Jared Dempster

B.E.Sc Mechanical Engineering
Western University

5 months at Tesla
12 Months at Armatec Survivability Corp
4 years of Formula-SAE experience

TESLA

Battery Design Engineering Intern

- Procured and organized novel permanent high current joints for pull testing and environmental testing, including: PTCE, HTHE, HTOE and Thermal Shock
- Designed an injection molded container for cell venting investigations, reducing cost and lead times over 3D prints. Developed a new fixture for the test that eliminates incorrect boundary conditions, and improves useability
- Formulated a testing regime to compare array barrier materials and insulations in thermal event heat soak performance. Designed the molds, manufactured coupons, and personally ran all tests. As a result, the team has a clear idea of the relative difference to expect between vehicle architectures.
- Designed a pressure vessel to represent full pack volume for flame arrestor behavior during a cell venting scenario

Western FORMULA RACING

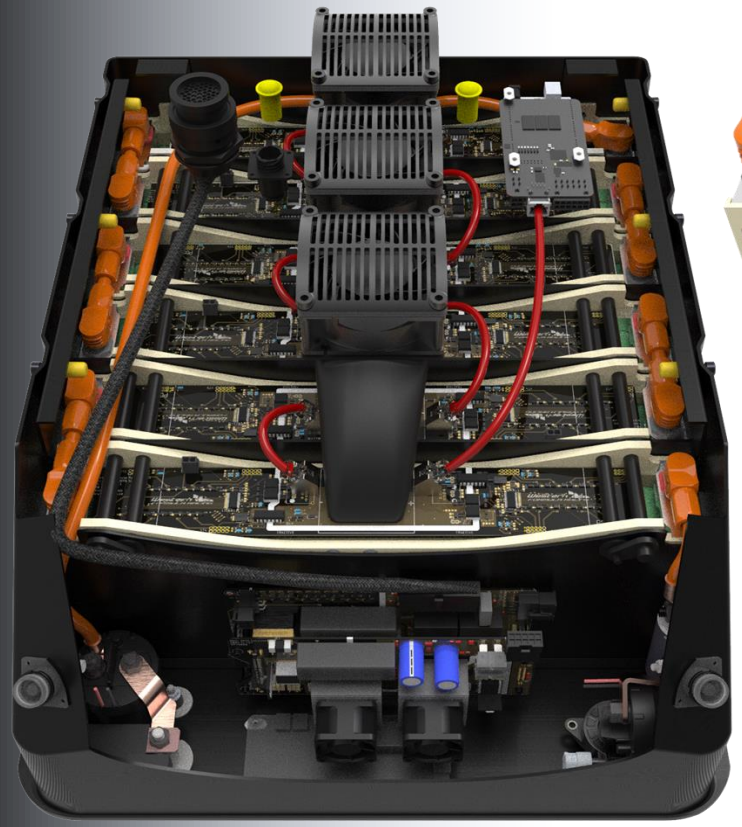
2021 Technical Director

- Lead a team of 40 students through the challenge of major vehicle redesign, while combating the limitations imposed by Covid restrictions
- Conducted regular design reviews with all subsystem leads, providing constant feedback and guiding the direction of the vehicle
- Implemented high level keep out zone and mating assemblies for all major systems, easing collaborative design
- Created a vehicle wide decision matrix and utilized the team-developed lap time simulator to compare and finalize discrete vehicle architectures

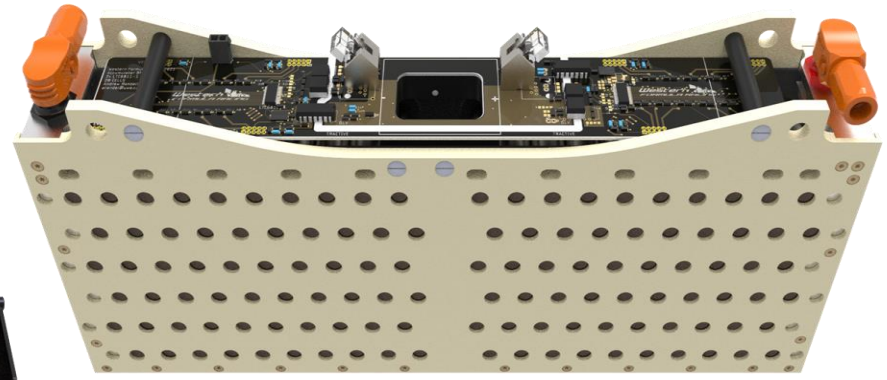
Western Formula Racing

2021 Battery Design 2020

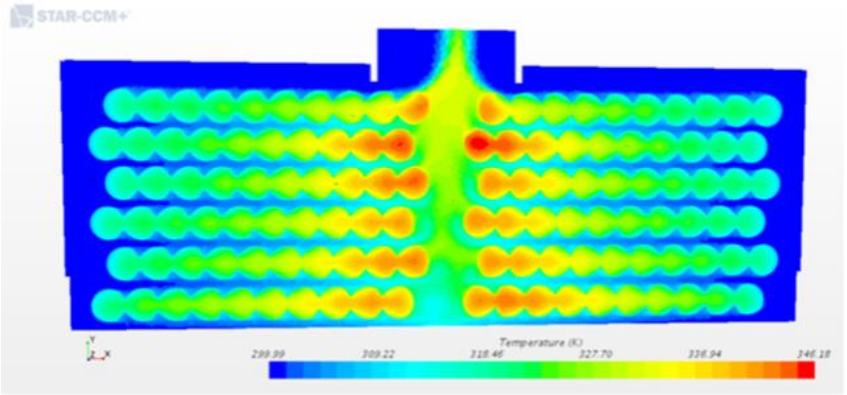
- Designed our teams first ever custom battery modules. Achieving a 45% reduction of percent non cell mass
- The final energy density of the accumulator is 30% higher than the previous design, while maintaining greater power density.
- Designed fuse testing jig and conducted testing to compare nickel vs aluminum cell level fusing. Also utilized this rig to replicate thermal boundary conditions and determine that a mica insulator was needed to protect the cell wrap
- Created a position sensitive cooling model from CFD results, integrated with discharge profiles from the team's quasi-static lap time simulator
- Designing battery enclosure to be easily serviceable
- Packaged all high current cables in the vehicle



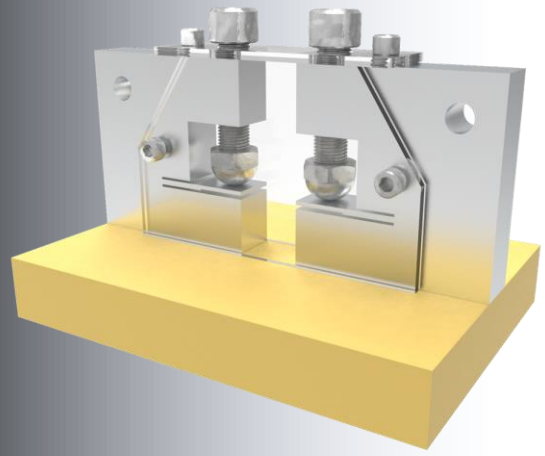
Accumulator (lid removed)



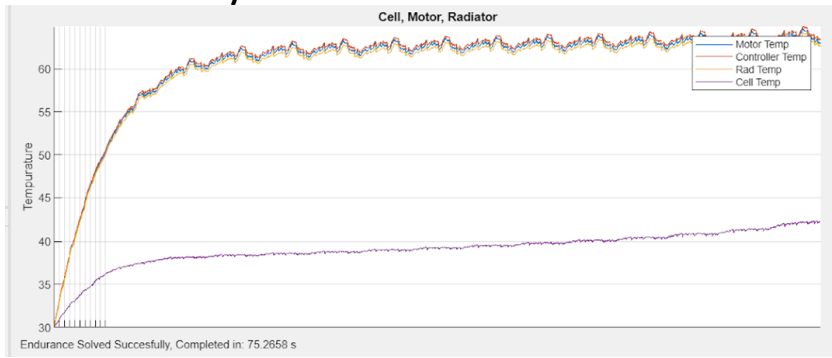
6P20S Battery Module



Steady State Module CFD Results



Fuse Testing Jig



Endurance Event Cooling Model

Armatec SURVIVABILITY

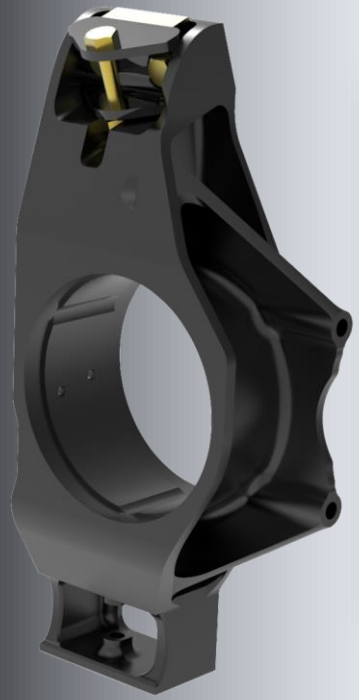
Design Engineering Intern

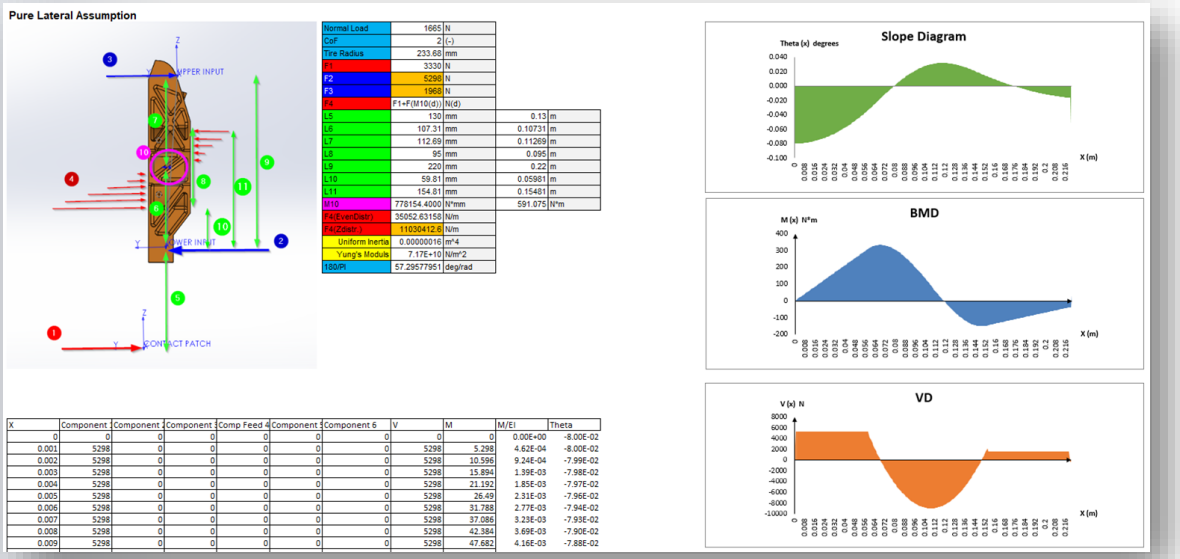
- Designed a vehicle hull welding fixture to support the X000kg hull through an unlimited roll motion
- Designed spaceframe castor legs that rapidly retrofit onto vehicle hull during fabrication.
- Conducted tolerance stack up analysis of mine blast protective seat assemblies to identify root cause of installation issues
- Drafted engineering reports and facilitated testing to prove compliance with military standards
- Implemented red line corrections on internally identified and customer requested changes

Western FORMULA RACING

General Team Member 2020

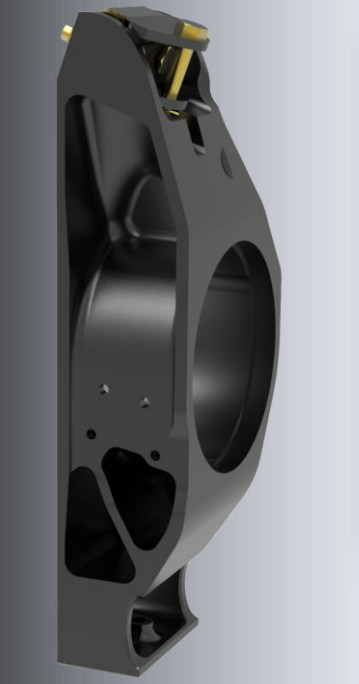
- Designed camber adjustable front uprights, massively reducing setup change time
- Conducted FEA with multiple load cases and varying studies including Modal, Buckling, Static and generative design which ultimately inspired the “archway” concept at the upper pickup point
- Utilized a parametric model which represented the travel limitations of the suspension and steering to accelerate the interference checking process
- Verified deflections with an excel model
- Concluded that deflections were negligible when compared to the camber characteristics of our tires and pursued a stress driven optimization

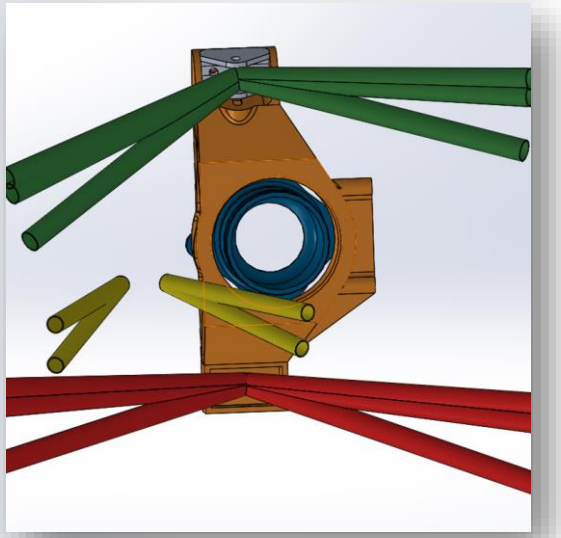


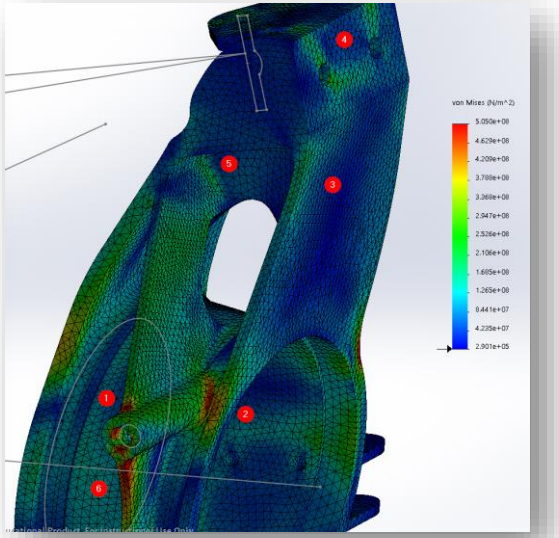


Normal Load	1665	N	
CoF	2	(-)	
Tire Radius	233.68	mm	
F1	3330	N	
F2	5298	N	
F3	1968	N	
Fx	F1+F(M10(d))	N(d)	
L5	130	mm	0.13 m
L6	107.31	mm	0.10731 m
L7	112.69	mm	0.11269 m
L8	95	mm	0.095 m
L9	220	mm	0.22 m
L10	59.81	mm	0.05981 m
L11	154.81	mm	0.15481 m
M10	778154.4000	N*mm	591.075 N*m
Fa(EvenDistr)	35052.63158	N/m	
Fa(Static)	116304412.6	N/m	
Uniform Inertia	0.00000016	m^4	
Yung's Modulo	7.17E+10	N/m^2	
180/PI	57.29577951	deg/rad	

X	Component	Component	Component	Comp Feed 4	Component	Component 6	V	M	M/EI	Theta
0	0	0	0	0	0	0	0	0	0.00E+00	-8.00E-02
0.001	5298	0	0	0	0	0	5298	5.298	4.62E-04	-8.00E-02
0.002	5298	0	0	0	0	0	5298	10.596	9.24E-04	-7.99E-02
0.003	5298	0	0	0	0	0	5298	15.894	1.39E-03	-7.98E-02
0.004	5298	0	0	0	0	0	5298	21.192	1.85E-03	-7.97E-02
0.005	5298	0	0	0	0	0	5298	26.49	2.31E-03	-7.96E-02
0.006	5298	0	0	0	0	0	5298	31.788	2.77E-03	-7.94E-02
0.007	5298	0	0	0	0	0	5298	37.086	3.23E-03	-7.93E-02
0.008	5298	0	0	0	0	0	5298	42.384	3.69E-03	-7.90E-02
0.009	5298	0	0	0	0	0	5298	47.682	4.16E-03	-7.88E-02



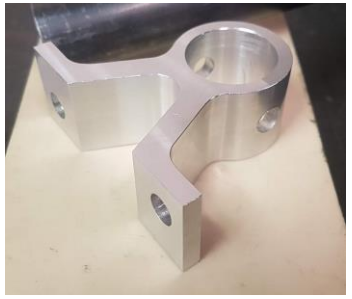


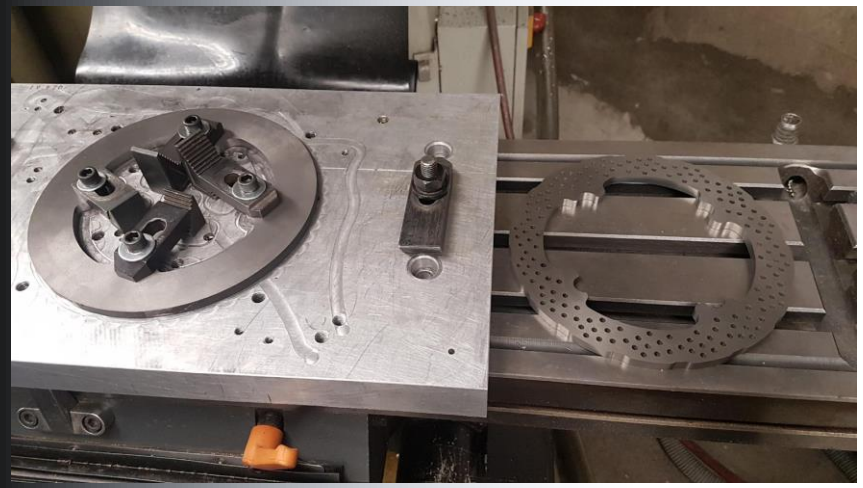


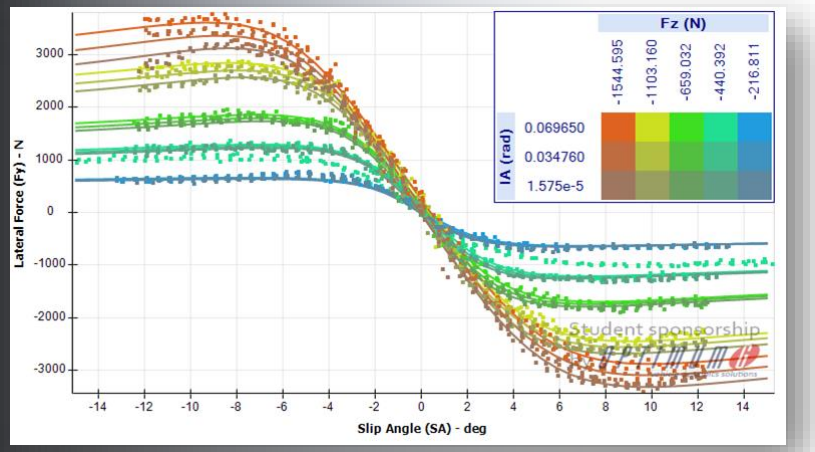
Western FORMULA RACING

General Team Member 2020

- Compiled physical testing of race tires to produce multivariable equations representing tire behavior, motivating the change to low profile continentals
- Mentored younger members through DFM reviews, CNC and CAM training
- Adopted an accelerated timeline to successfully manufacture all required components before restrictions prohibited shop access, contributing to our team being one of a few running vehicles in North America
- Machined many components, some shown here:
  - Brake Rotors
  - Differential Mount
  - Drivetrain Mount
  - Gearbox Mount
  - Pedal Rail Mount
  - Push / Pull Rod Turnbuckles
  - Spindle Bullets



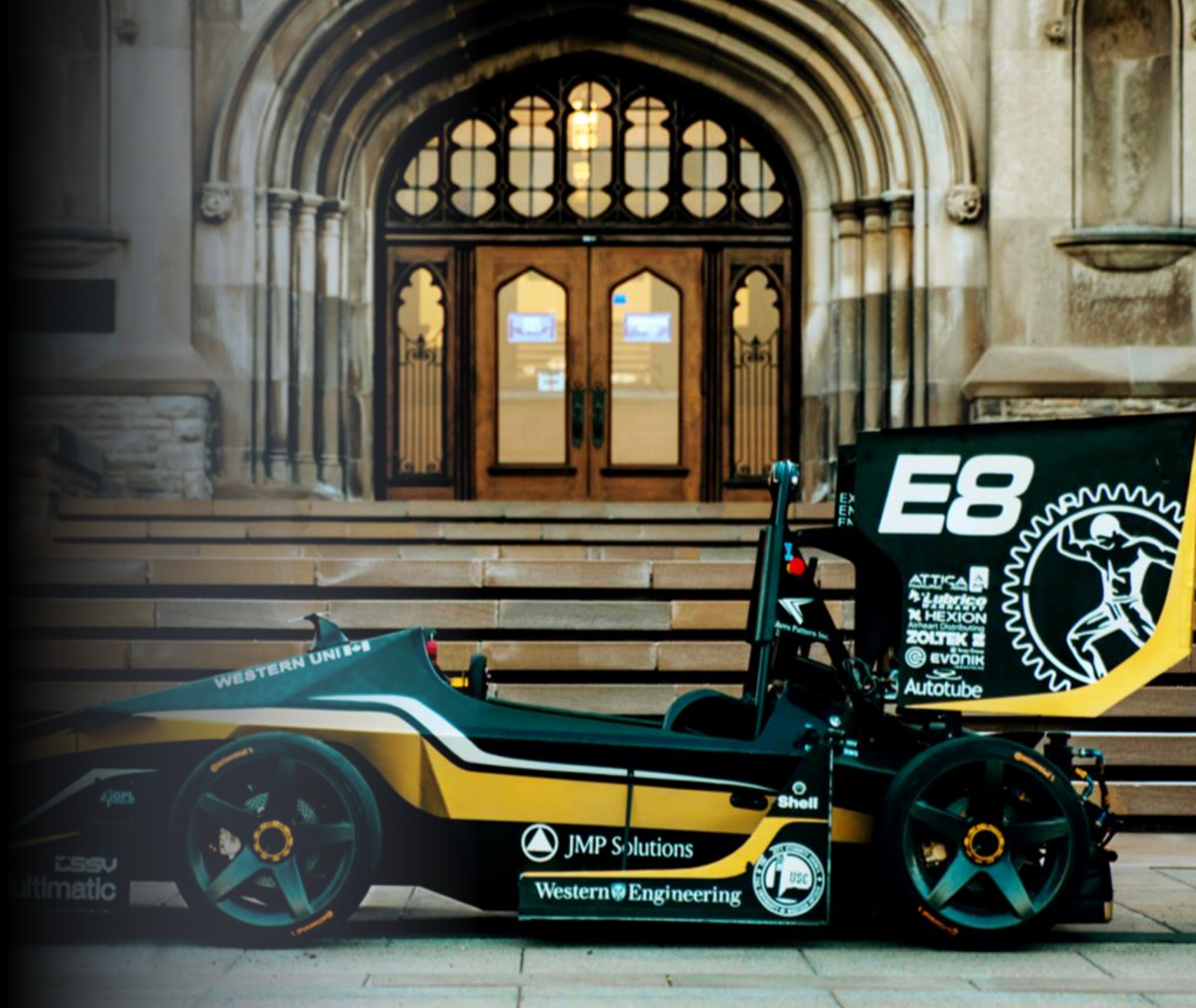




Western FORMULA RACING

2020 Testing Season

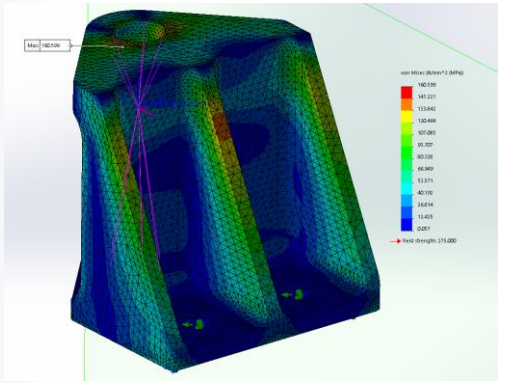
- PMSC Autocross on board footage
- WOSCA Autocross on board footage
- The 2020 testing season was a huge success. The car ran more reliably than ever and while we were not able to attend competition due to the pandemic, we attended 2 local autocross events
- Fastest car in team history
- 5.0 seconds on FSAE spec skid pad
- 0-75m in 3.8 seconds

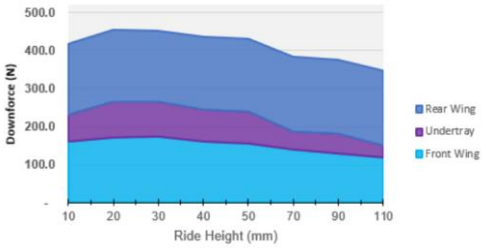


Western Formula Racing

2019 Suspension Lead

- Developed numerical vehicle dynamics simulations and analyzed historical data to determine key vehicle attributes including motor selection, final drive ratio, and battery capacity of the team's first electric car.
- Designed rear suspension package for the team's first full carbon fiber monocoque
- Finalized the mechanical design of the entire system with respect to loads and interferences





Downforce vs. ride Height at 60 km/h for entire aero package

Avro Pattern Inc.

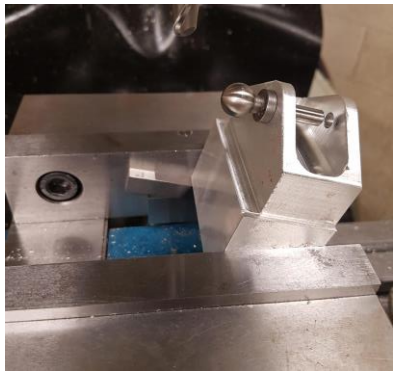
Shop Assistant

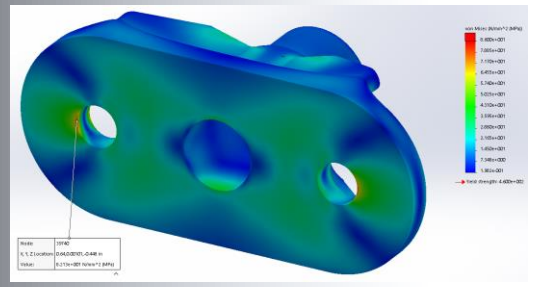
- Assisted in the manufacturing of aerospace casting patterns.
- Manufactured rear gunner turret mounts for Lancaster Bomber
- Conducted set-up and operation of CNC mills
- Lathe
- Cylindrical grinder
- Radial arm drill press
- MIG welding
- Table saw
- 30” circular sander

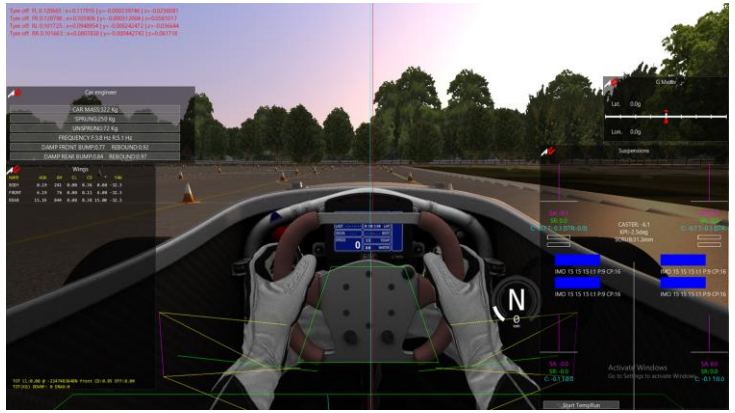
Western FORMULA RACING

2018 Suspension Member

- Designed welding jigs for suspension A-arms
- Designed and machined discrete adjusters to rapidly modify ride heights. Conducted FEA analysis and hardware selection.
- Implemented a driver training simulator in Assetto Corsa that allows the team to match an extensive number of vehicle parameters and build 1:1 scale replicas of competition tracks
- Machined a intricate die for CNC training
- Machined suspension clevises







DJH DESIGNS INC

Shop Assistant

- Conducted my high school internship at DJH Designs which profoundly impacted my drive to pursue mechanical engineering. They are a small family business with an incredible product line and work atmosphere. It is thanks to my experiences here that I was able to integrate seamlessly with the Formula SAE team.

- Assisted in the manufacturing and assembly of laser measurement and film thickness systems

- Conducted set-up and operation of CNC mills

- Lathe
- Pneumatics assembly
- Wiring harness assembly
- Machine maintenance

- Kept the shop clean!