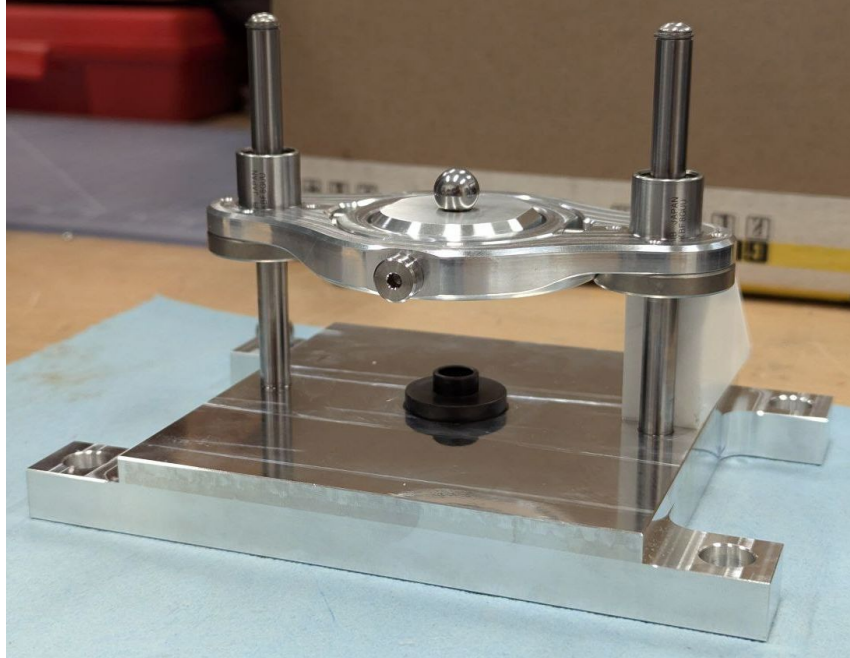


# Engineering Projects Portfolio

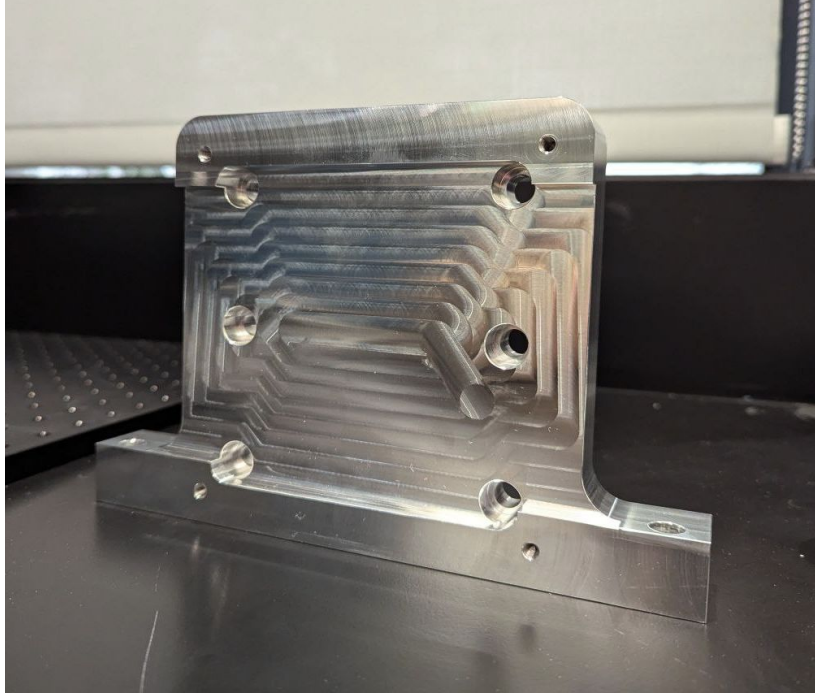
Pavel Matyukhin

# Ring-on-Ring Glass tester



- A device for Ring on Ring testing used to characterize glass properties
- Proven to successfully and reliably test glass samples, deployed in the field for evaluation of glass properties
- Top ring has can self-adjust to surface inclination (can spin freely around 2 axis in the plane of the sample)
- Precision pins and linear bearings ensure smooth rotation and linear movement as well as minimal lateral play

# Battery Shock Fixture



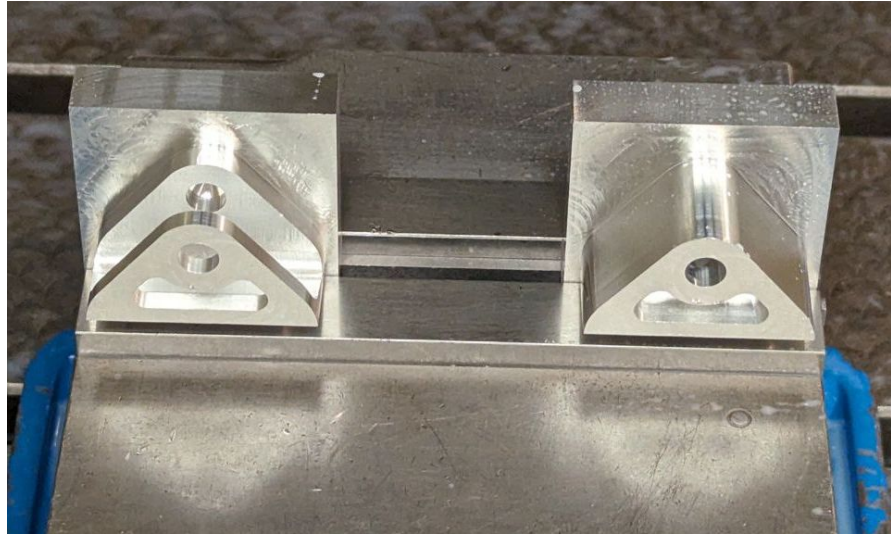
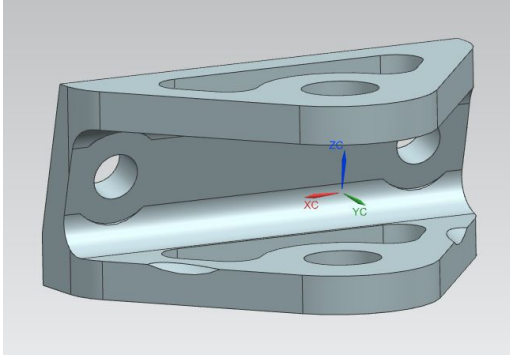
- Solid aluminum fixture for battery testing
- Currently used in the field to test various configurations and sizes of batteries
- Multiple mounting points and orientations included to test in 3 shock directions
- Includes features to install accelerometers
- Successfully tested with minimal change in shock transmission
- Spaces on the sides and large front space designed for HSV camera accessibility and DIC analysis

# Pen and Pencil Manufacturing Project



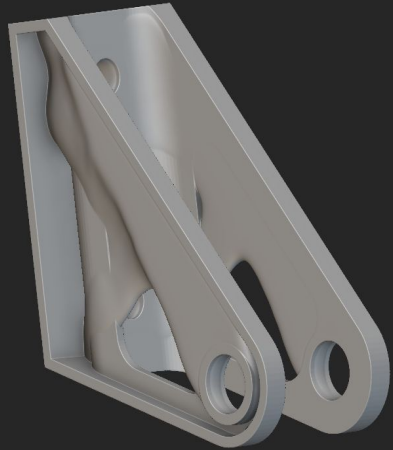
- Final project for Design for Manufacturing class
- Utilizes multiple materials from different classes (Bronze, Maple wood, Carbon fiber composite)
- Alternative version made from 3 metals (Aluminum, Bronze, Steel)
- Features hidden mechanisms inside the barrel for pen and pencil actuation
- Manufacturing methods include: manual milling, lathe, composite layup and curing
- Link [YouTube video presentation](#)

# Suspension Clevises for GFR24 (Capstone Project)



- Redesign of Suspension Clevises for GFR24e and 24d electric racecars
- Successfully completed 2024 Formula Student competition season
- 11 unique components, 88 parts over 4 cars
- Manufactured on a 3-axis CNC and Manual mills
- All parts designed for Safety Factor  $>1.8$  by utilizing hand calculations and FEA
- Reduced total weight of the system from 1100g to 700g compared to previous year
- Improved manufacturability by standardizing features across all parts and sizing for tools
- Reduced the number of unique parts by keeping features symmetrical where appropriate
- [Link to Project Poster](#)

# 3D Printed Suspension Clevises



- Alternative version of suspension clevises for GFR24 race cars
- Designed through nTopology, implementing topology optimization and FEA
- Metal printing allows for more complex geometry than traditional manufacturing
- Potential weight savings of more than 20% from traditional design depending on the material
- Design was made considering both functional and aesthetic features
- Physical parts were sponsored and printed by HP

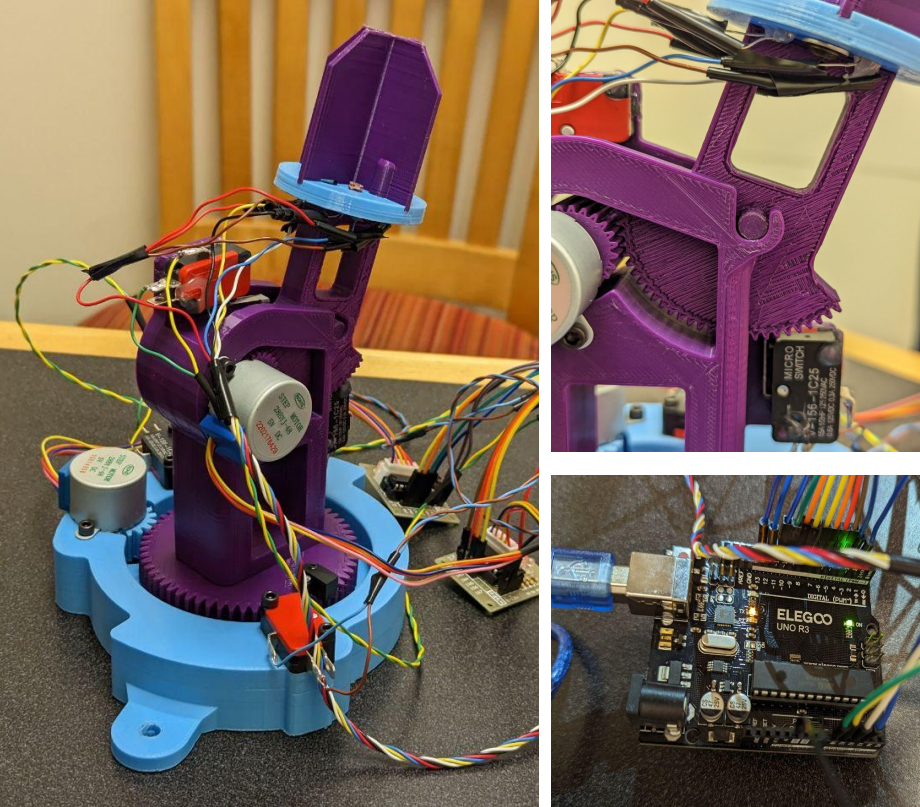


# Kitchen Multi-Tool



- Class project designed considering customer requirements and products available on the market
- Concepts were generated using DFMEA and house of quality methods
- Designed, manufactured, assembled and tested within 6 weeks
- Utilizes 3D printed parts and off the shelf electronic components
- Allows variable speed settings, and multiple tool attachments which are attached on a common thread
- Includes documentation with technical specifications and engineering drawings
- Link to [YouTube video presentation](#)

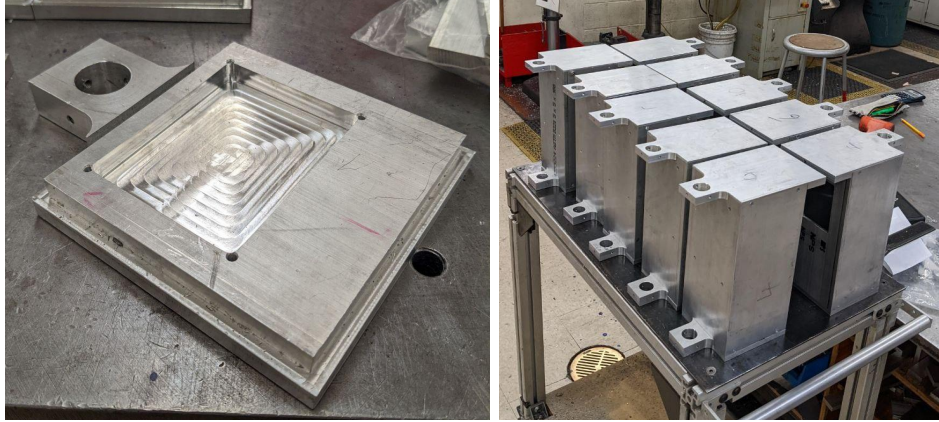
# Arduino Sun-Tracker



- A Sun-tracker assembly that tracks source of light and records light levels in real time
- Consists of 3D printed case, gearing mechanism, light splitter; switches, sensors and stepper motors for 2 axis movement
- Light is detected by 4 photosensors, separated by a 3D printed “light splitter”
- Utilizes 2 stepper motors to rotate sensors around 2 axes to point at source of light
- Continuously locates source of light and records light levels derived from electrical values
- Runs on single Arduino Uno board
- Link to [YouTube video presentation](#)



# Aluminum Case Assemblies (Manufacturing Project)



- Aluminum assemblies to hold cameras / data acquisition equipment in forest environment
- Programmed and setup CNC Mill to continuously manufacture identical components
- A set of 10 identical aluminum assemblies consisting of 6 components each
- Made engineering drawings with GD&T to ensure assembly between
- Fast-paced project completed and assembled in 5 weeks

