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# PORTFOLIO

KARL-OSKAR PAJUS

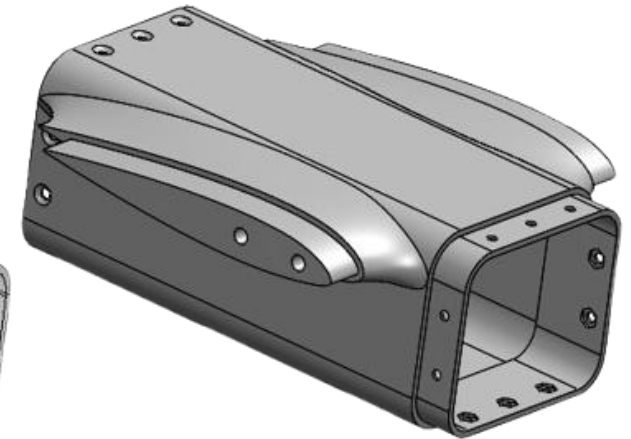
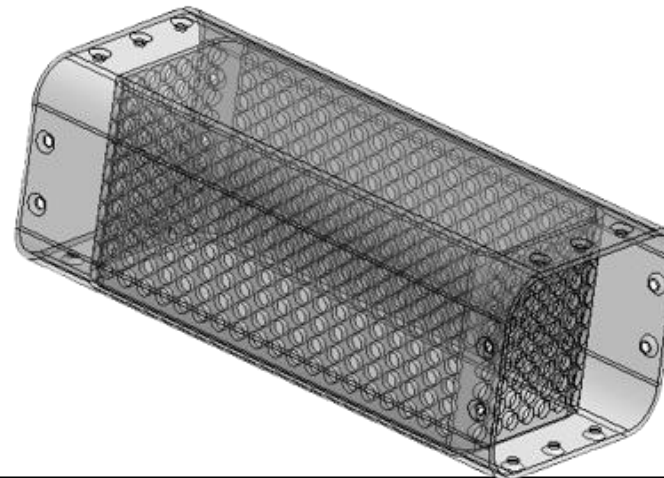
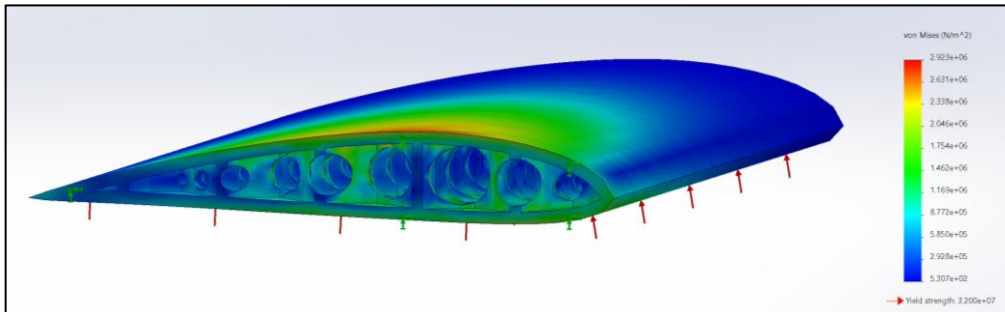
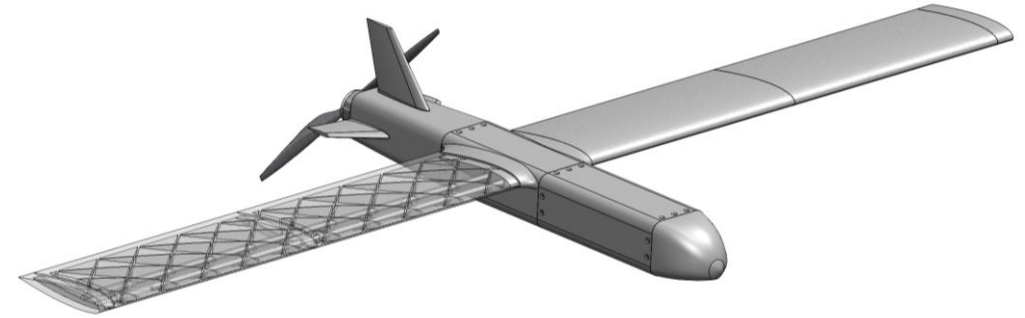
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# SLS PRINTED MODULAR UAV

For a capstone project developed a modular group 2 drone designed to be SLS printed

- Modelled components on SOLIDWORKS
- Validated designs through fluid simulation and FEA
- Performed materials testing to develop design parameters
- Put together detailed testing plans for joints and components



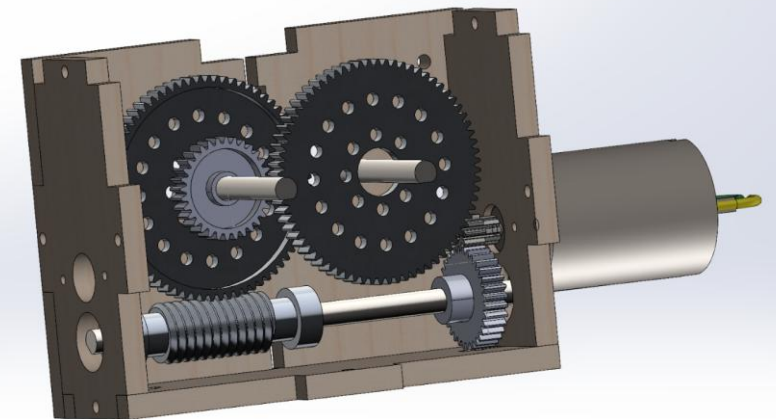
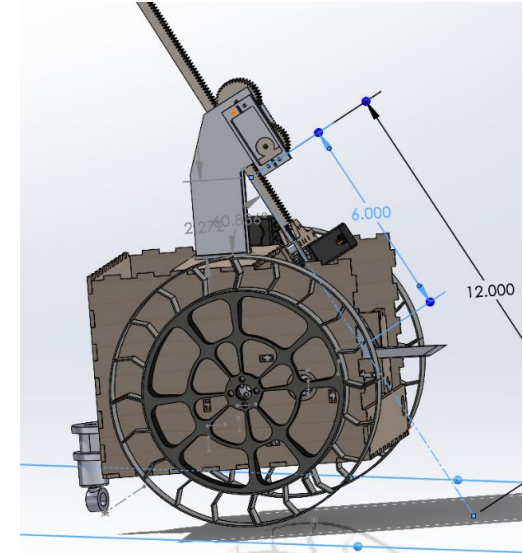
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# MARS ROVER COMPETITION

Built a remote-controlled rover for a competitive obstacle-course project in a Machine Engineering course

- Led the modeling and fabrication side of the project
- Designed a high-tolerance and compact gearbox
- Put together protocols to ensure proper fit for laser cut and machined components
- Fabricated parts using lathe machining, 3D printing, and laser cutting

In the end we successfully completed all assigned tasks on the course, achieved 3rd place and I gained experience in DFM, tolerance control, and efficient prototyping.

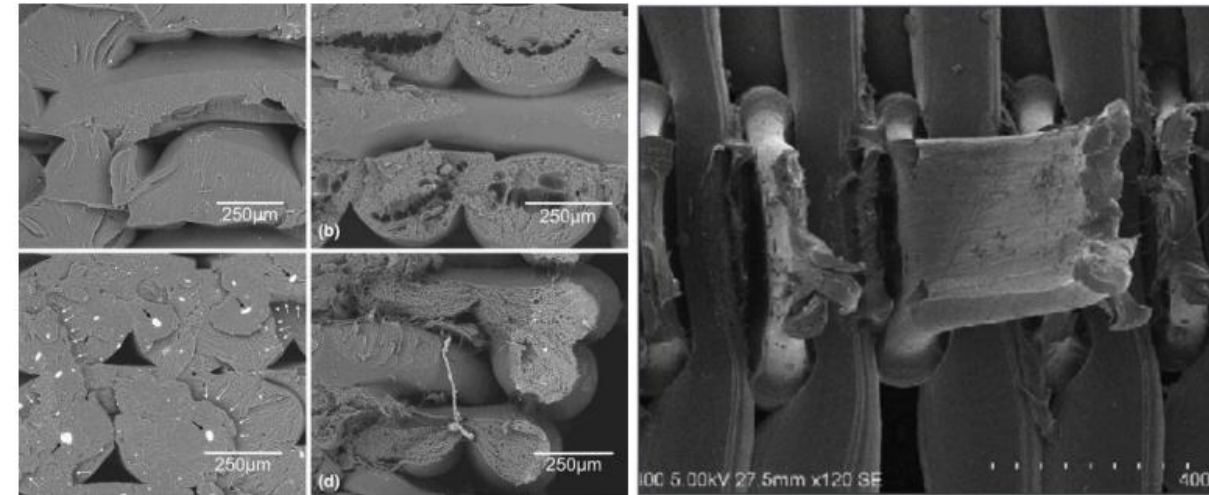


# MATERIAL TESTING OF 3D PRINTED POLYMERS

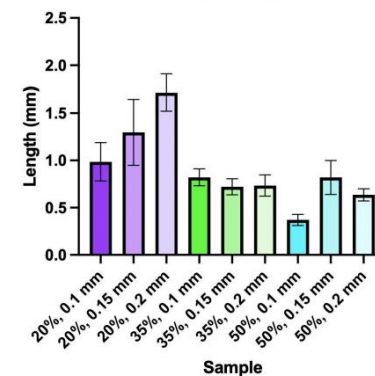
The goal of this project was to understand the impact of layer height, infill percentage, and infill pattern on strength and failure behavior.

- Developed testing procedures for different parameters
- Performed tensile and compression tests using an Instron testing rig
- Used an SEM to analyze the fractures and identify failure modes
- Processed and visualized the data using MATLAB and excel

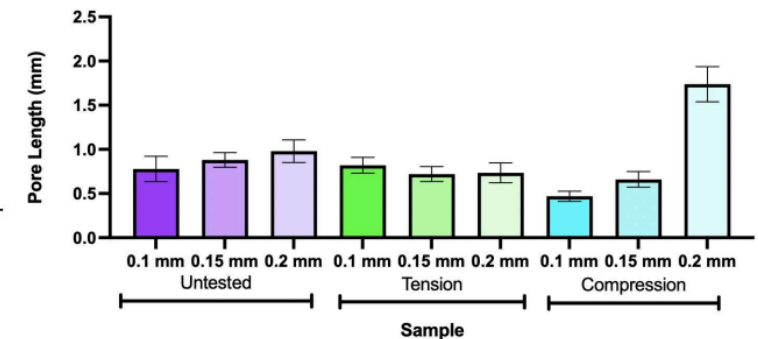
Produced quantitative datasets and used the findings to synthesize recommendations improve production efficiency for 3d printing structural parts.



Tensile Testing Average Pore Sizes



Untested, Tension, and Compression Pore Sizes at 35% Infill





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# INTERACTIVE LED SCULPTURE

I wanted to learn more about microcontrollers and LED controls, so I designed and build a 3d printed light sculpture and coded sound reactive LED patterns.

- Modelled the frame structure in SolidWorks
- Soldered the LED strips and designed the wire routing
- Built housings for electronics
- Programmed the microcontroller

The final results was a fully functional, sound-responsive light installation. Through this project I gained experience in microcontroller programming, soldering, and electromechanical integration.



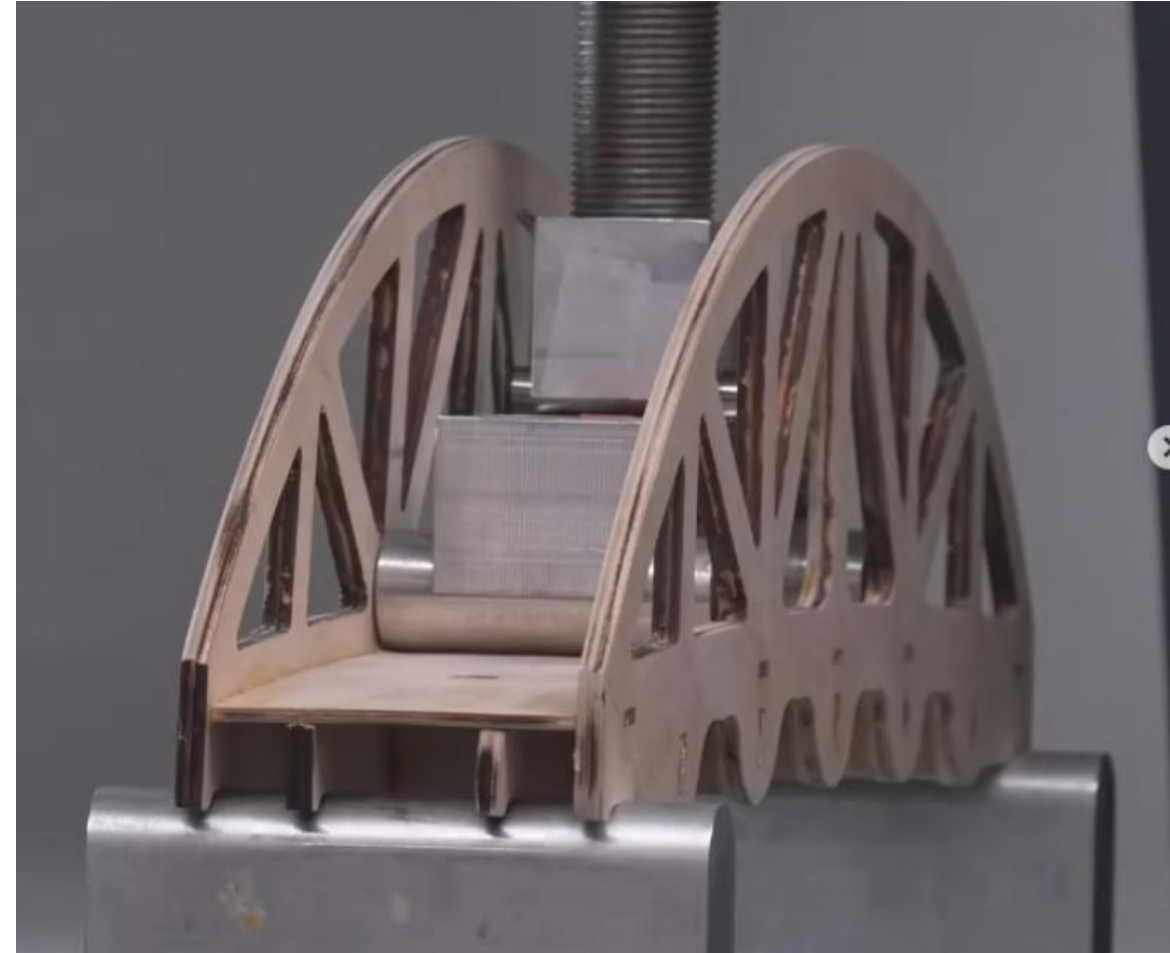
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# BRIDGE COMPETITION

Course project to design and build an optimized truss bridge and explore structural efficiency, creativity, and load-bearing performance through hands-on analysis.

- Researched traditional truss styles and developed new concepts with teammates
- Performed manual calculations and SolidWorks FEA for iterative structural optimization
- Modeled all components in CAD, laser-cut the final components and assembled it for testing

We demonstrated a truss bridge with a strong strength to weight ratio, gained experience in FEA, iterative design, structural analysis, CAD, testing and fabrication.

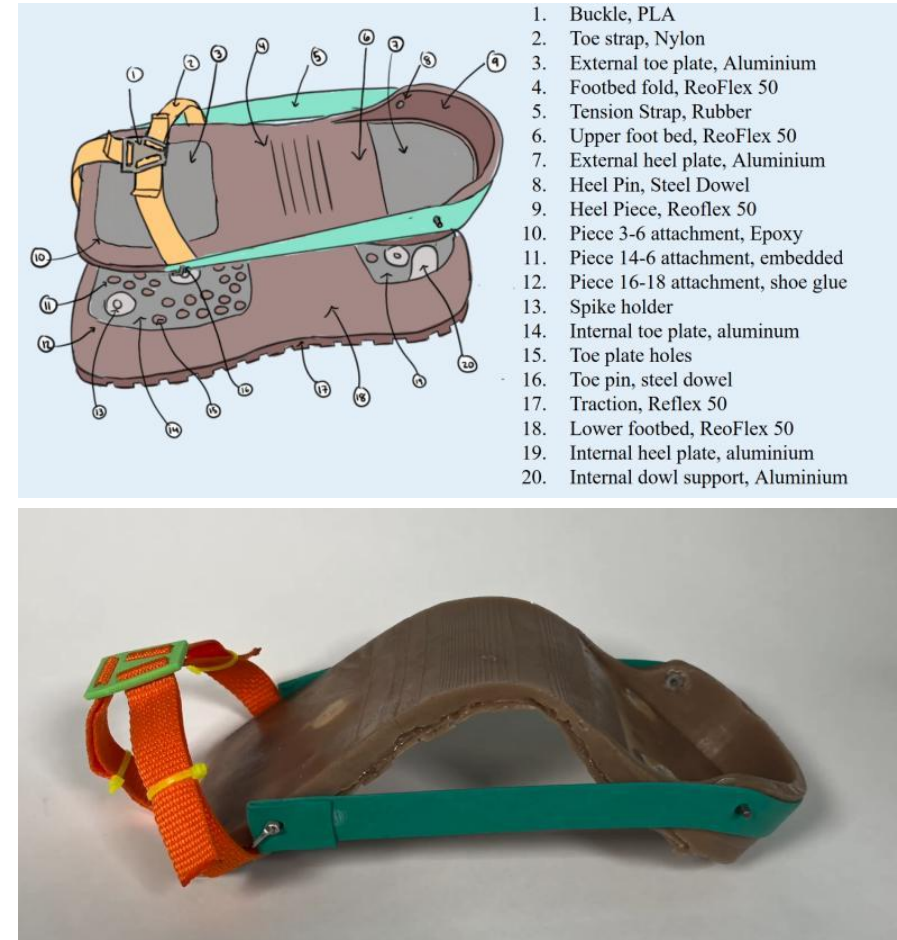


# SPIKEASE ASSISTIVE MOBILITY DEVICE

Team project to identify a market gap in the assistive device field, gather market data and using that develop a functional and a marketable product

- Conducted detailed market research and analysis
- Prototyped using polymer molding, sheet metal components, and elastics
- Conducted stress and repeated-stress testing to validate durability

The final design reduced donning time from ~20 seconds (market leaders) to ~3 seconds, all while being fully hands-free. In addition, we developed a business plan that was successfully presented to Dartmouth faculty.





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# BLACKSMITHING/KNIFEMAKING

To pursue my interest in metalworking I built a blacksmithing studio and spent a couple years knife smithing.

- Built many of the tooling needed for knife production
- Learned about metallurgy and heat treating
- Used hand and power tools for fabrication

Through this I learned a lot about design, fabrication, metallurgy and product design.

