ANTENNA POINTER

Nathaniel Blair

By: Joshua Nutter

Cesar Vasquez

Senior Design 1: Team 3

Group Members

Nathaniel Blair, E.E.

Joshua Nutter, M.E.

Cesar Vasquez, M.E. – Team Leader

Group Meetings

Tuesday 3:00pm–4:00pm

Thursday 12:00pm–4:00pm

Advisors

Dr. Tej Lamichhane (Main)
- Tuesday 11:00:am–1:00pm

Jonathan Adams (FAA)
- Friday 12:00pm–1:00pm
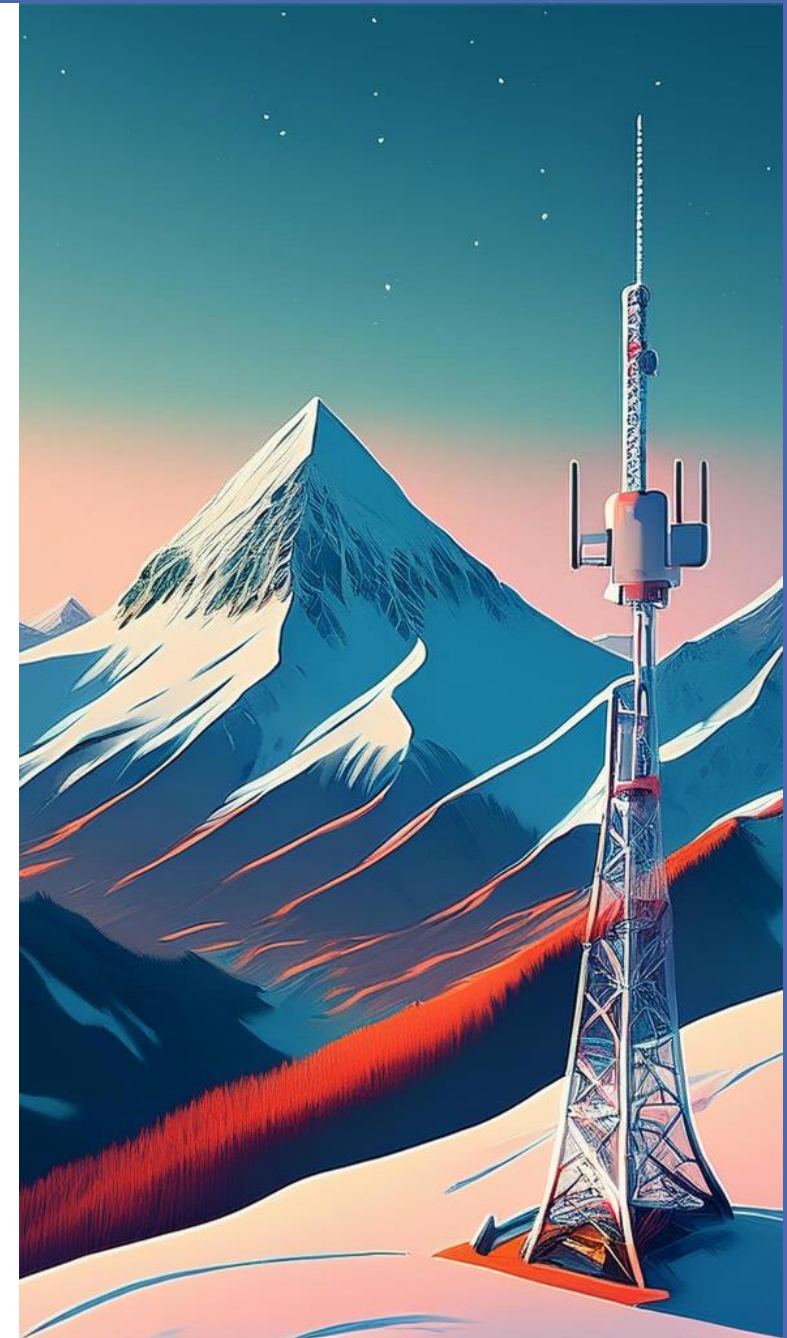
Dr. Evan Lemley (Co)

Dr. Nesreen Alsbou (Co)

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

Deliverables

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

Plan of Execution

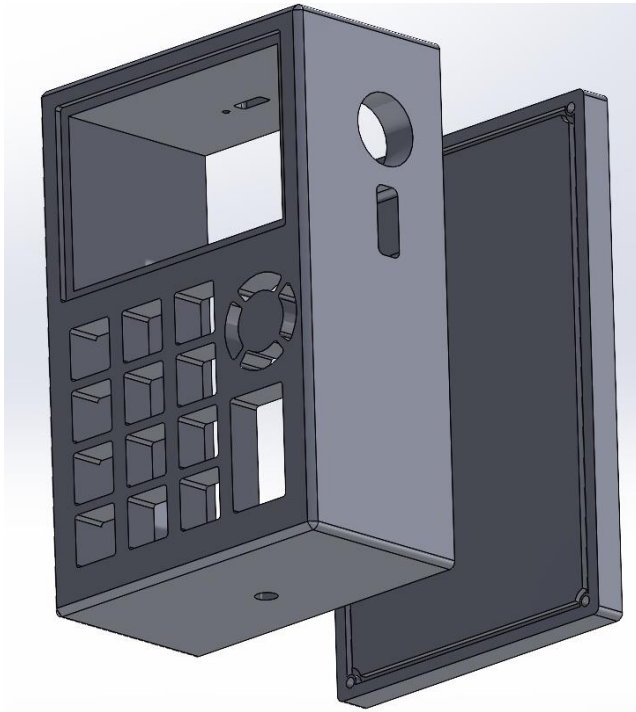**ESP32**
- User Interface
- Sensor data

MPU9250
- Magnetometer
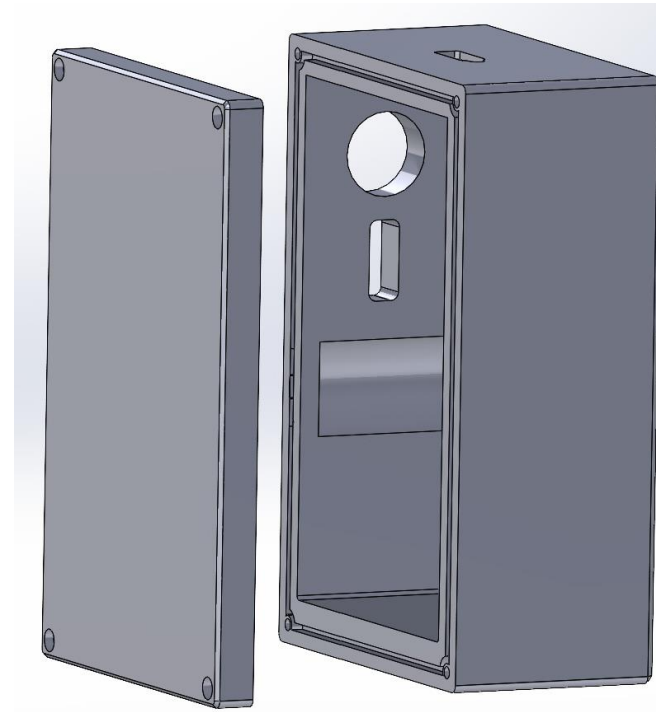- Gyroscope
- Accelerometer

Ceramic coated fabric
- Lightweight and durable
- Non-magnetic
- Insulated (Cold and heat proof)

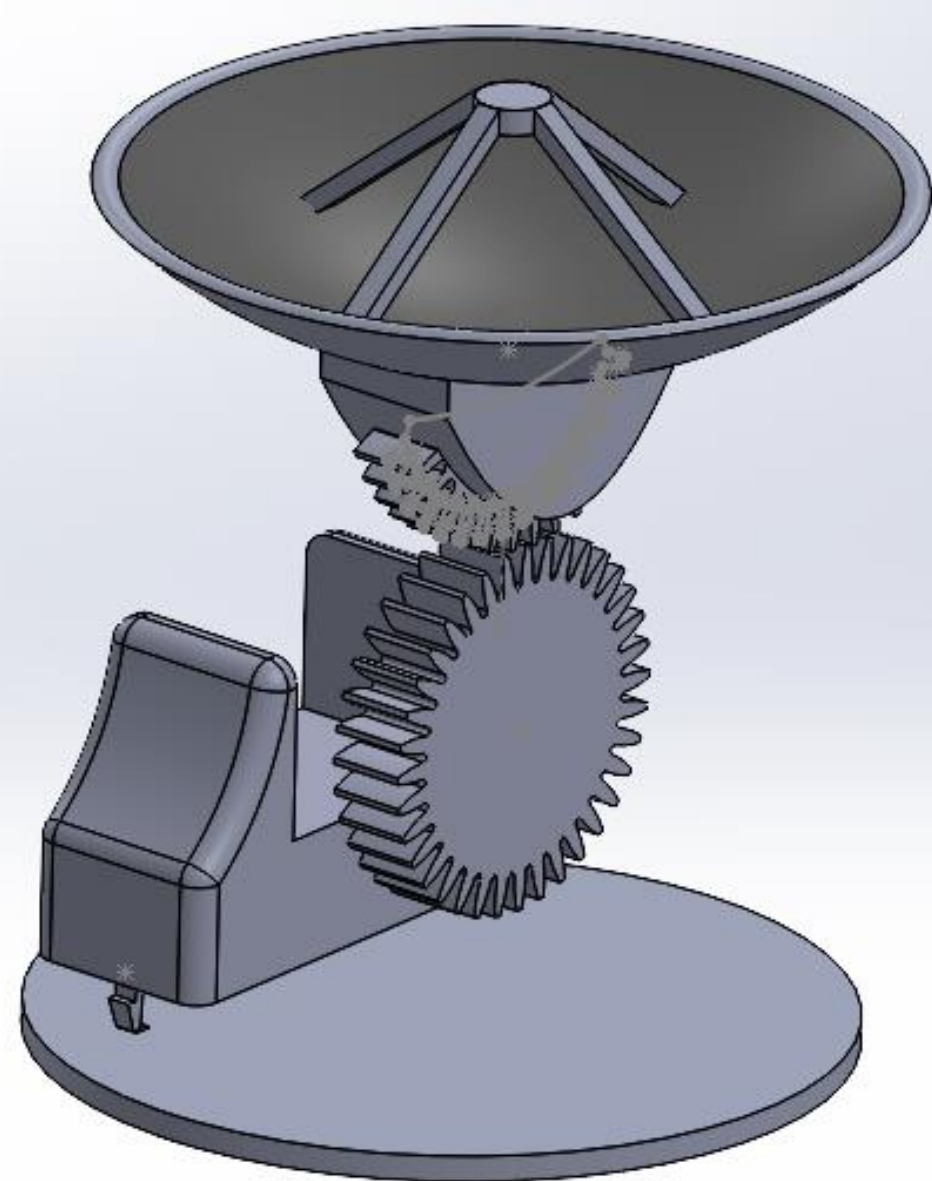# Antenna Pointer Device Shell

Keypad

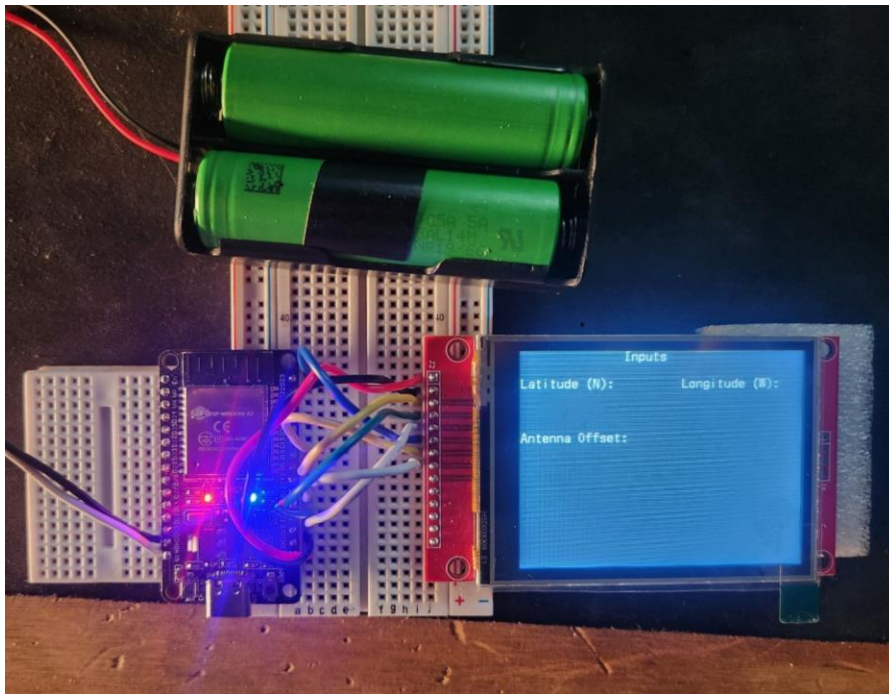**Backplate**

Antenna SolidWorks Model

Antenna materials thus far include:

- Antenna dish

- Elevation gear

- Servo base

- Platform

Electrical Prototype

Display

Code

User Interface Prototype

Input

Output

Inputs

Latitude:	Longitude:
61.2176 N	149.8997 W

Antenna Offset:	Enter
18.9 °	

Outputs

Magnetic Declination:	Antenna Offset:
14.5833 ° E	18.9 °

Magnetic Azimuth:	Device Elevation:
167.64 °	48.4 °

True Azimuth:	Adjusted Elevation:
153.06 °	29.5 °
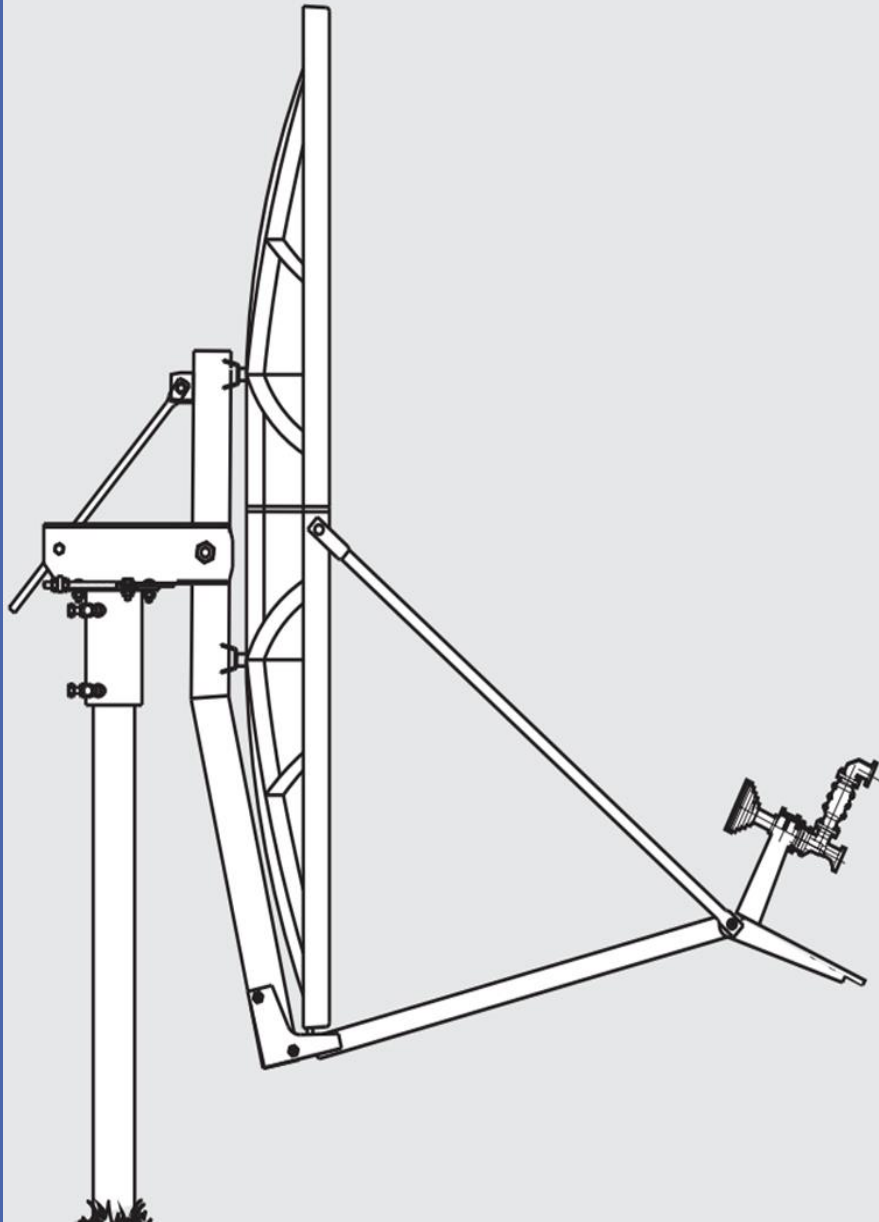
Future Work

Nathaniel:
- Order components before end of October
- Program user input
- Read sensor data
- Output adjusted data

Joshua:
- Get antenna 3D printed by this week
- Research button materials

Cesar:
- Get shell 3D printed by this week
- Find suitable seal

Goals

Senior Design 1	Senior Design 2
Setup	Improve UI
– User data input	Weatherproof device
– Sensor Data	Incorporate stand & clamp
3D print necessary components	Custom keypad & switches to fit
Finish usable prototype	SolidWorks model
	Test on antennas at FAA

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

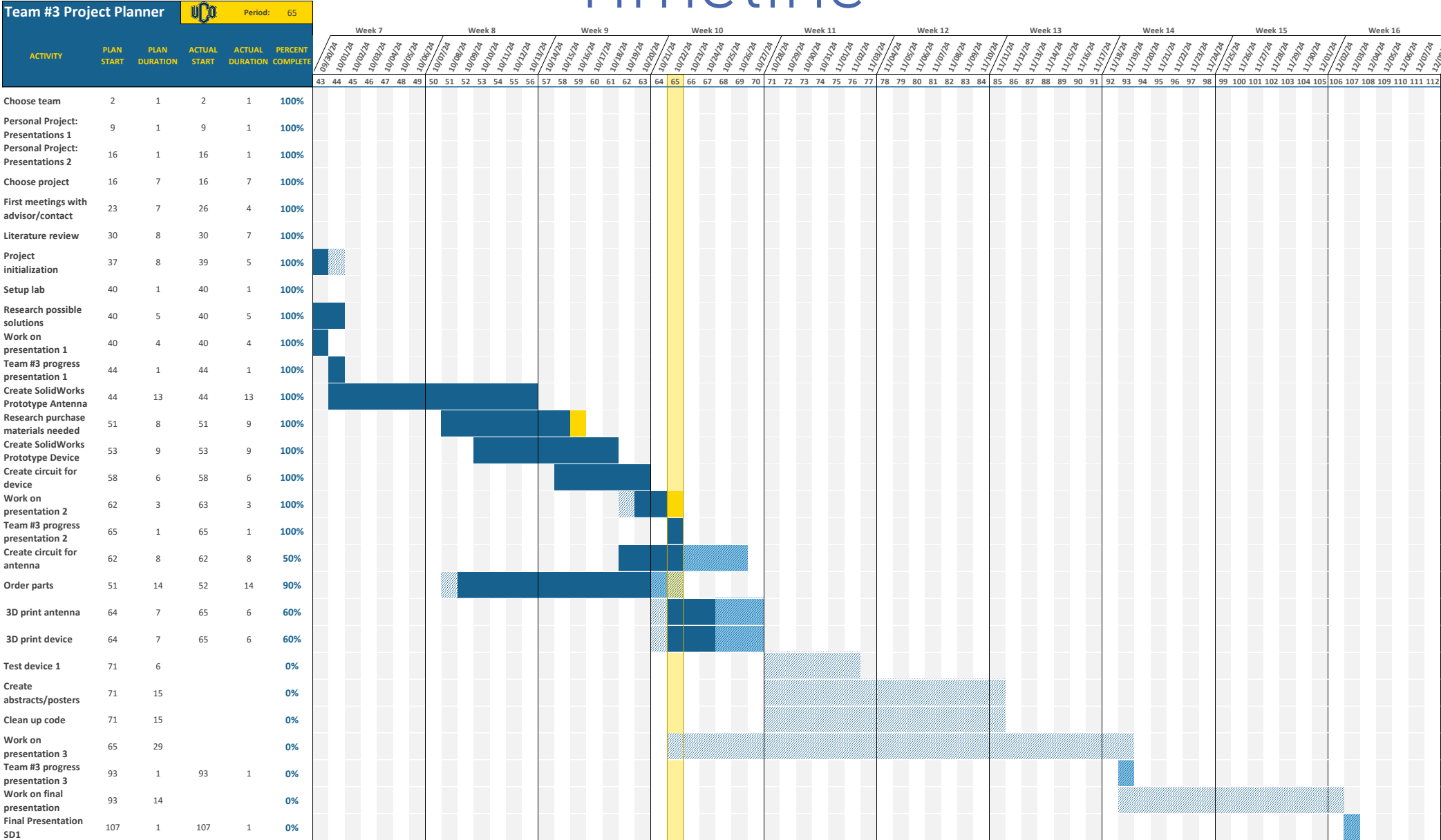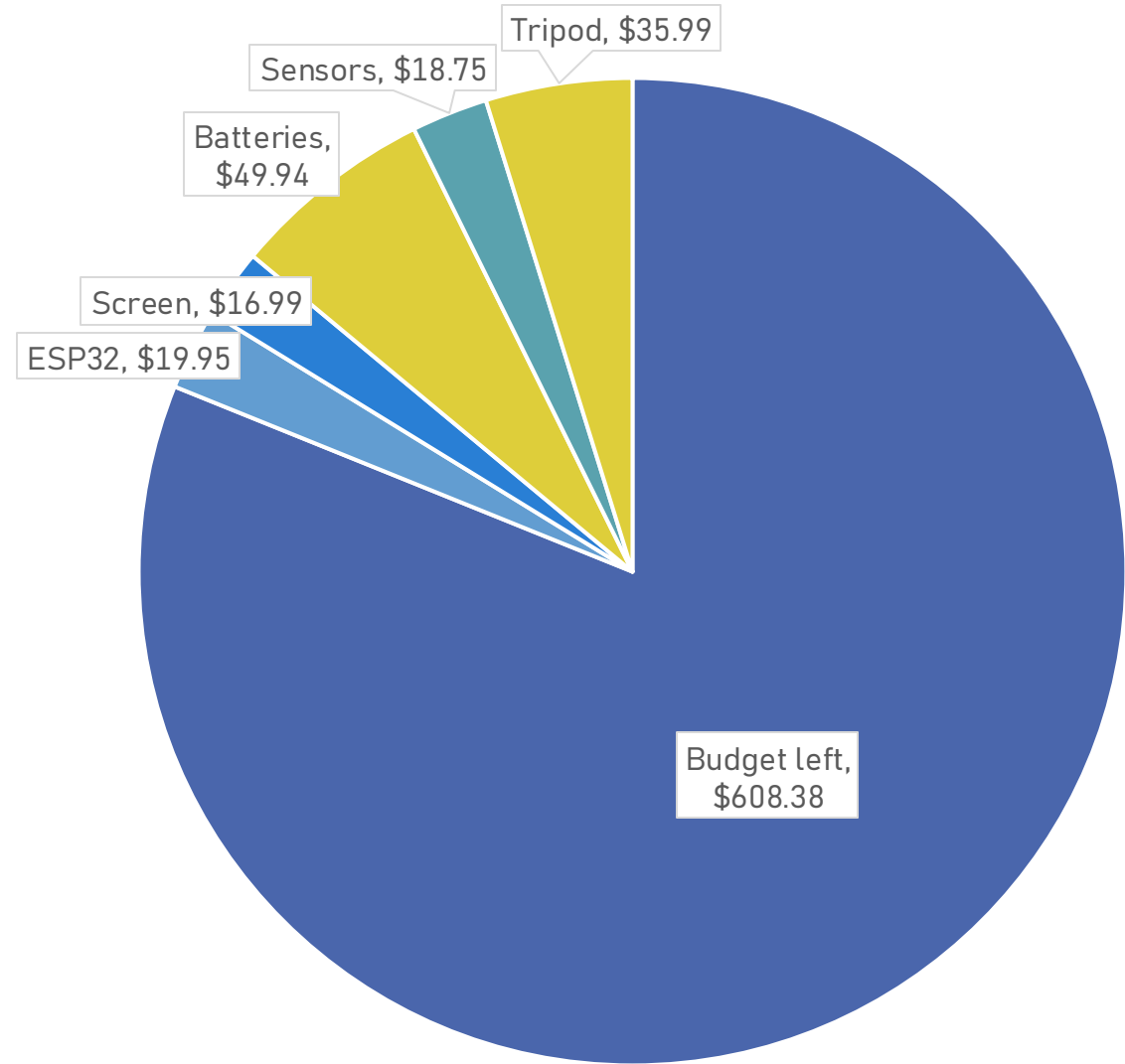| ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
Choose team	2	1	2	1	100%
Personal Project: Presentations 1	9	1	9	1	100%
Personal Project: Presentations 2	16	1	16	1	100%
Choose project	16	7	16	7	100%
First meetings with advisor/contact	23	7	26	4	100%
Literature review	30	8	30	7	100%
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	50%
Order parts	51	14	52	14	90%
3D print antenna	64	7	65	6	60%
3D print device	64	7	65	6	60%
Test device 1	71	6			0%
Create abstracts/posters	71	15			0%
Clean up code	71	15			0%
Work on presentation 3	65	29			0%
Team #3 progress presentation 3	93	1	93	1	0%
Work on final presentation	93	14			0%
Final Presentation SD1	107	1	107	1	0%

Team #3 Project Planner — Period: 65

Budget

Theoretically Spent:

- $143.62, still need to order parts

Possible Future Costs:

- Keypad, switches, etc.

- Satellite Finder App

- Prime ribeye steaks

Thank you