Driven and curious Mechanical Engineering graduate with a passion for mechanical design and high-volume manufacturing. Experienced with leadership, hands-on skills, cross-functional collaboration, and owning hardware from start to finish.

Seeking to leverage my skills in a work environment where I can grow.

Aidan Siaotong

Engineering Portfolio

B.S. Mechanical Engineering, University of California, Irvine – 2025

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(818) 318-0452

Formula SAE – Upper Steering System (1)

Project Objective

Design, build, and test the upper steering system for Anteater Formula Racing's 2025 competition car.

Personal Contributions *(Human Interface Design Engineer)*

- Conducted all background research to define project goals and design requirements
- Responsible for all CAD, verification, part sourcing, manufacturing, assembly, testing, and integration with other sub-teams

Steering Non-Uniformity Analysis

- Characterized the non-uniform motion of universal joints in MATLAB to configure steering column parts
- Eliminated non-uniformity present in the previous car's design

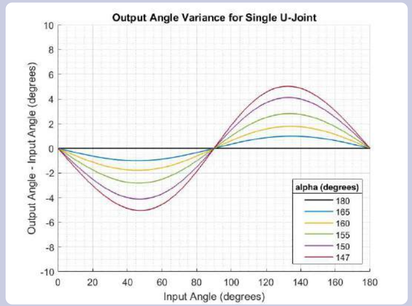
Steering Column and Shaft Sizing

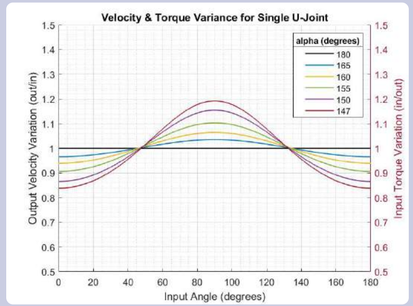
- Sized steering column components using hand calculations (Excel) to balance the tradeoff between torsional stiffness and additional mass
- Conducted structural analysis of u-joint parts in ANSYS to verify the strength of selected components in worst-case loading scenarios
- Used APDL commands to relate input torque to rotational deflection of u-joint parts

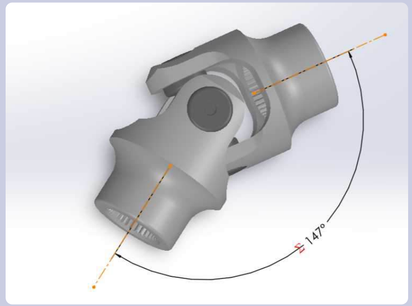
Steering Support Structural Analysis

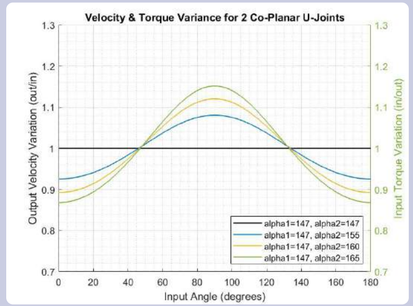
- Sized tubing for steering system supporting structures in ANSYS Mechanical
- Used beam elements to quickly iterate through different beam cross sections

Steering Non-Uniformity Analysis

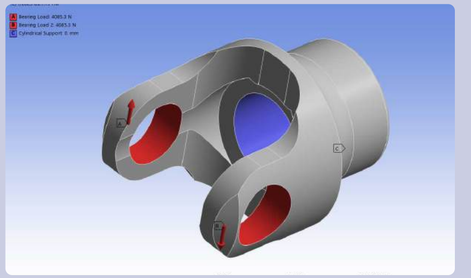


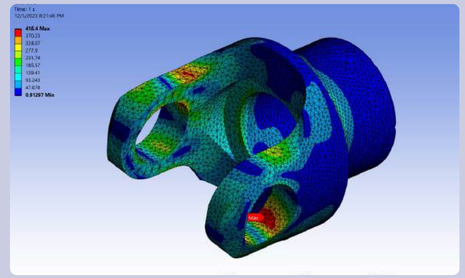






Steering Column and Shaft Sizing





	Average Steering Torque		Maximum Steering Torque	
	30.0	N-m	135.0	N-m

STIFFNESS

Part	Material	OD (mm)	J (mm^4)	L (mm)	G (GPa)	φ (rad)	k (N-m/rad)
Steering Column	7075 Aluminu	16.87	7943.41	53.5	26.9	7.51E-03	**3993.98**
	7075 Aluminu	19.05	12929.44	29.8	26.9	2.57E-03	**11671.21**
Universal Joint						1.72E-03	**17452.90**
Intermediate Shaft	416 Stainless	19.05	12929.44	76.2	83.0	2.13E-03	**14083.25**
Universal Joint						1.72E-03	**17452.90**
Steering Pinion Shaft	7075 Aluminu	19.05	12929.44	215.9	26.9	1.86E-02	**1610.94**

EQUIVALENT STIFFNESS, K	
875.34	N-m/rad

TOTAL ANGLE OF TWIST, ϕ	
0.03	rad
1.96	degrees

MASS

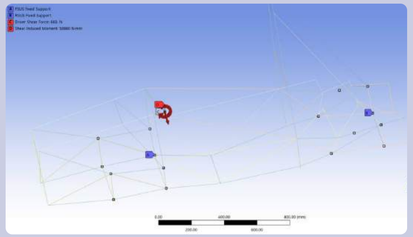
Part	Material	OD (mm)	L (mm)	ρ (g/cc)	V (cm^3)	m (g)
Steering Column	7075 Aluminu	16.87	7943.41	2.81	47.81	**134.34**
	7075 Aluminu	19.05	12929.44	2.81	33.98	**95.47**
Universal Joint						**175.03**
Intermediate Shaft	416 Stainless	19.05	12929.44	7.80	94.63	**738.10**
Universal Joint						**175.03**
Steering Pinion Shaft	7075 Aluminu	19.05	12929.44	2.81	246.15	**691.67**

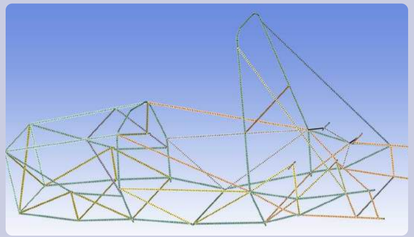
TOTAL MASS	
2009.63	g
4.43	lb.

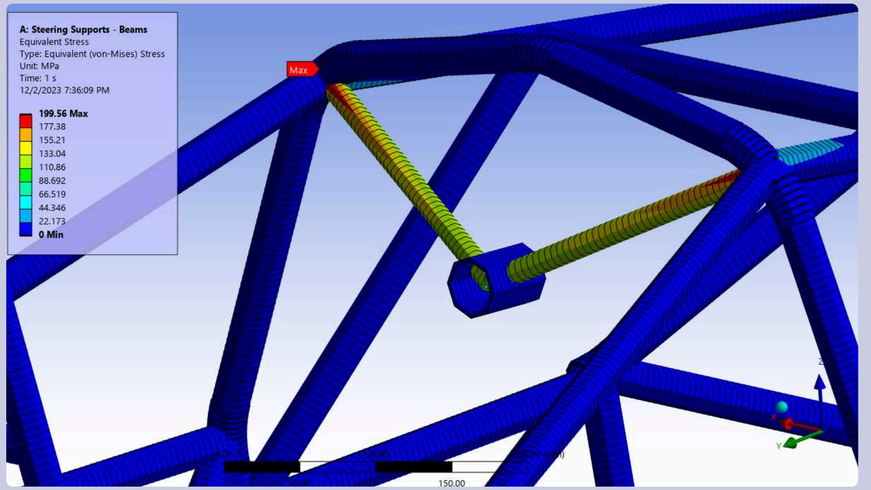
STRESS

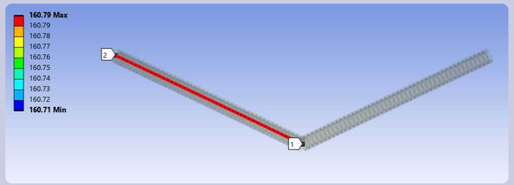
Part	Material	OD (mm)	J (mm^4)	τ_Y (MPa)	τ_max (MPa)	FOS
Steering Column	7075 Aluminu	16.87	7943.41	331	**143.32**	2.310
	7075 Aluminu	19.05	12929.44	331	**99.45**	3.328
Universal Joint				503	**416.40**	1.208
Intermediate Shaft	416 Stainless	19.05	12929.44	340	**99.45**	3.419
Steering Pinion Shaft	7075 Aluminu	19.05	12929.44	331	**99.45**	3.328

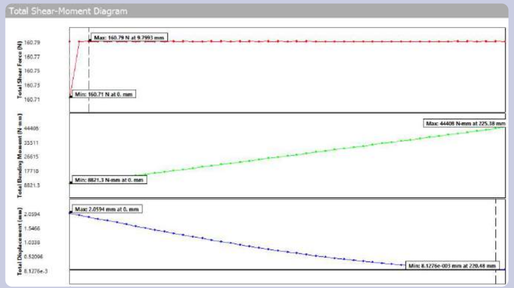
Steering Support Structural Analysis











Formula SAE – Upper Steering System (2)

Steering Support Sub-Modeling

- Conducted structural analysis of the steering supports using shell elements to verify strength

Manufacturing and Assembly

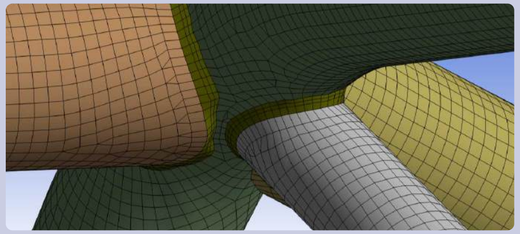
- Machined steering shafts and brackets using manual/programmable mills and lathes
- Designed and 3D printed welding jigs

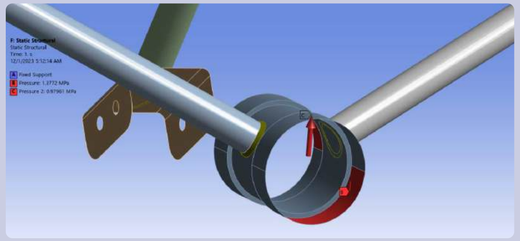
Results

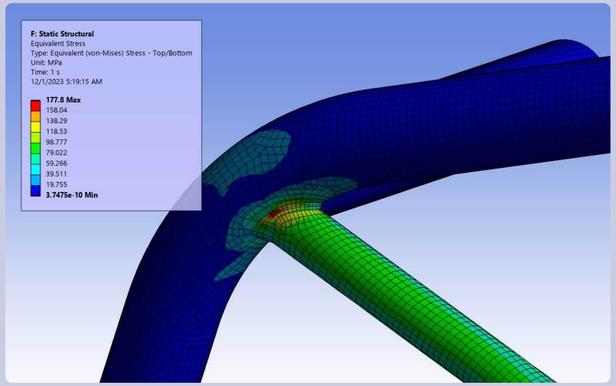
- Decreased steering system mass by 12%
- Reduced backlash/play by over 50%
- Drivers claimed that car felt safer and provided better road feedback
- Steering system held up during track testing and competition and passed inspection without issue

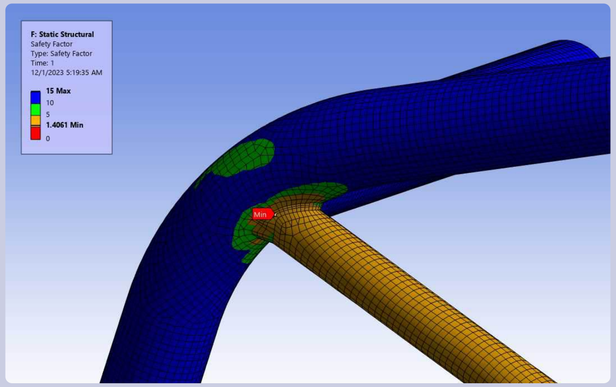
Gastly at FSAE Michigan 2025

Steering Support Sub-Modeling

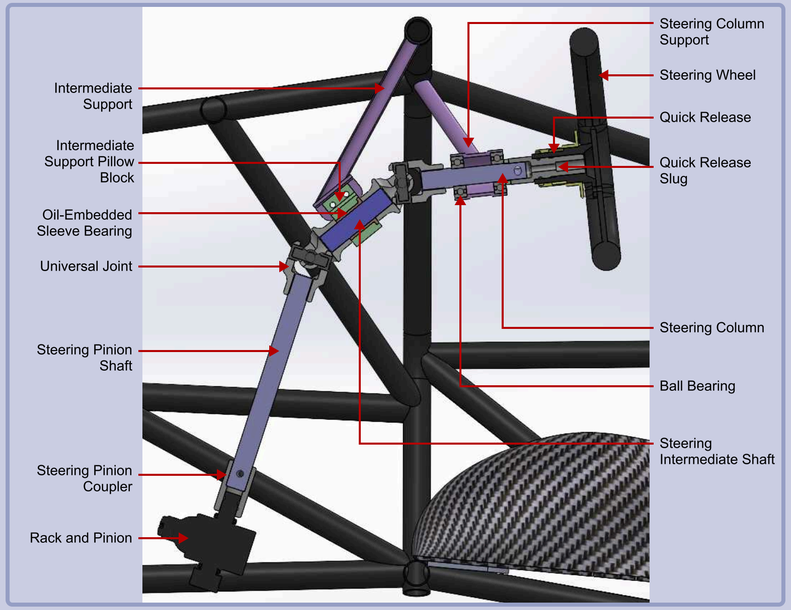




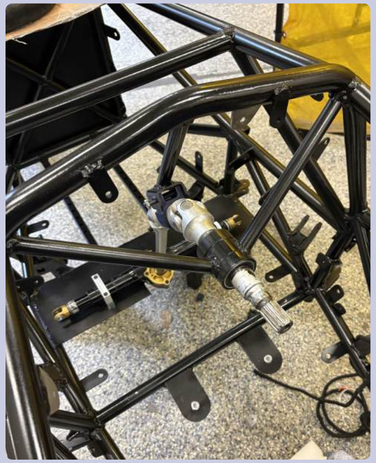




Final Design



Manufacturing and Assembly



Formula SAE – Braking Dynamics Modeling

Project Objective

Characterize FSAE car vehicle braking performance and size hydraulic brake system components for safety and efficiency.

Personal Contributions *(Lead Human Interface & Brakes Engineer)*

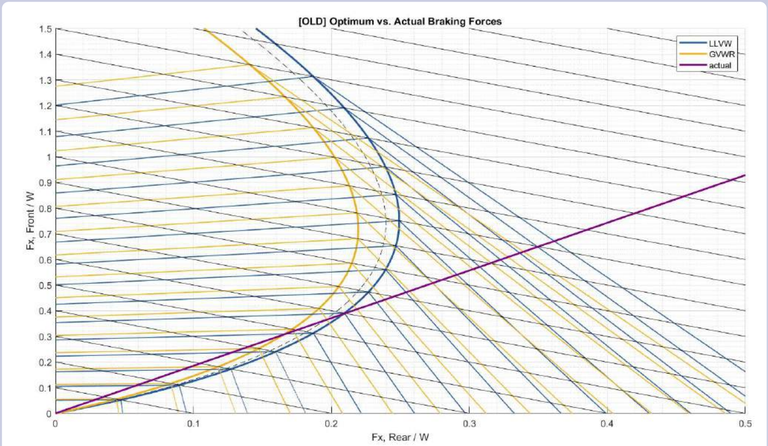
- Conducted all background research and studied hydraulic brake systems to define project scope and requirements
- Developed MATLAB scripts to model braking dynamics for a given vehicle profile (geometry, weight distribution)
- Evaluated braking dynamics at extremes of loading conditions to account for all scenarios (GVWR, LLVW)
- Sized hydraulic brake system components to prevent dangerous premature rear wheel lockups
- Verified theoretical pedal force/deceleration ratio remained below 445 N/g
- Parameterized the model and scripts to be flexible for the design of future vehicles

Results

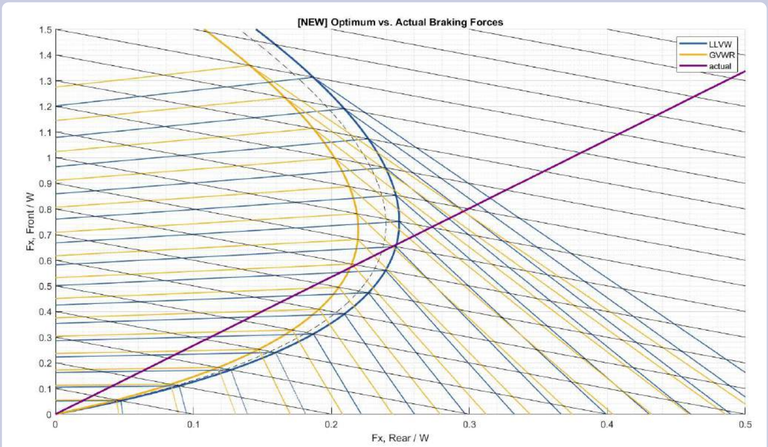
- Successfully passed the brake test at competition for first time in 6 years, using the model to guide brake bias tuning
- Sized hydraulic brake components for the team's next vehicle, increasing maximum safe deceleration by 56%

Gastly at the Brake Test

Optimum and Actual Braking Force Distributions

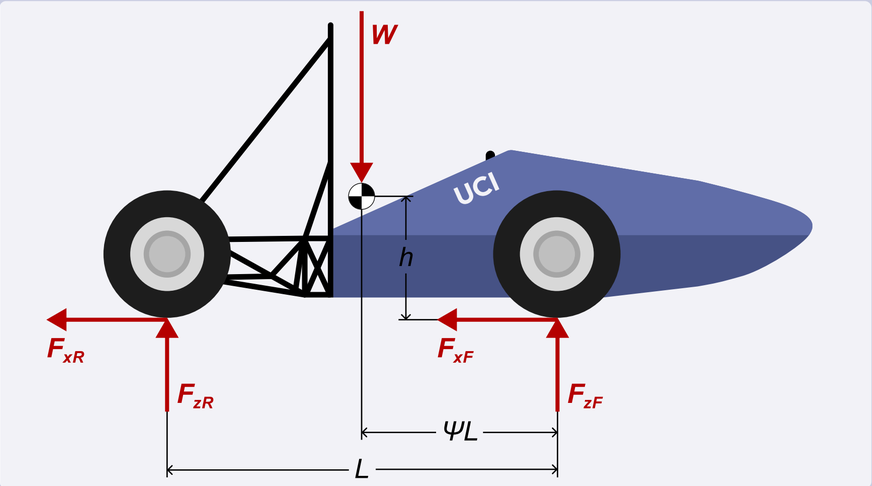


Front Master Cylinder Bore Diameter	20.6375mm
Rear Master Cylinder Bore Diameter	20.6375mm
Brake Balance	65% Front / 35% Rear
Critical Deceleration	0.556G



Front Master Cylinder Bore Diameter	15.875mm
Rear Master Cylinder Bore Diameter	19.05mm
Brake Balance	73% Front / 27% Rear
Critical Deceleration	0.868G

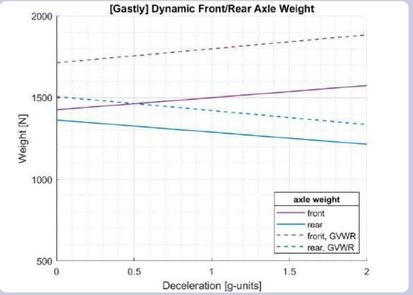
Braking Dynamics Free-Body Diagram

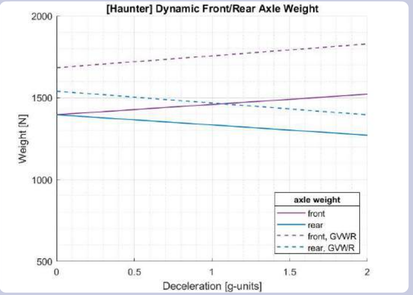


Assumptions

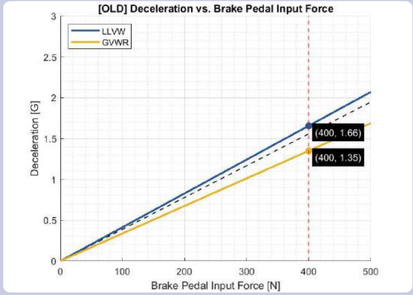
1. Neglected aerodynamic effects (for safety and simplification)
2. Neglected rolling resistance (for safety)
3. Neglected engine braking (for safety)
4. Assumed relative center-of-gravity height is not very sensitive to driver loading conditions
5. Assumed vehicle is braking on level ground (track conditions)

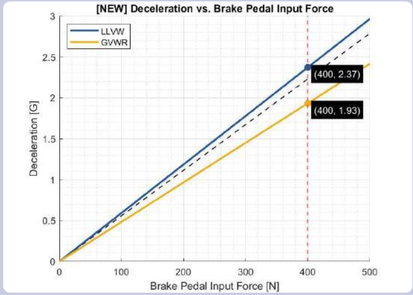
Dynamic Axle Loads





Deceleration Ratios

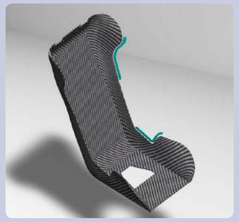




Formula SAE – Carbon Fiber Seat

High-Density Foam Negative Mold


Seat Trimming Stencils



Project Objective

Manufacture carbon fiber seat and improve driver comfortability.

Personal Contributions

- Prepared high-density foam negative mold for carbon fiber layup
- Improved the original seat design for increased driver mobility and rules compliance
- Designed stencils and trimmed the existing seat using a Dremel
- Resurfaced seat with flame-resistant fabric to remedy excessive sanding

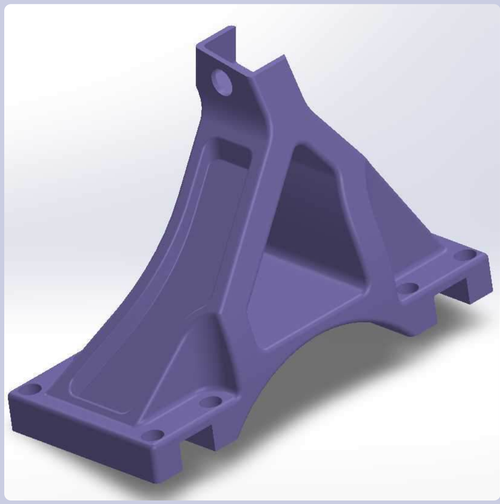
Results

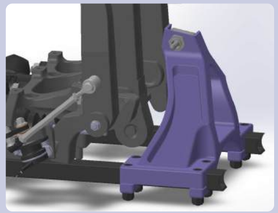
- Received positive feedback from design judge at competition about seat construction / build quality
- Improved driver comfortability

Original Seat

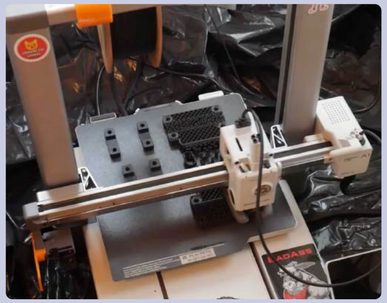
Final Seat


BOTS Bracket Design





Rapid Mfg. & Assembly




BOTS Bracket Installed

Project Objective

Rapidly design and implement brake over travel switch (BOTS) bracket to replace ineffective design.

Personal Contributions

- Designed the entire BOTS bracket on the flight to Michigan
- Rapidly iterated versions to reduce support material and print time
- Printed, assembled, and verified the functionality of the BOTS bracket

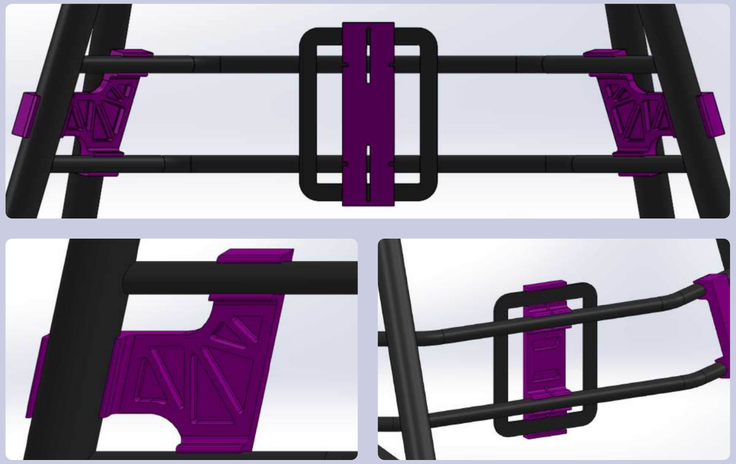
Results

- Completed entire project in less than 18 hours (including print time)
- Delivered critical part the night before competition with no time to prototype or make mistakes
- Passed BOTS demonstration at technical inspection without issue

Formula SAE – BOTS Bracket

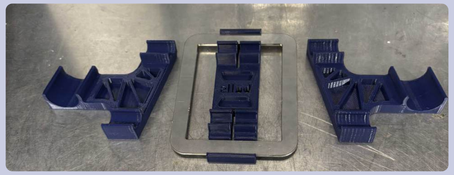
Formula SAE – Head Restraint

Head Restraint Welding Jigs



Head Restraint Tubes

3D Printed Jigs



Head Restraint Welded

Project Objective

Manufacture new head restraint (identified rules violation with previous design, prompting redesign).

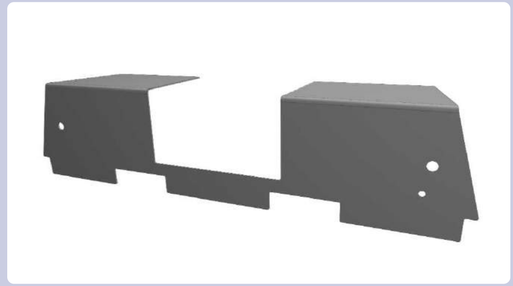
Personal Contributions

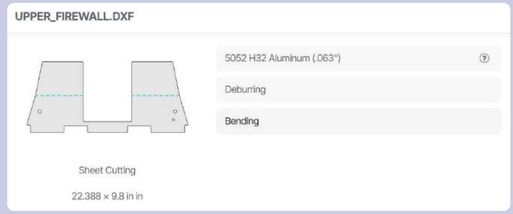
- Supervised the design of a new head restraint to address the previous design's rule violations
- Designed and 3D printed jigs to hold head restraint parts in place for welding
- Manufactured the head restraint using hands-on tools, including tube benders and angle grinders

Results

- Produced robust head restraint design that accommodated all drivers and passed technical inspection without issue

Upper Firewall Design





Project Objective

Redesign upper firewall to accommodate new head restraint design and improve build quality.

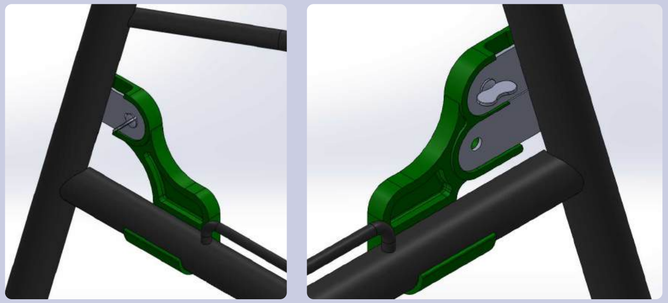
Personal Contributions

- Guided new member in the redesign of an improved, rules-compliant upper firewall
- Modified the firewall design for sheet metal bending DFM/A
- Added asymmetric features to aid assembly and to account for welding tolerances
- Designed and 3D printed jigs to hold firewall tabs in place for welding

Results

- Created rules-compliant firewall that was easily manufacturable

Firewall Tab Welding Jigs



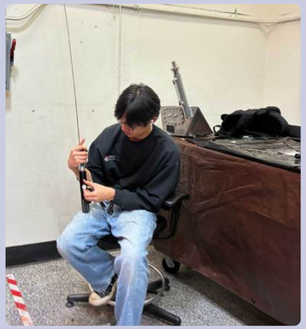
3D Printed Jigs

Upper Firewall Installed

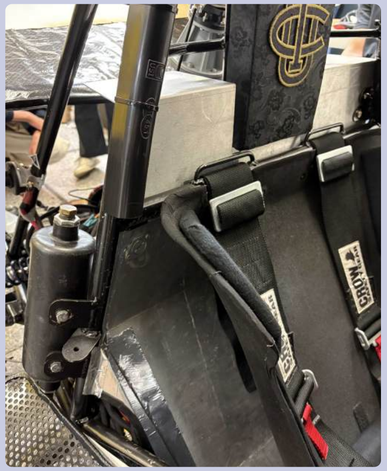
Formula SAE – Upper Firewall

Formula SAE – Miscellaneous

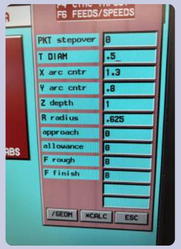
Brake Line Flaring



Cockpit Before and After Becoming Lead

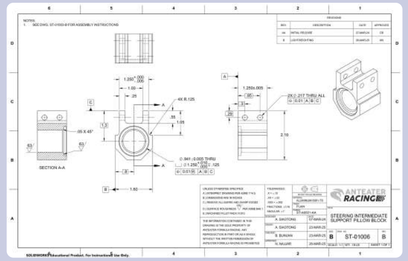
Misc. Fabrication



Misc. Testing

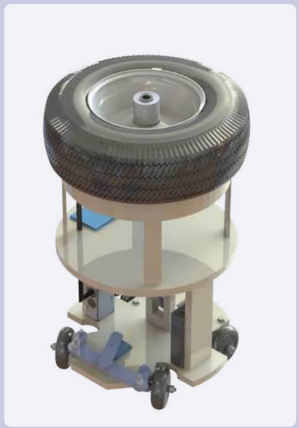
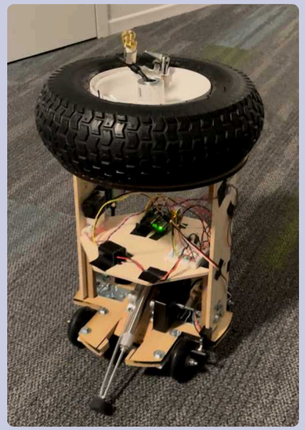

Sheet Metal Bending


Drafting



Project Management

Autonomous Robot Pneumatic Propulsion

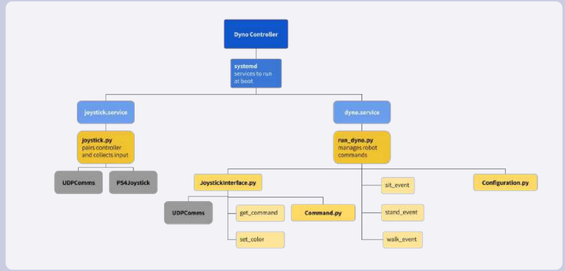



Jewelry Hammer

Thread Checker

Quadruped Robot Control Architecture





Bicycle Model


Course Projects

Tesla – Vehicle Engineering, Chassis

I worked in Tesla's Chassis Design department as Mechanical Design Engineering Intern in Summer 2024. At the end of my internship, I was evaluated highly by my mentor and supervisor, who highlighted my strengths in technical execution, critical thinking, problem solving, and teamwork.

Brake-By-Wire Testing Rig

To assist the development of brake-by-wire hardware for a new vehicle, I designed, built, and tested a physical rig for validating brake-by-wire design concepts. My design included interchangeable parts and adjustability to enable testing with different prototype hardware. Within the span of my internship, I successfully conducted testing with the rig to evaluate the effectiveness of protective features, then presented my findings to the department.

Model S NVH Investigation

Noise, vibration, and harshness (NVH) issues were reported by Model S owners, specifically on vehicles outfitted with the Carbon Ceramic Brake Kit. I was tasked with investigating and attempting to reduce the brake pad rattle for this vehicle configuration. I instrumented a Model S with recording equipment and led vehicle-level testing to characterize the brake NVH issue. I tested the vehicle with 5 different pad retaining pin designs, then processed and quantitatively compared audio data across each design in MATLAB. I identified the least disturbing setup, and I made the MATLAB tool I created to analyze audio data adaptable for different NVH issues.

Cybercab Brake Rotor Drawings

I conducted drawings reviews for a new set of solid and vented brake rotors for the Cybercab. Some features of these brake rotors had never been produced before by the supplier, and I leveraged statistical analysis methods and insights from the Supplier Industrialization team to ensure specific tolerances could be held. I communicated back and forth directly with supplier to effect 40+ drawing changes, and I established these drawings as the departmental standard, serving as reference for all future brake rotor sourcing.

Model S with Carbon Ceramic Brakes

Tesla Cybercab