Aerostructures

Rocket Division

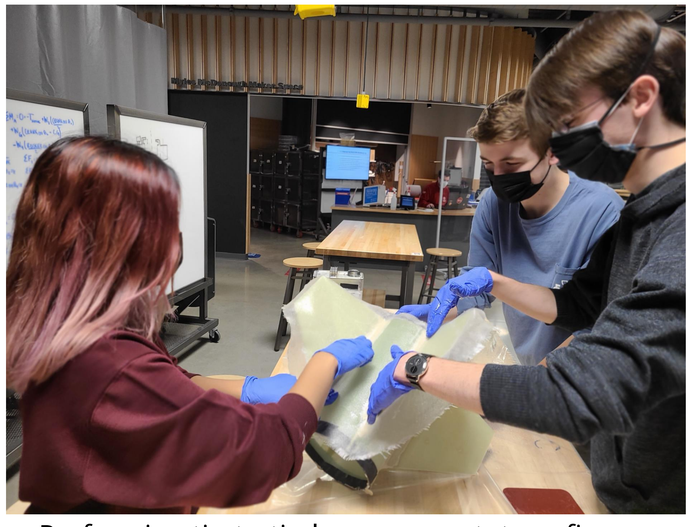
Overview

The aerostructures subteam is responsible for the external structure of the vehicle, including the nosecone, body tubes, fin can, and tailcone. The nosecone and body tubes are COTS, while the tailcone is a custom fiberglass part. The fin can is made of a custom fiberglass tip-to-tip layup using G10 fiberglass fin cores.

Attaching the fins to the prototype fin can

Creating fin fillets on prototype fin can

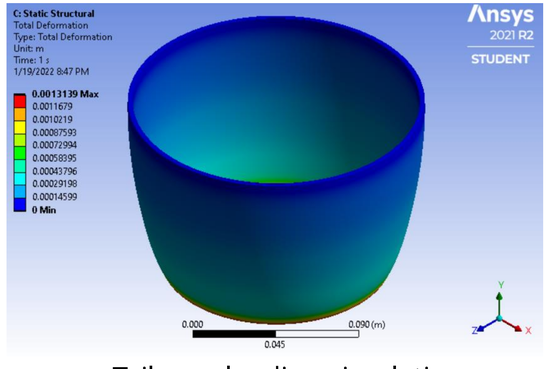
Laying up prototype tailcone



Performing tip-to-tip layup on prototype fin can

Demolded prototype tailcone

Prototype fins and tailcone



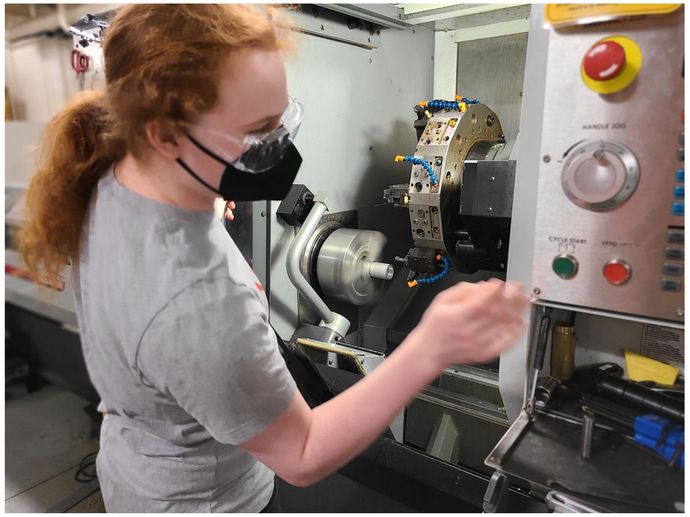
Tailcone loading simulation

Couplings

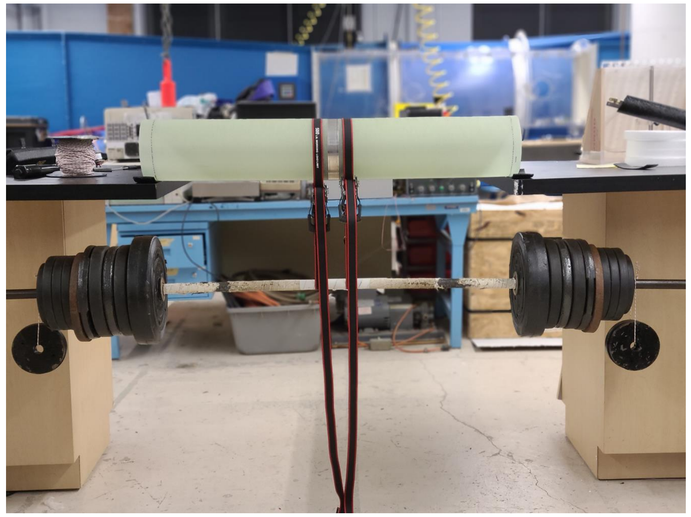
Rocket Division

Overview

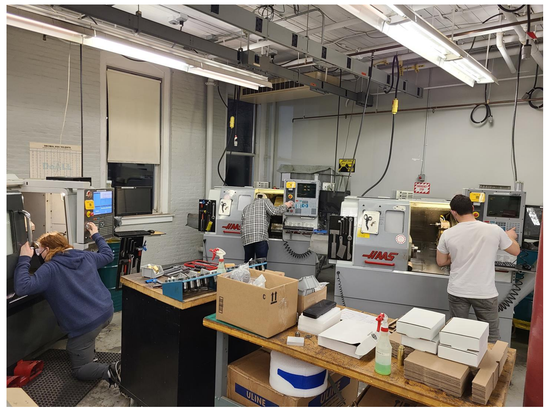
The couplings subteam is responsible for the design and construction of the SRAD airframe couplings. As an alternative to coupler tubes, these machined couplings offer similar rigidity at a reduced weight and provide standardized mounting points for internal components such as the recovery bay and airbrakes. The coupling subteam also designs and manufactures the motor retention system.



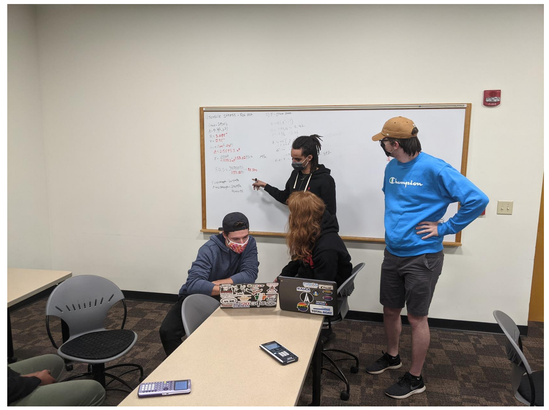
Machining thread test articles



Load testing a prototype coupling

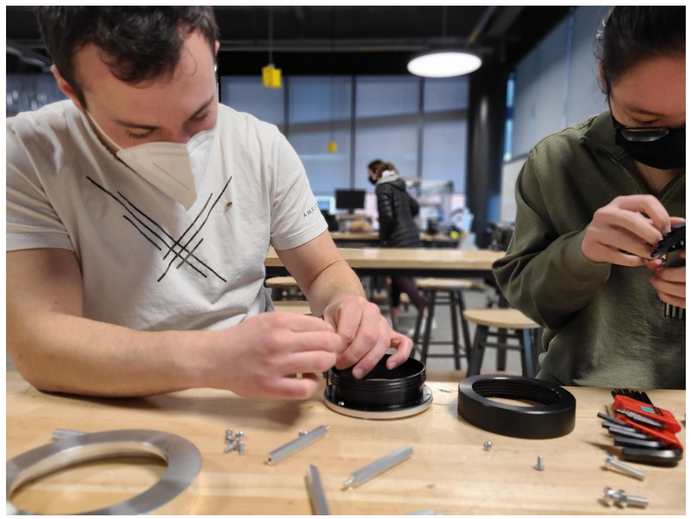


Students learning to operate CNC lathes

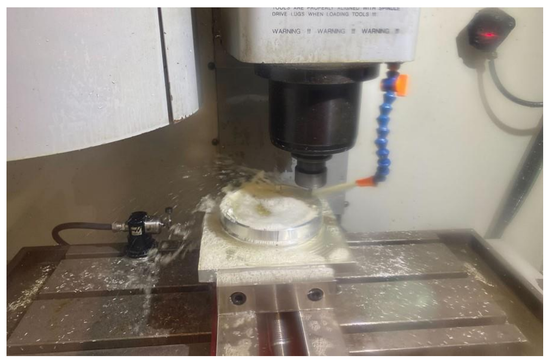


Stress analysis meeting

Testing the coupling torquing mechanism



Assembling the motor retention system



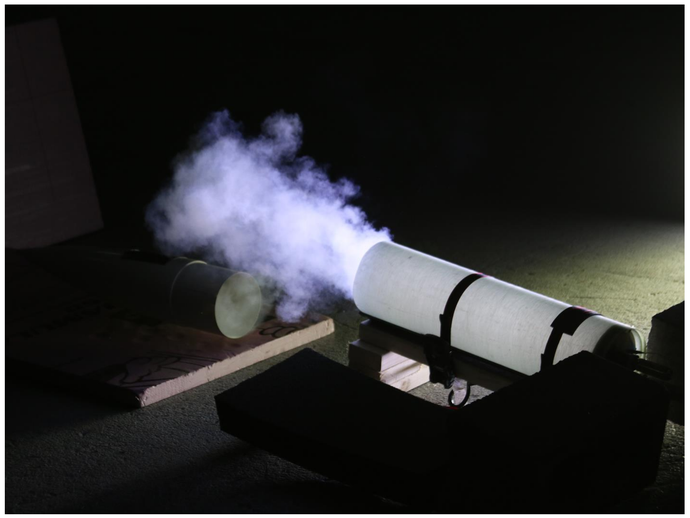
Machining mounting flanges on coupling

Recovery

Rocket Division

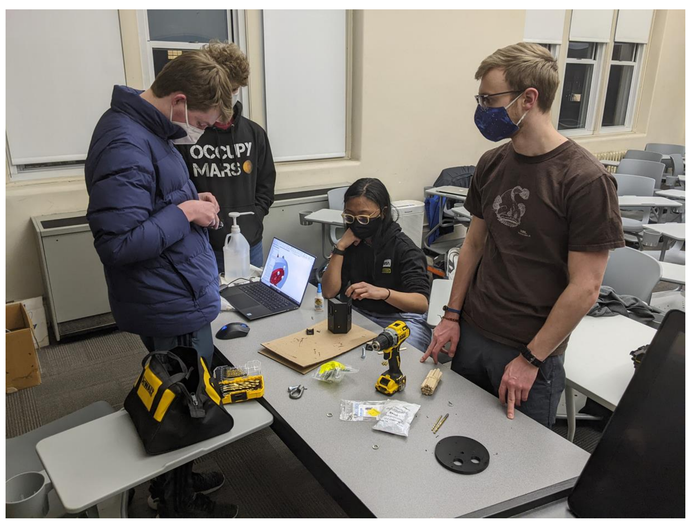
Overview

The recovery subteam is responsible for the design of the recovery system for the vehicle. The main recovery system consists of a drogue and main parachute, with the vehicle separated using a COTS CO_2 ejection system. Using a single separation event, the main parachute is held within the vehicle by pyrotechnic releases. The recovery subteam also designed and constructed the recovery bay which holds all recovery electronics and the COTS GPS tracker.

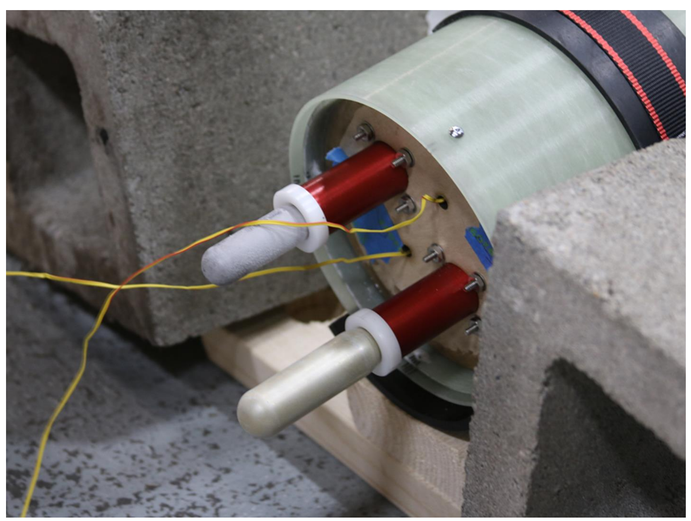


CO_2 ejection testing

Drop testing of single-ended recovery system

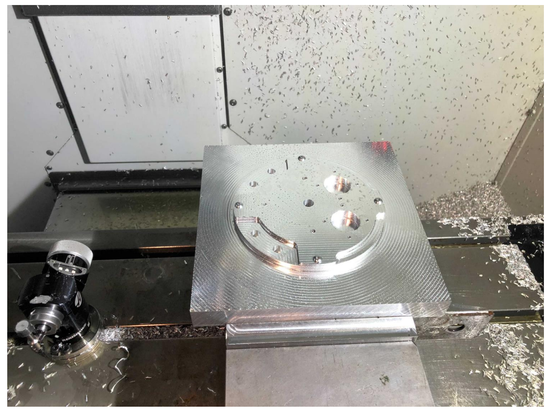


Assembling the prototype recovery bay



CO_2 ejection system after deployment

Machining the recovery bay bulkhead



The machined bulkhead

Recovery bay design meeting

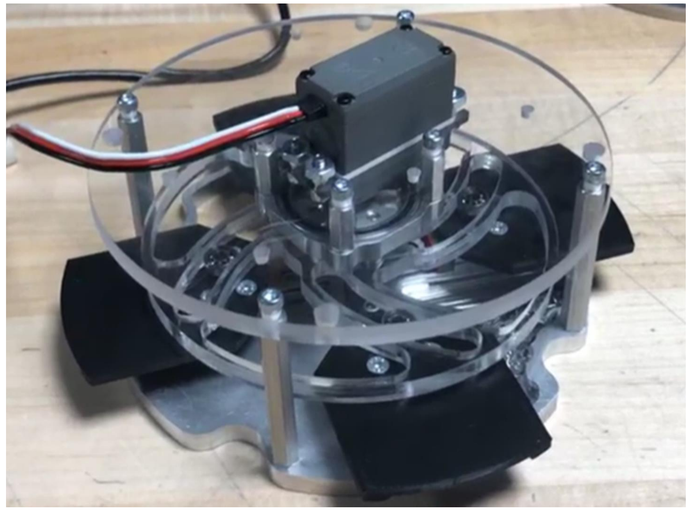
Airbrakes

Rocket Division

Overview

The airbrakes subteam is responsible for the design and construction of the airbrake system, used to actively control the apogee of the vehicle. The airbrakes consist of four fins that extend through the airframe to increase the drag of the vehicle, actuated via a slotted cam plate. Control is accomplished by estimating the vehicle's apogee, then adjusting the drag coefficient to reach the target apogee.

Testing the airbrake prototype



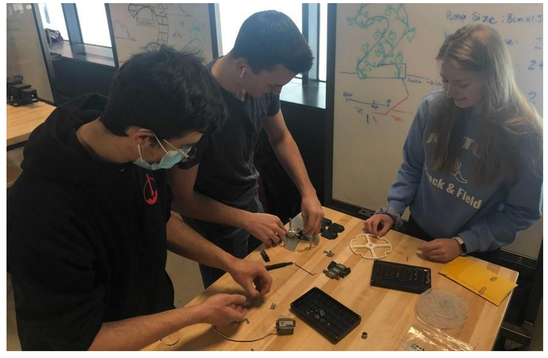
The prototype airbrake system

Squaring stock for the airbrake fins

The airbrake fins prior to parting operation

Initial mechanical design meeting

Machined rail mounting plate on fixture



Assembling the airbrake prototype

HPRC WPI AIAA

Electronics and Programming

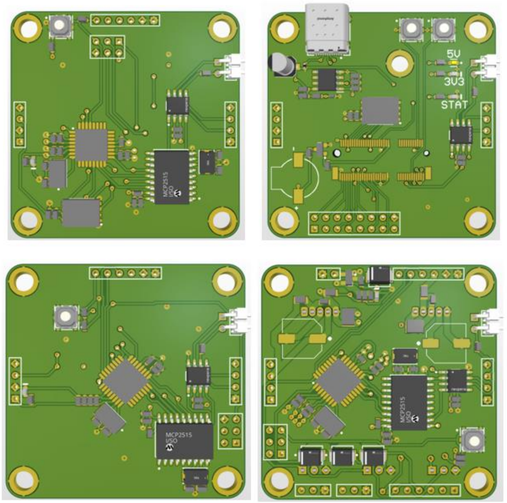
Rocket and Payload Divisions

WPI

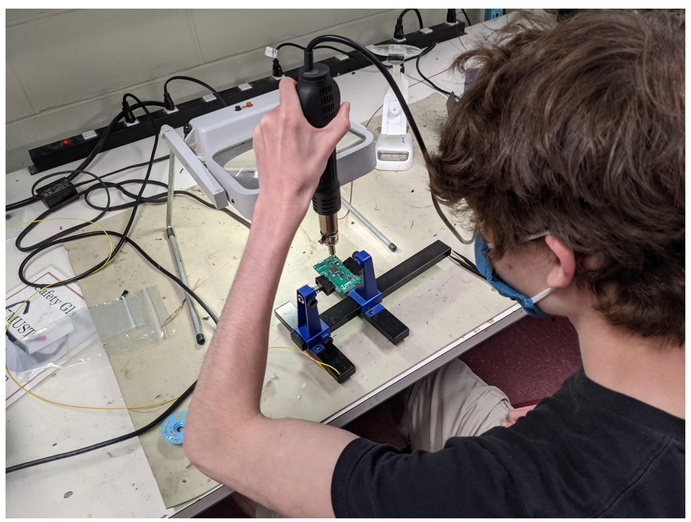
Overview

The electronics and programming team is responsible for all custom electronics across the rocket and payload divisions. The team designed the avionics stack that logs and transmits flight data and controls the airbrakes, as well as the ground station hardware and software used to receive the data. They also make the software for controlling the payload retention system and quadcopter.

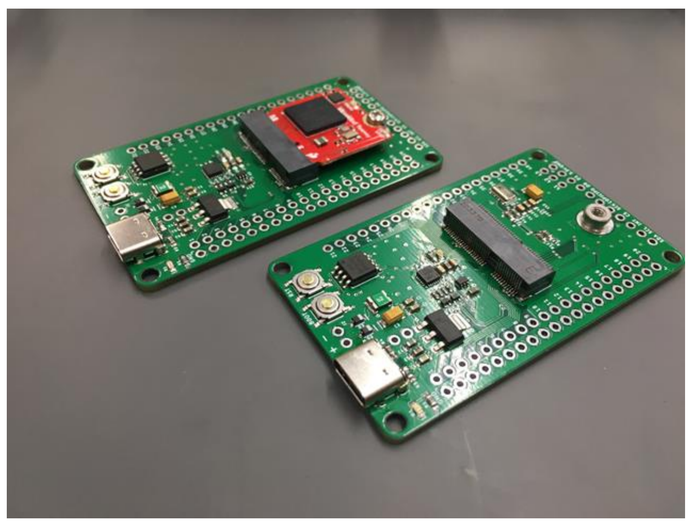
Testing an antenna on a drone at Wachusett reservoir



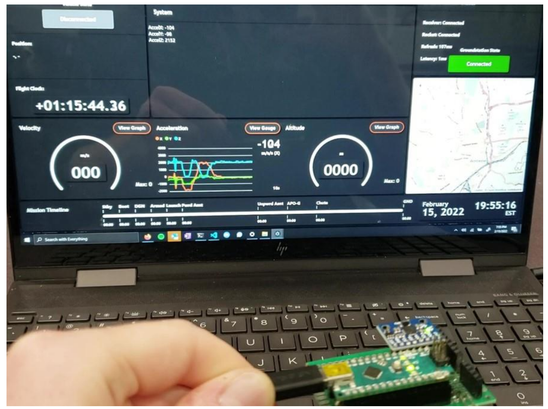
Custom avionics stack boards



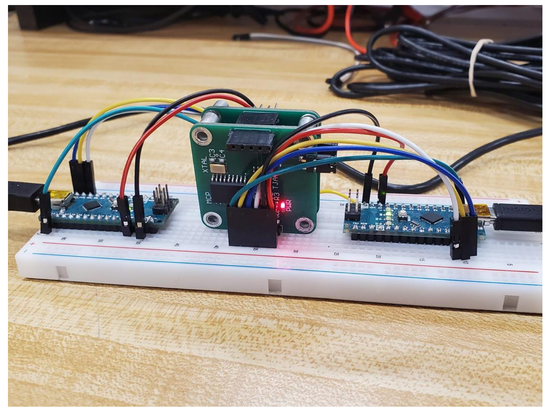
Assembling Polaris PCB



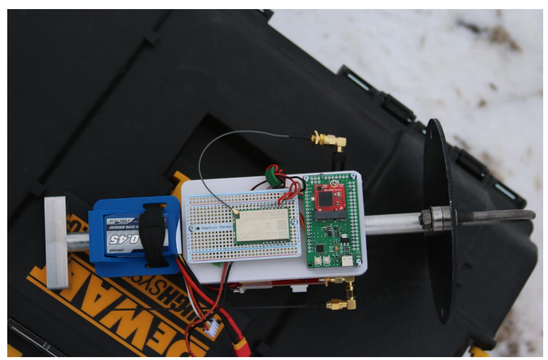
Completed Polaris PCB



Ground station data testing



CAN bus test board stack



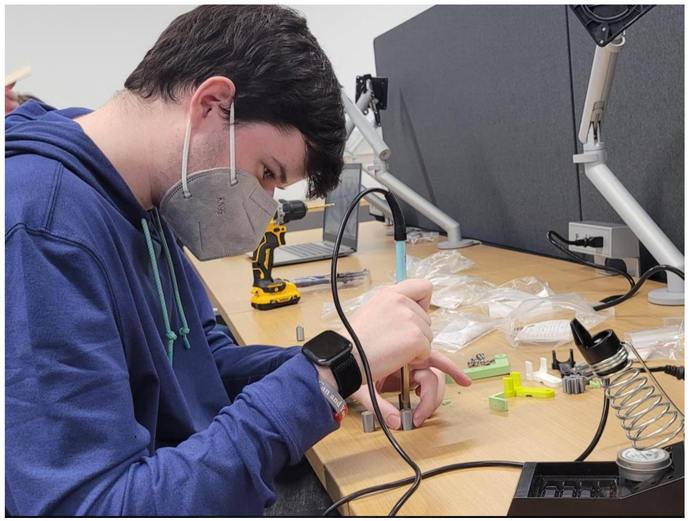
Polaris PCB in 2021 Avionics Bay

Payload Mechanical

Payload Division

Overview

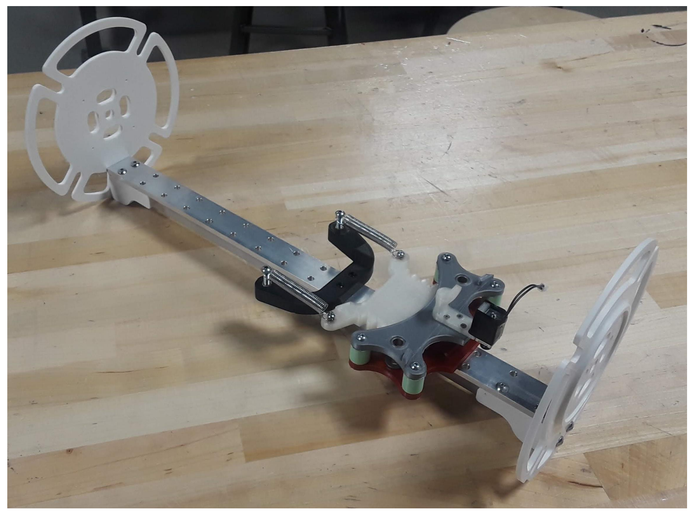
The payload mechanical subteam is responsible for designing and building the physical sections of the payload. This year, the payload is a quadcopter that will locate the rocket using a directional antenna. In addition to designing the quadcopter, the payload mechanical team designed a retention and recovery system, to ensure it will safely reach the ground.



Assembling a gripper prototype

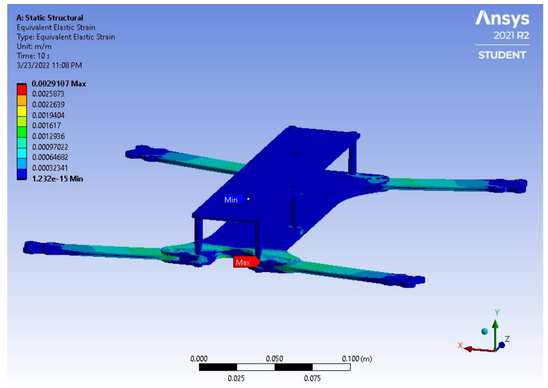
Final carbon fiber quadcopter frame and electronics

Plastic quadcopter frame prototype

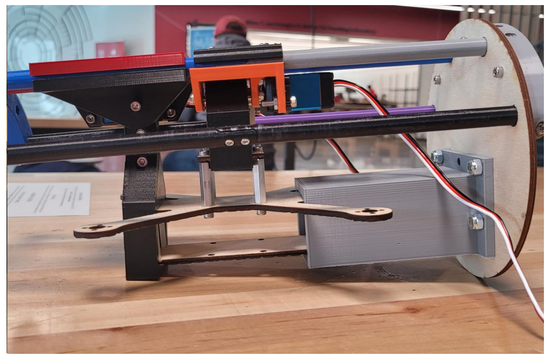


Arm deployment prototype on payload spine

Machining quadcopter locking pins



Simulation of quadcopter structural model



Early Dropping Quadcopter Prototype