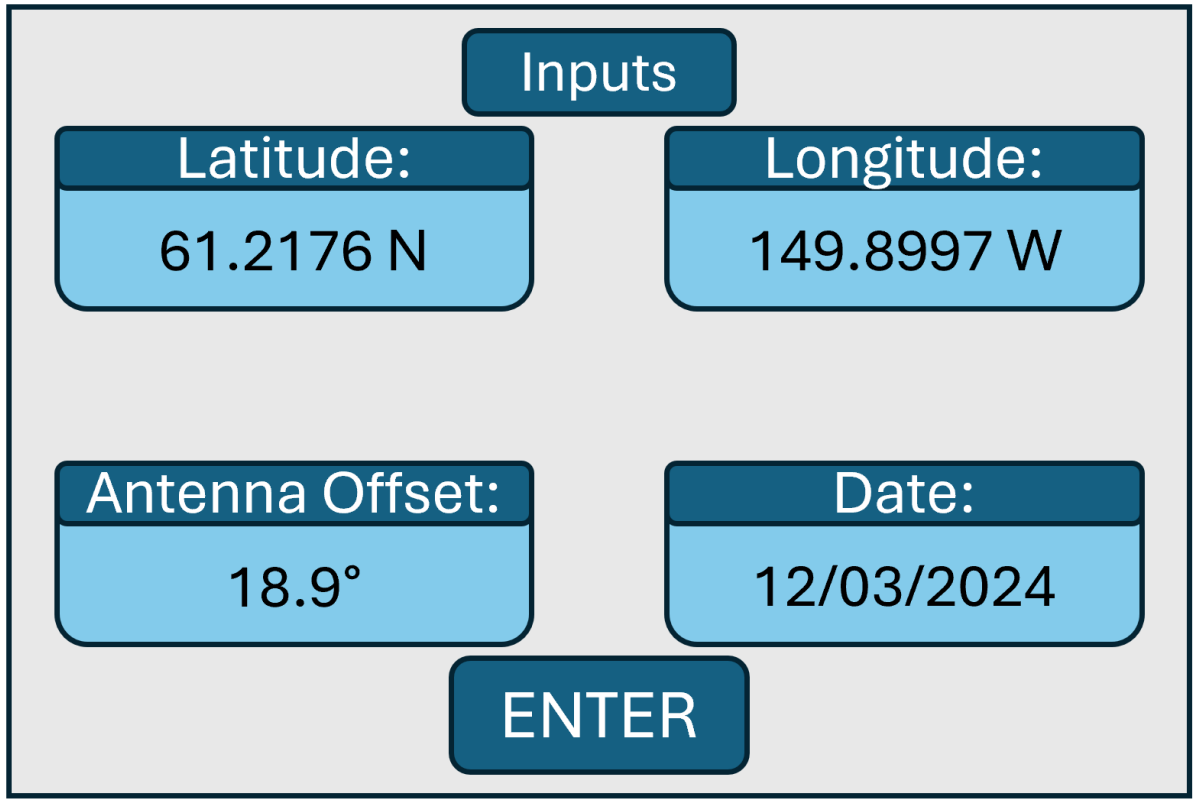
```
icm test: Azimuth: 80.749901 degrees
icm test: Elevation: 11.916349 degrees
```

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

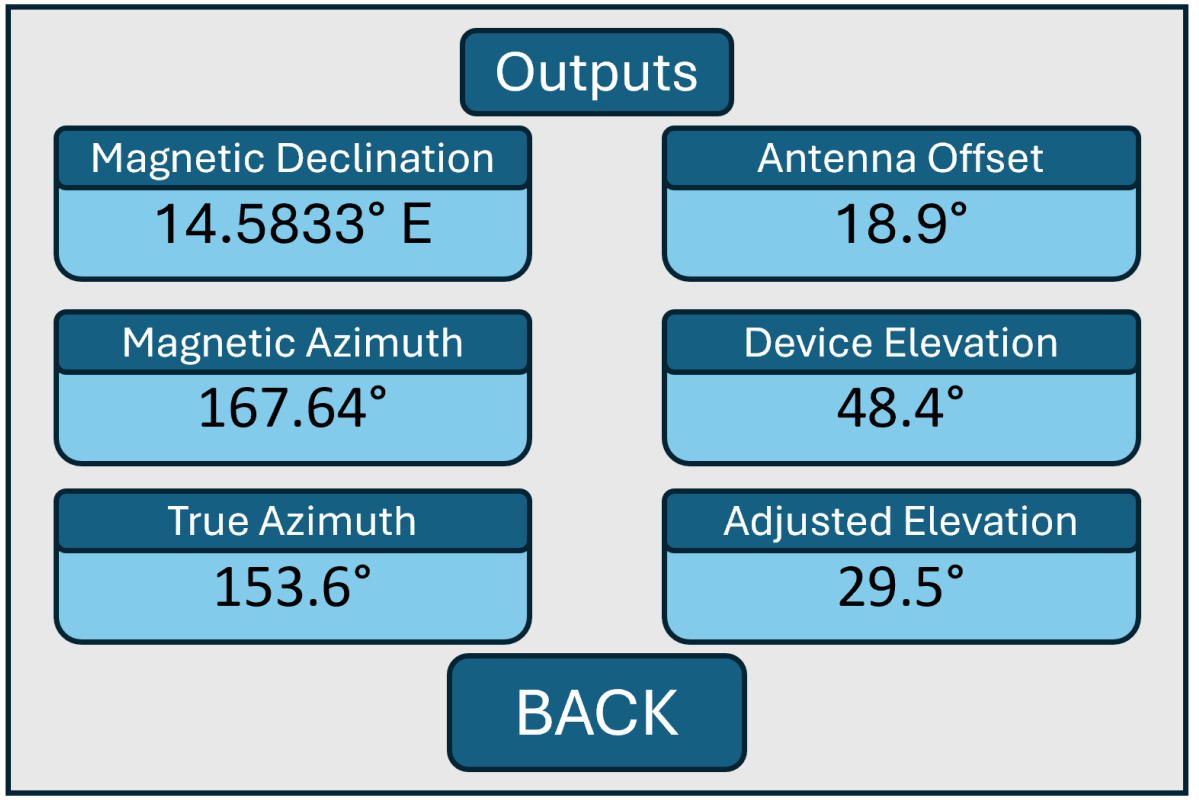
GitHub repository:
UCO_SD_TEAM3_AntennaPointer [1]

User Interface Prototype

Input



Output



Impacts

Social

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

Economic

- Lower maintenance costs
- Device is relatively cheap

Project Standards

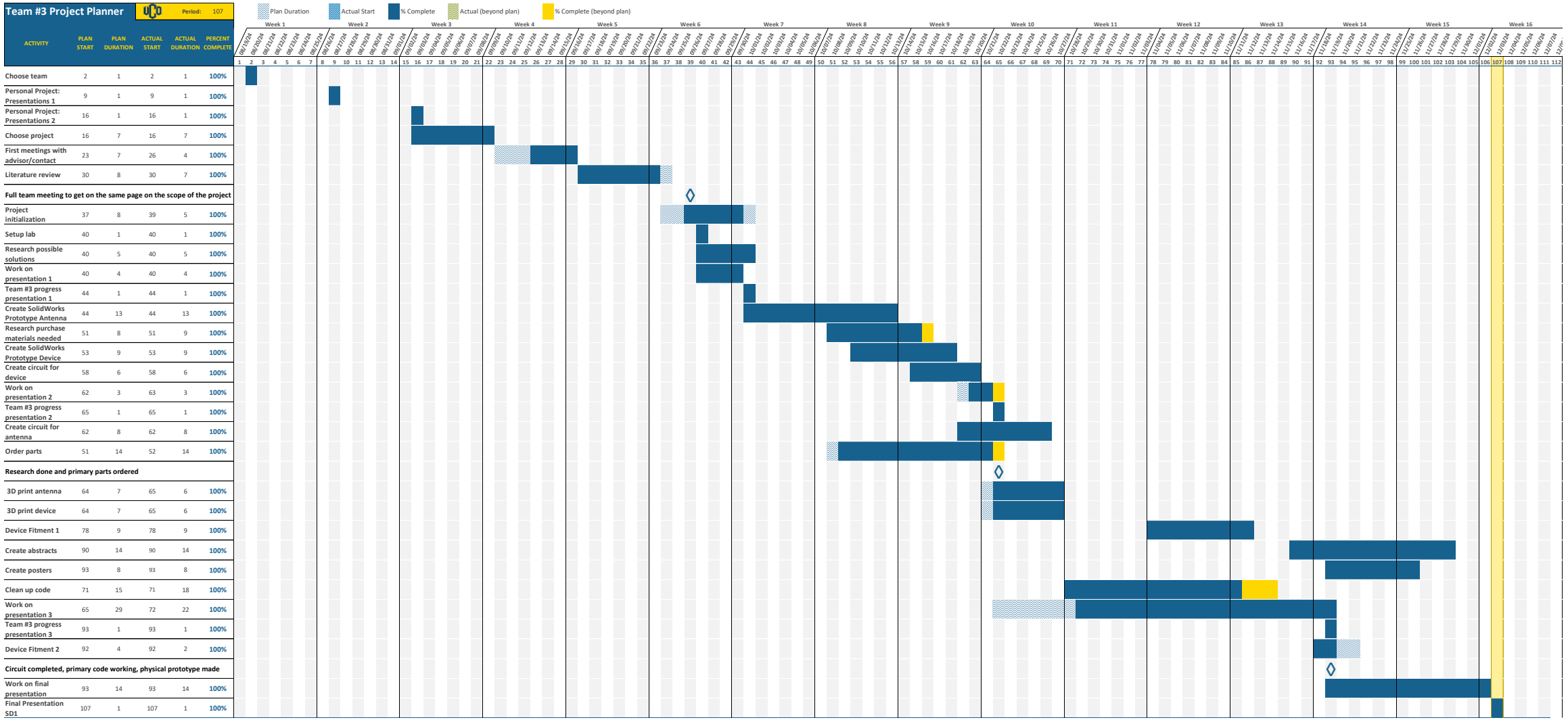
Mechanical

- ASME Y14.5:
  Dimensioning and Tolerancing

Electrical

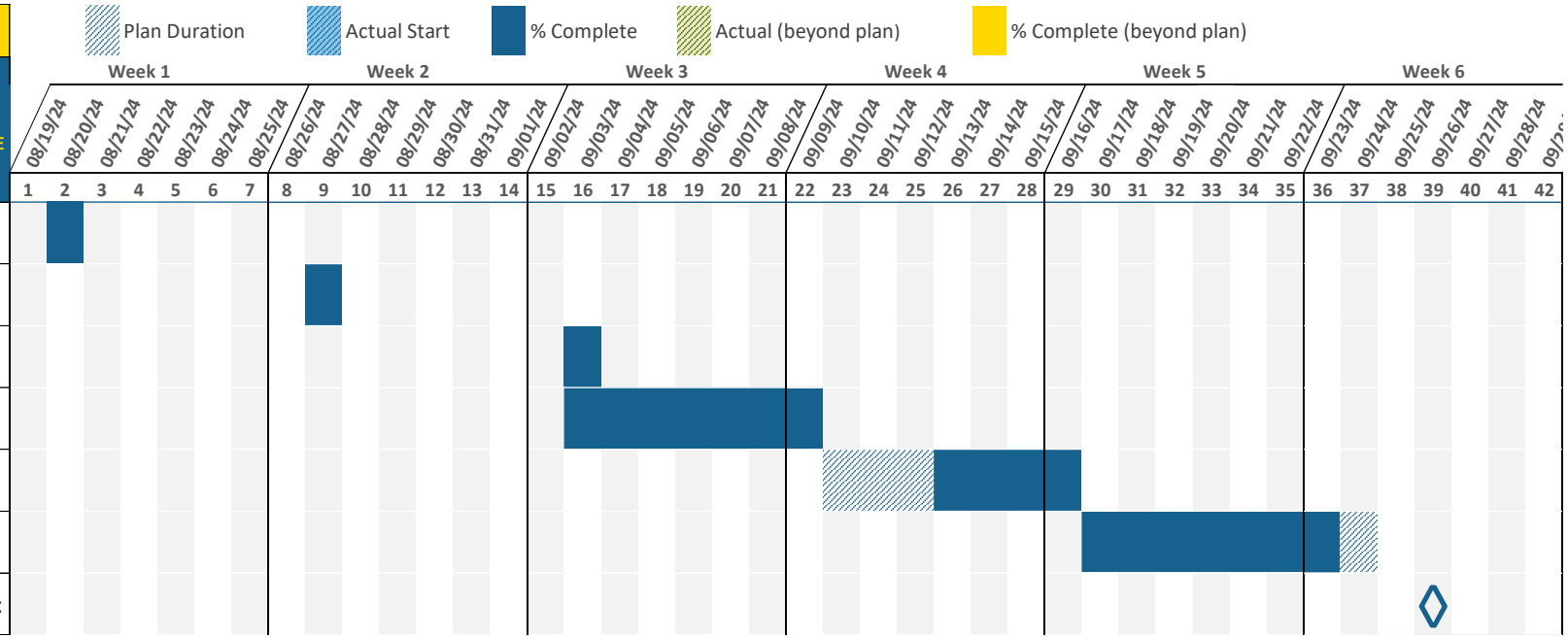
- IEEE 315:
  Graphical Symbols for Electrical and Electronic Diagrams
- IEEE P145:
  IEEE Draft Standards for Definition of Terms for Antennas

Timeline


Team #3 Project Planner
Period: 107
Plan Duration
Actual Start
% Complete
Actual (beyond plan)
% Complete (beyond plan)
ACTIVITY
PLAN START
PLAN DURATION
ACTUAL START
ACTUAL DURATION
PERCENT COMPLETE
Choose team 2 1 2 1 100%
Personal Project: Presentations 1 9 1 9 1 100%
Personal Project: Presentations 2 16 1 16 1 100%
Choose project 16 7 16 7 100%
First meetings with advisor/contact 23 7 26 4 100%
Literature review 30 8 30 7 100%
Full team meeting to get on the same page on the scope of the project
Project initialization 37 8 39 5 100%
Setup lab 40 1 40 1 100%
Research possible solutions 40 5 40 5 100%
Work on presentation 1 40 4 40 4 100%
Team #3 progress presentation 1 44 1 44 1 100%
Create SolidWorks Prototype Antenna 44 13 44 13 100%
Research purchase materials needed 51 8 51 9 100%
Create SolidWorks Prototype Device 53 9 53 9 100%
Create circuit for device 58 6 58 6 100%
Work on presentation 2 62 3 63 3 100%
Team #3 progress presentation 2 65 1 65 1 100%
Create circuit for antenna 62 8 62 8 100%
Order parts 51 14 52 14 100%
Research done and primary parts ordered
3D print antenna 64 7 65 6 100%
3D print device 64 7 65 6 100%
Device Fitment 1 78 9 78 9 100%
Create abstracts 90 14 90 14 100%
Create posters 93 8 93 8 100%
Clean up code 71 15 71 18 100%
Work on presentation 3 65 29 72 22 100%
Team #3 progress presentation 3 93 1 93 1 100%
Device Fitment 2 92 4 92 2 100%
Circuit completed, primary code working, physical prototype made
Work on final presentation 93 14 93 14 100%
Final Presentation SD1 107 1 107 1 100%
Week 1
Week 2
Week 3
Week 4
Week 5
Week 6
Week 7
Week 8
Week 9
Week 10
Week 11
Week 12
Week 13
Week 14
Week 15
Week 16

Timeline

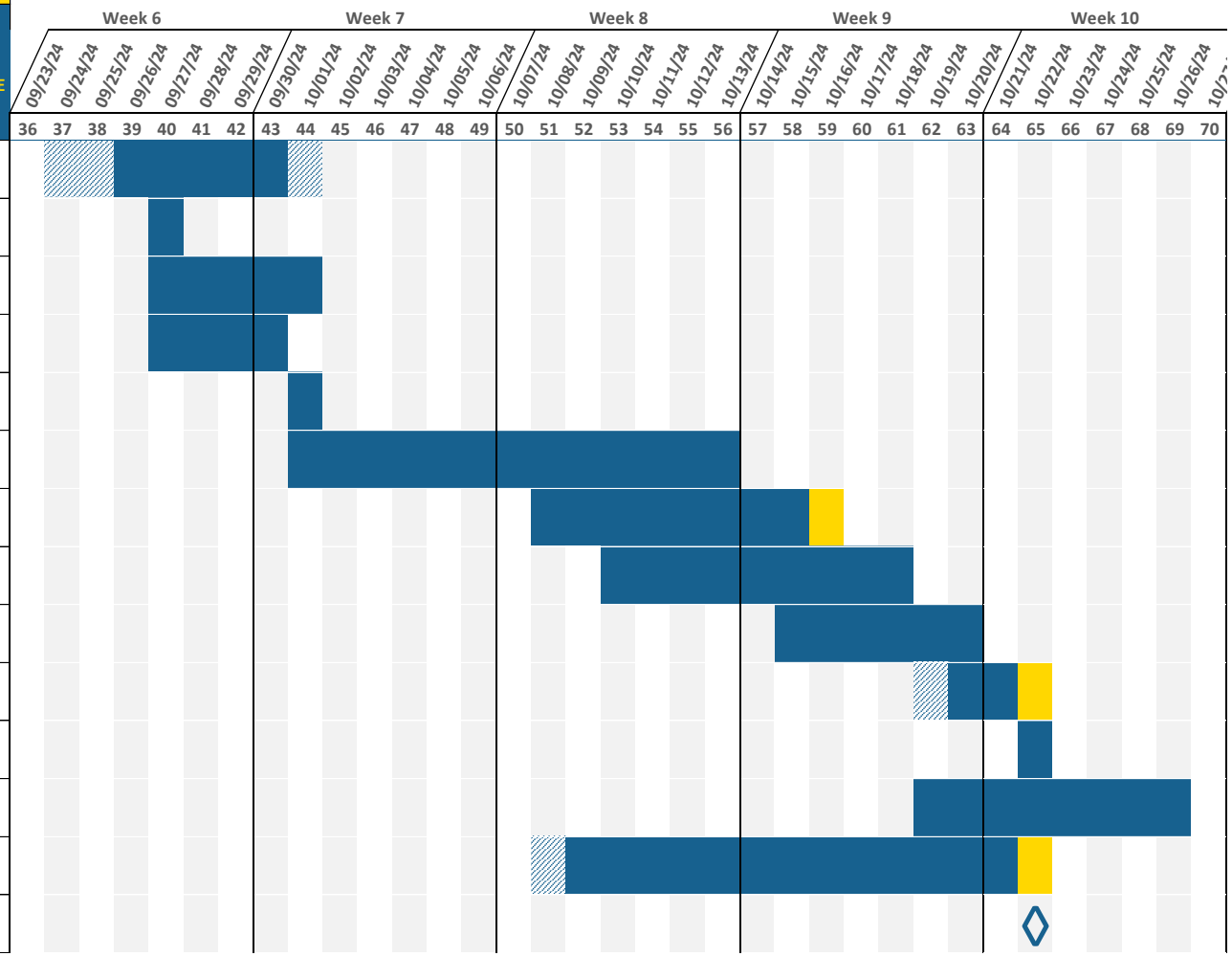
Team #3 Project Planner		Period:	100	
ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
Choose team	2	1	2	1	100%
Personal Project: Presentations 1	9	1	9	1	100%
Personal Project: Presentations 2	16	1	16	1	100%
Choose project	16	7	16	7	100%
First meetings with advisor/contact	23	7	26	4	100%
Literature review	30	8	30	7	100%
Full team meeting to get on the same page on the scope of the project					



Timeline

Team #3 Project Planner — Period: 100

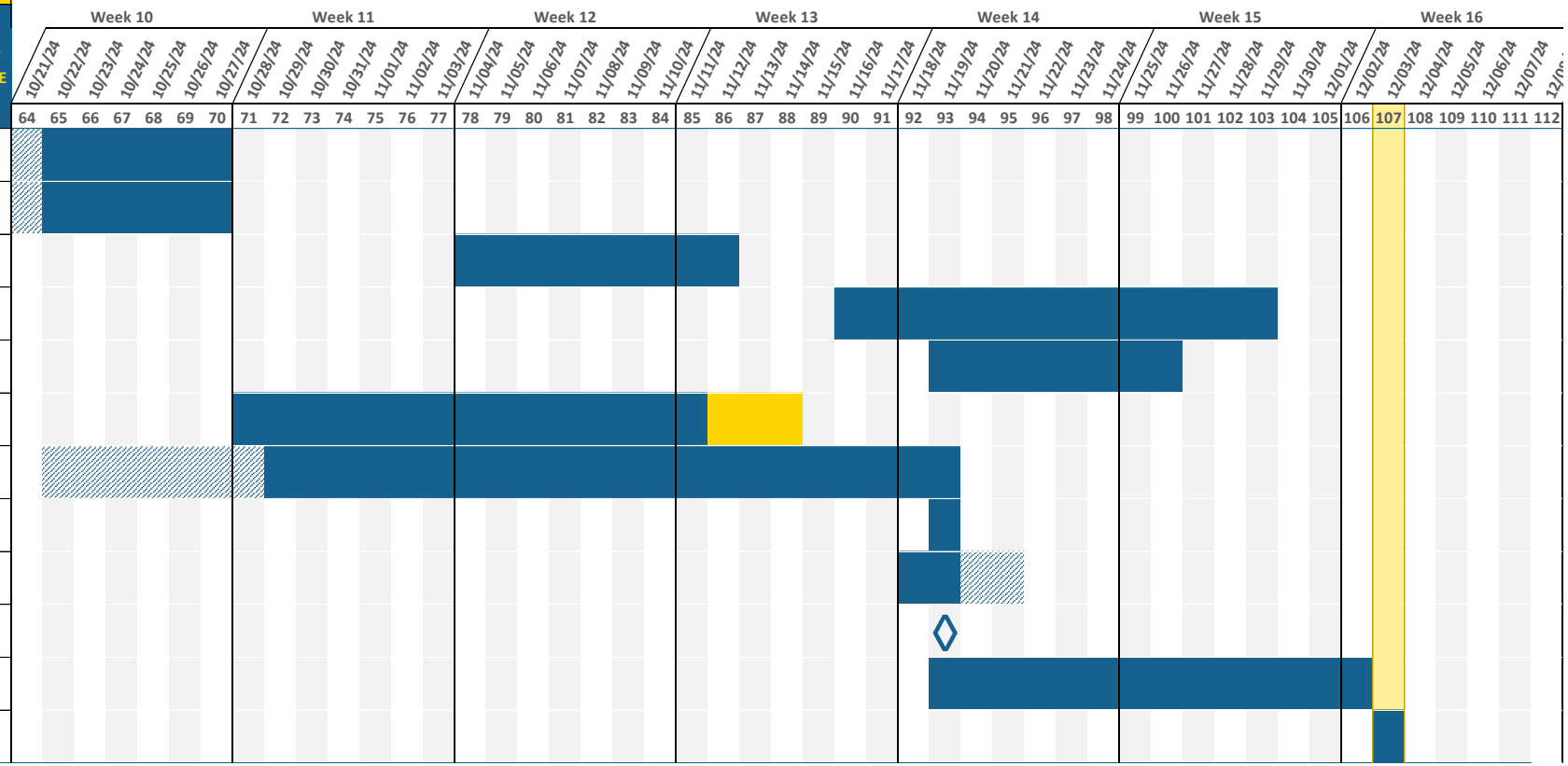
ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
Project initialization	37	8	39	5	100%
Setup lab	40	1	40	1	100%
Research possible solutions	40	5	40	5	100%
Work on presentation 1	40	4	40	4	100%
Team #3 progress presentation 1	44	1	44	1	100%
Create SolidWorks Prototype Antenna	44	13	44	13	100%
Research purchase materials needed	51	8	51	9	100%
Create SolidWorks Prototype Device	53	9	53	9	100%
Create circuit for device	58	6	58	6	100%
Work on presentation 2	62	3	63	3	100%
Team #3 progress presentation 2	65	1	65	1	100%
Create circuit for antenna	62	8	62	8	100%
Order parts	51	14	52	14	100%
Research done and primary parts ordered					

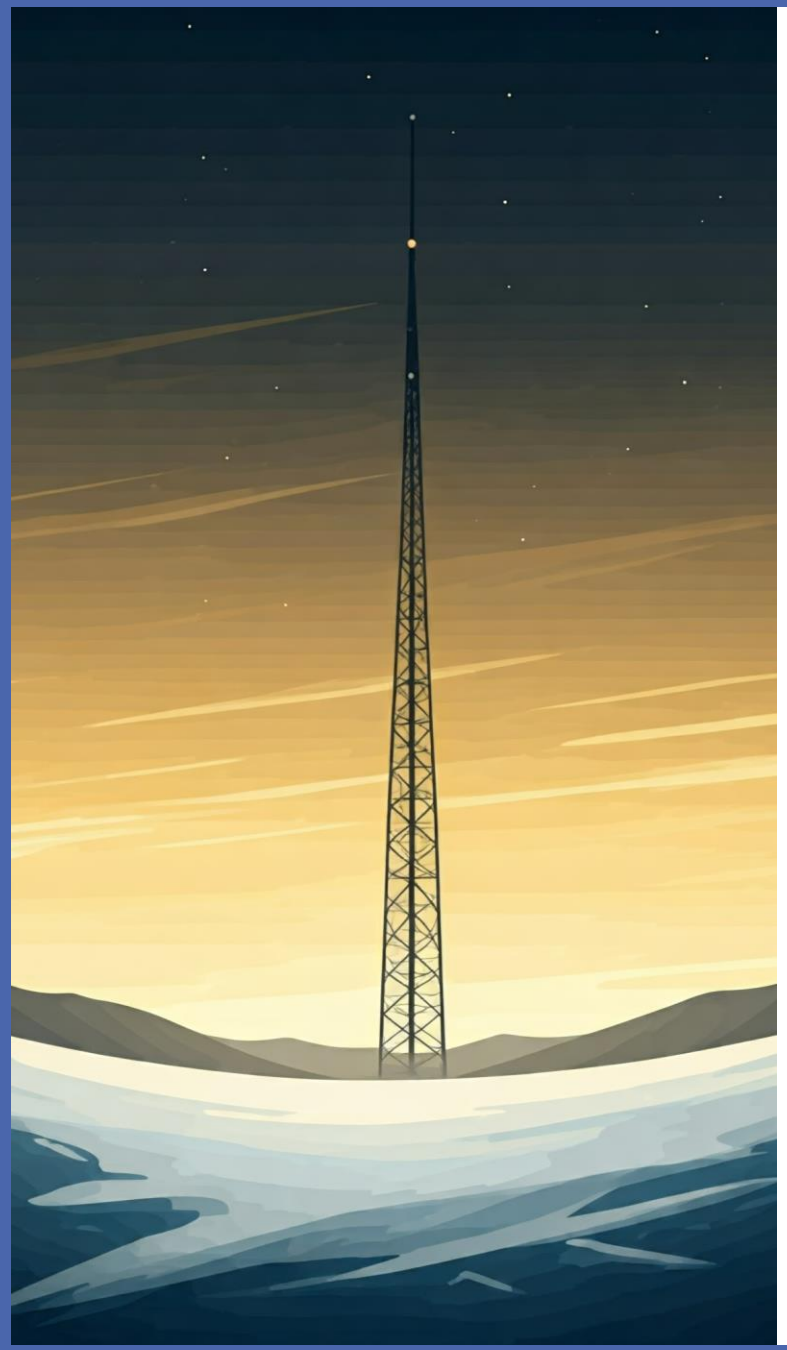


Timeline

Team #3 Project Planner — Period: 107

ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
3D print antenna	64	7	65	6	100%
3D print device	64	7	65	6	100%
Device Fitment 1	78	9	78	9	100%
Create abstracts	90	14	90	14	100%
Create posters	93	8	93	8	100%
Clean up code	71	15	71	18	100%
Work on presentation 3	65	29	72	22	100%
Team #3 progress presentation 3	93	1	93	1	100%
Device Fitment 2	92	4	92	2	100%
Circuit completed, primary code working, physical prototype made					
Work on final presentation	93	14	93	14	100%
Final Presentation SD1	107	1	107	1	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

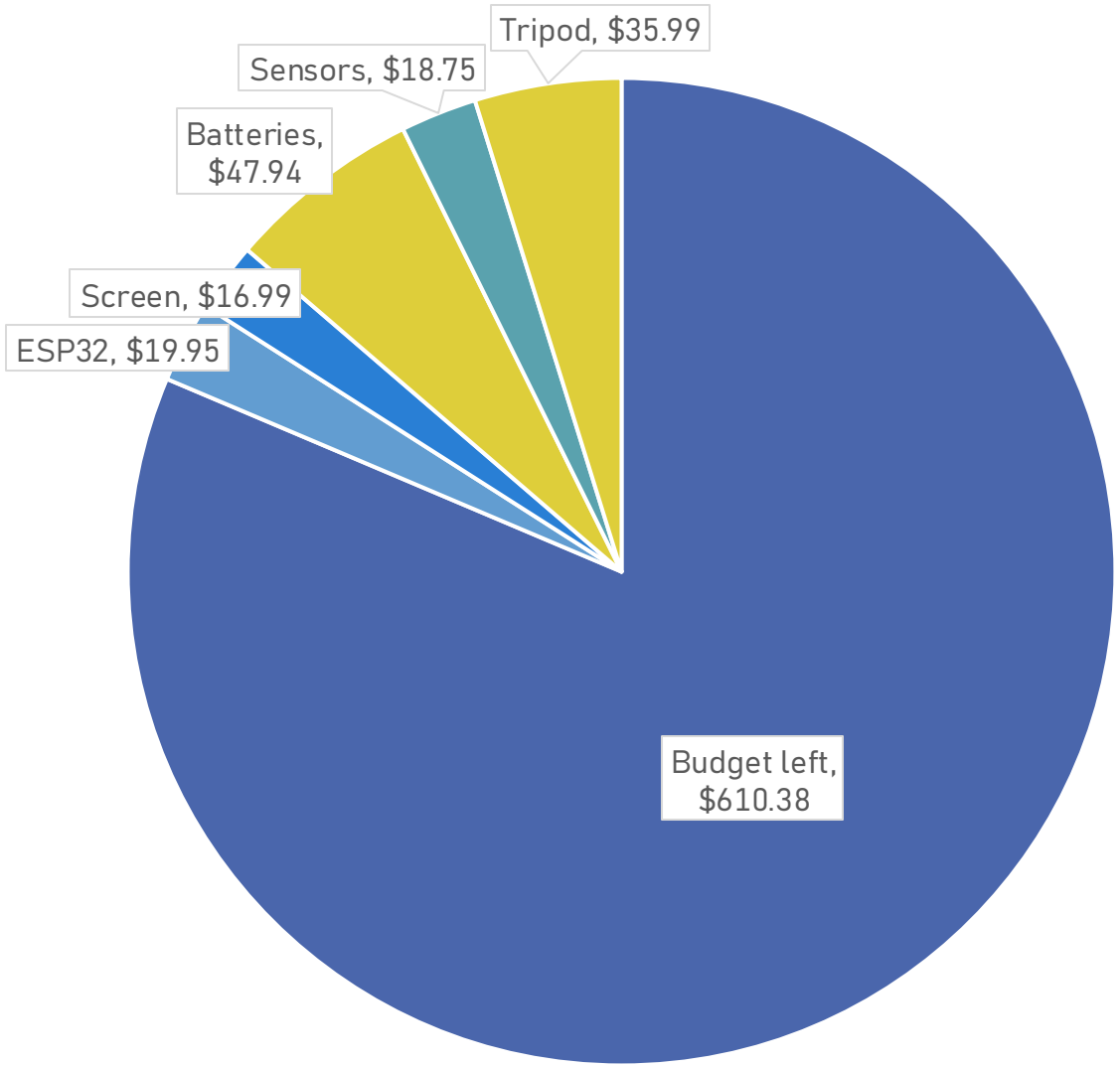
Budget

Spent so far:

- $139.62 spent
- $610.38 left

Possible Future Costs:

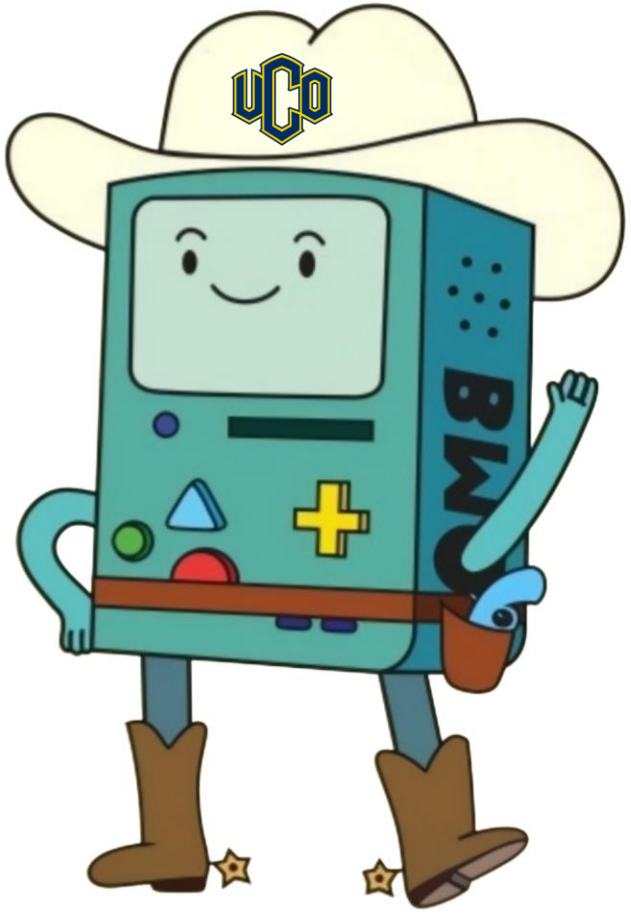
- Custom keypad PCB, switches
- $2.99 Satellite Finder App
- $349.00 Silicone 40A Resin [2]
- Ceramic coated fabric
- Hardware



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