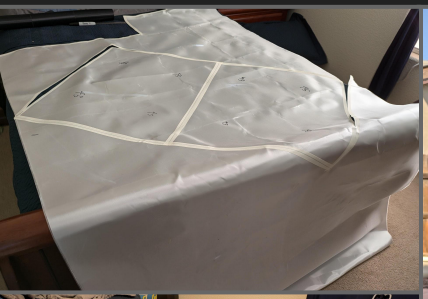
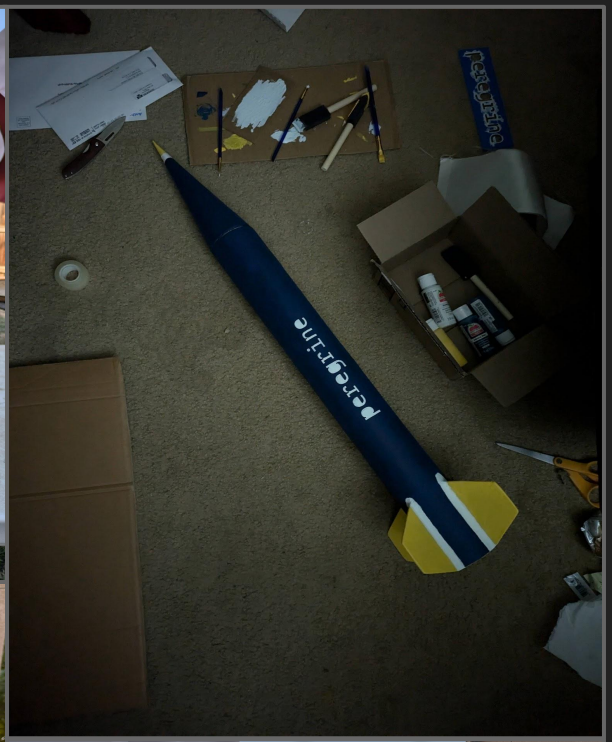
Projects Portfolio

Felipe Jr Figueroa-Lopez

Level 1/2 High Power Rocket

Personal Project I Completed over the Summer of 2024





- Built to support H-J class motors and meets the build requirements for Level 1 & 2 High Power Certification.
- Mass w/o motor: 1.5 kg
  Body Tube OD: 8cm
  Length: 90cm
- Designed in Openrocket and Solidworks
- Made out of fiberglass cloth, carbon fiber board, epoxy, PLA, kevlar string, & ripstop nylon
- Body tube & motor tube manufactured using a wet fiberglass layup
- Fins & centering rings cut to shape using CNC machine and rotary tool
- Fin contraption secured in perfect alignment with help of 3D printed holder to keep everything in place while epoxy cured.
- Nose cone made of 3D-Printed PLA Core with an outer fiberglass layup.
- Parachute made with ripstop nylon
- Everything attached together with kevlar string.

E96R - Rockets

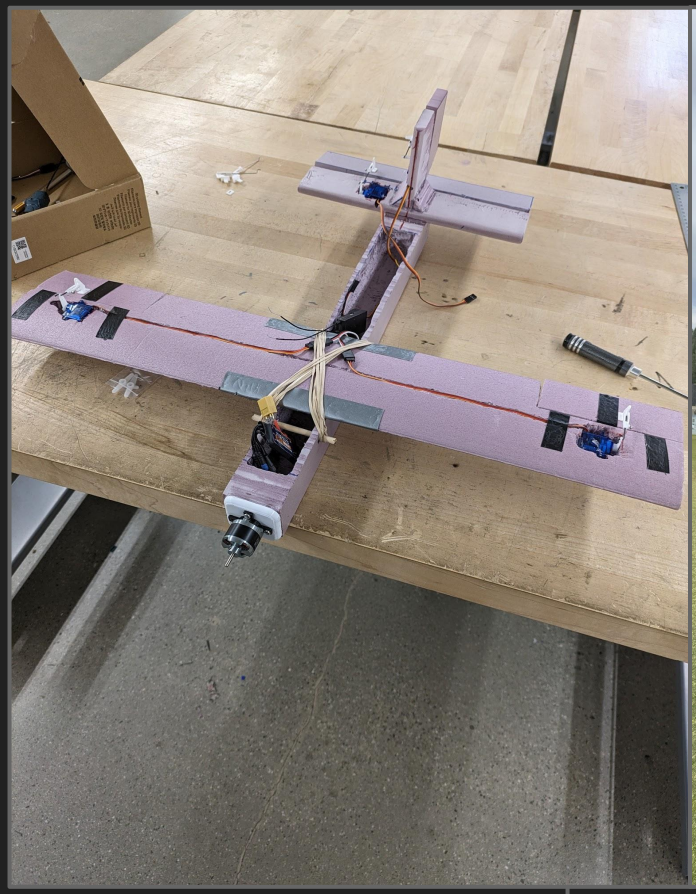
In a group of 3, two rockets were designed, built, and launched over the course of the 2023 Fall quarter

- Small, 3D-Printed A-class rocket
- Designed using Open Rocket and Solidworks (for both rockets)
- Attachment point between nose cone and body tube failed during the ejection of the parachute
- Nose cone descended properly, while the now unattached body tube and fins free fell toward the ground

- Larger G-class rocket built toward end of quarter
- Made of fiberglass (body tube), polywood (fins), & Pla (3D-printed nose cone & internal egg “cup”)
- 3D-Printer, laser cutter, & wet layup used
- Goals: >2000ft apogee & successful recovery of rocket with egg still being in tact
- The egg unfortunately broke :(

E96 - Planes

Two RC planes built in a team of 5 over the course of the 2023/2024 Winter quarter

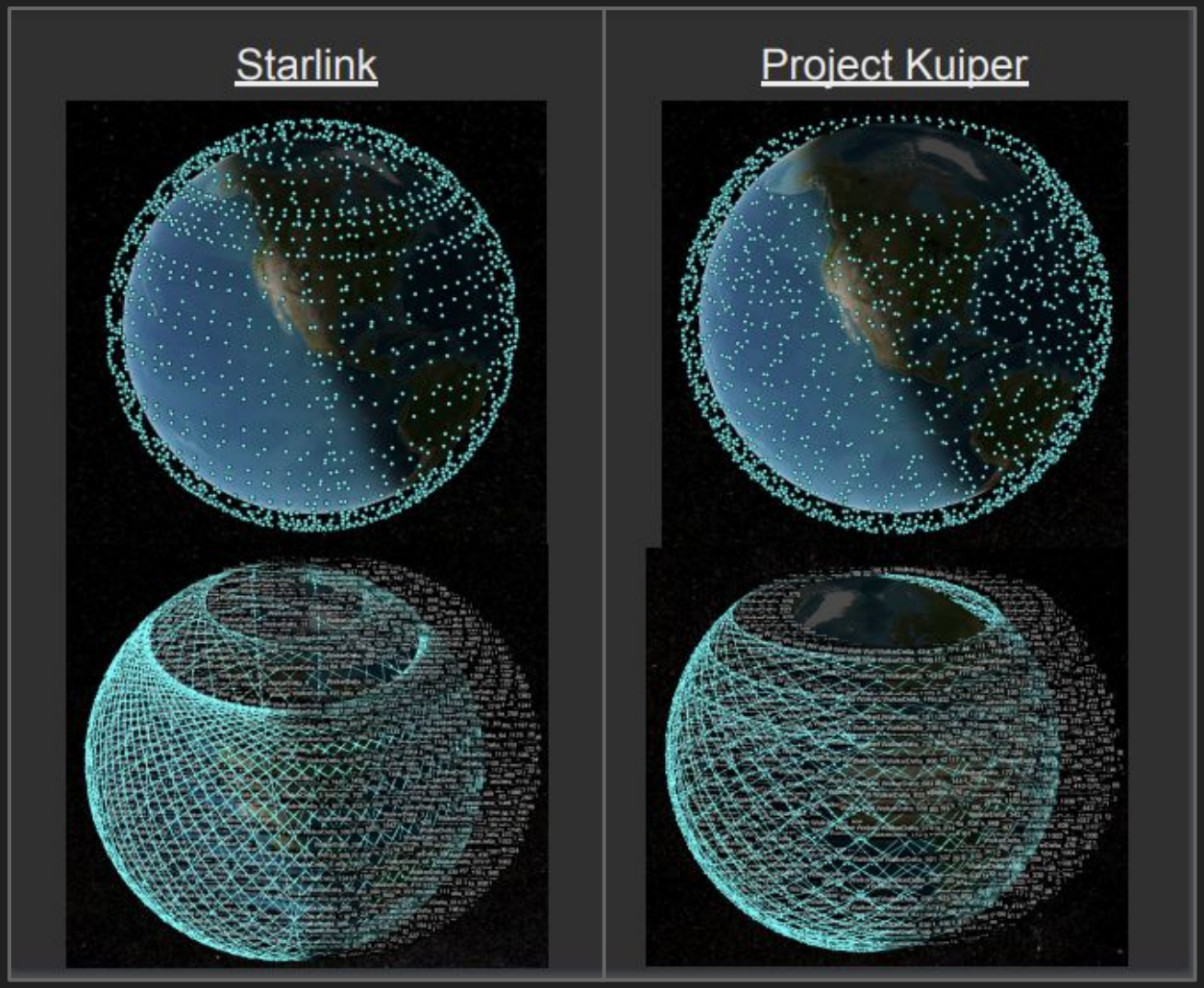


- 25in wingspan plane designed on Onshape (for both planes)
- Built out of pink foam, 3D-printed parts, rubber bands, servo motors, and other necessary electronics
- Goal was simply for it to fly for more than a few seconds
- Plane crashed and broke shortly after take off on first flight due to electronic communication problems.

- 48in wingspan plane built for speed and agility
- Straight airfoil profile
- Made mostly with same materials as previous plane. Upgrades include more powerful motor, more sophisticated telemetry equipment, packing tape covering the length of top and bottom of wing for greater strength to thickness ratio, & plastic wrap wrapped around fuselage for better aerodynamic profile
- Reached a top speed >60mph while executing tight turns (multiple flights)

Satellite Constellation Simulation

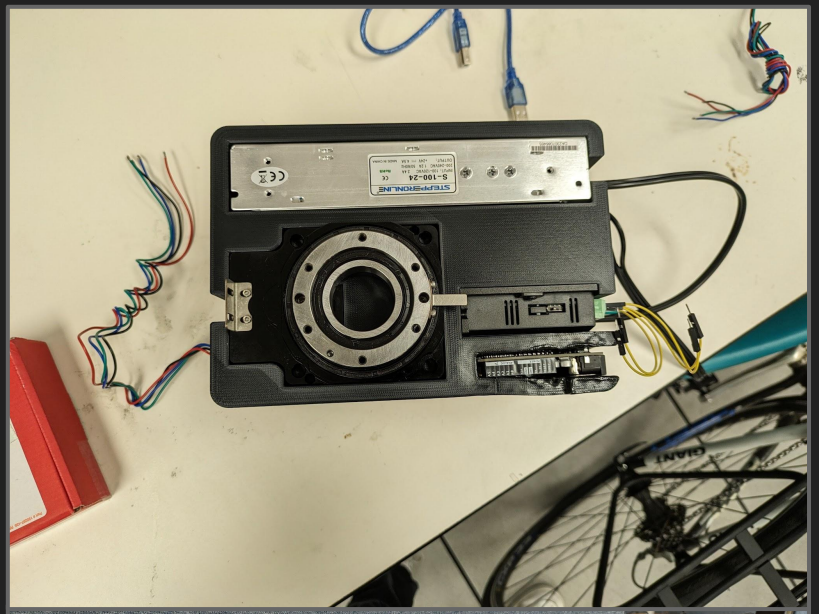
Simulations created to help with Satellite Communication Problems

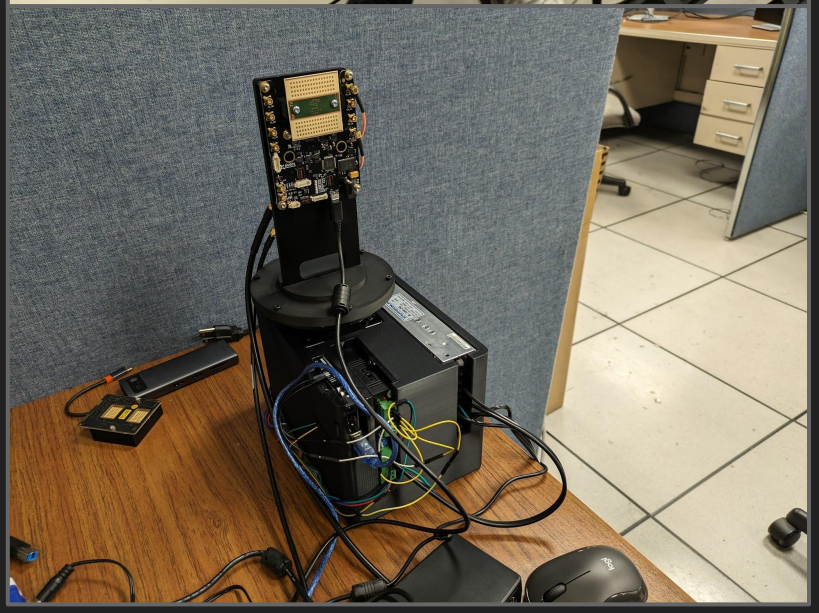


- Simulations created of Satellite constellations for SpaceX's Starlink and Amazon's Project Kuiper using MATLAB for the lab I worked in.
- TLE data of Starlink satellites collected to create an accurate, near-real-time simulation of the Starlink constellation
    - Able to determine things such as the current and future positions of any satellite in the constellation and calculate visibility windows between satellites and ground stations
    - The simulation helped others working in the lab with satellite communication problems.
- Project Kuiper Simulation created using only target number of satellites and placement data (not in operation at the time)

Phased Array Antenna Setup

Lab Needed Something to Keep Everything Neatly Together





- The lab I was working in had got a new phased array antenna and wanted to get some accurate measurements/data from it.
- First, I was tasked with finding a way to secure phased array antenna and its stand to the rotary actuator.
  - Designed & 3D-Printed a bottom disk with holes that would allow for it to be secured with screws to the actuator. On the top side was a large circular cut-out that provided a squeeze fit for the circular base of the antena stand. For redundancy, I designed a top circular part that would clamp down the top of the antenna base to to the previously designed part.
- 2nd, I needed to find a way to keep all the components of the antenna setup neatly together.
  - I designed a box that accommodated the stepper motor, rotary actuator, Arduino Uno, power supply, and motor driver; all without getting in the way of any wires or the antenna's movement.

* Everything designed in Solidworks

CNC Cuts/Carves

I Wanted/Needed to Learn how to Use a CNC Machine

- Had been wanting to learn how to use a CNC machine for a while, so I decided to buy a small one to get started learning.
- I've learned about different CAM softwares and how to communicate with these sort of machines. I've learned about which tools and toolpaths are used for which purposes.
- Have made some works such as those on the right (relief of Space Shuttle and carving of family name)
- Planning to use Haas CNC at my university in the coming quarter to practice machining with metal on an industrial-level machine.

* Combination of Fusion, HSMworks, and Solidworks used for CAD/CAM. UGS used as G-code sender

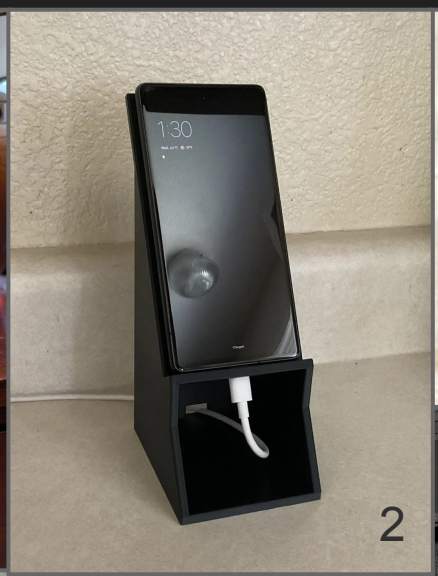
Desktop CNC Enclosure

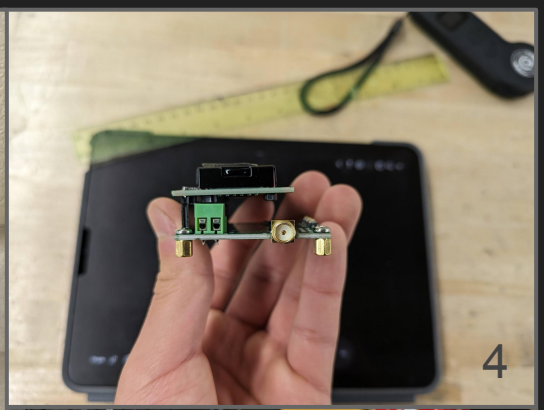
Enclosure needed to catch the dust/chips and some of the noise produced by my CNC Machine

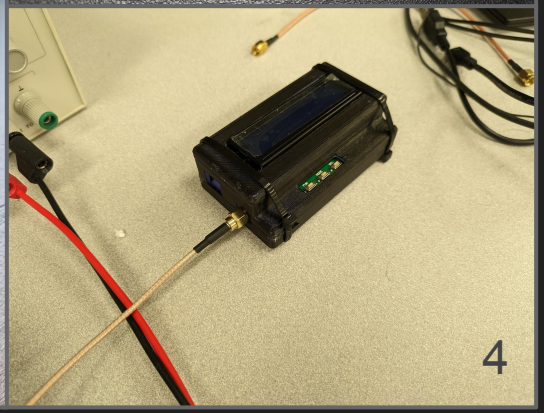
- Built out of cardboard, hot glue, and glass
- Used cardboard because I did not want to spend much money.
- Used the same box the CNC Machine was delivered in as the main housing section of the enclosure
    - Made small cut-outs in the back for cables to pas through
- Used other cardboard to make the door
    - Added flaps to the side to aid with noise suppression
    - Cut out a small viewing window and attached a piece of glass from an old picture frame.
- The hinge mechanism makes use of folds that come present in the corners of cardboard boxes.
- Plans were to make the door have a magnetic locking mechanism when closing, but since magnets were not available, electrical tape was used to keep the door tightly shut for the time being

Miscellaneous Designs

Other random designs I've created







1. Mini soccer ball stand
2. Cell Phone stand with ease of charging functionality
3. Multi-level ring stand
4. Case design for protection and structural support of digital power reader.

* All designed in Solidworks