



# THE SPARTAN RACER

## GO GREEN! GO WHITE! GO FAST!



JANUARY 2021

## Team Updates

### Happy New Year!

The team wasn't able to take the annual holiday photo this year as a result of obvious circumstances, but that doesn't mean we don't wish our fans, friends, family, and alumni a happy new year! Although nobody's 2020 went to plan, team members are hopeful that 2021 will be an incredibly successful year.



*An unseen photo of SR-20's first drive from late February*

### MSU Welcomes Students Back to Campus on January 19

Despite most classes remaining Online, Michigan State University will move forward with some in-person instruction on January 25th, two weeks after the spring semester begins on January 19th. This is a reflection of the latest Michigan Department of Health and Human Services epidemic order announced on December 18th.

Team members will remain home without shop access through winter break. Although this is upsetting, the additional steps taken towards reopening university facilities for student use are a positive stepping stone on the path to 2021 competition.

## System Spotlight: Chassis

### A Three Year Design Cycle

In order to save money and reduce manufacturing complexities, the chassis system operates on the three year long design cycle. This means that the chassis, which is composed of a carbon fiber monocoque and a steel rear sub-frame, doesn't undergo major changes from year to year. As awful as 2020 turned out to be, the platform was due for a triennial update, so the extra design time has played into the teams' hands quite well.

"Our goal is to create the lightest, but most structurally sound, chassis to keep the driver safe and the car fast," explains Garrett Colasinski, the team's chassis lead. "From what I've heard, past platform changes have been rushed, which usually leads to integration and manufacturing issues down the line. This year, despite the distance, we're working very closely with every system to make sure that all vehicle components are placed in locations that maximize overall performance."

### Half-Monocoque Switch

The monocoque, which is essentially a carbon fiber and aluminum honeycomb cocoon, is the main component of a composite chassis that all vehicle components are mounted to. It must be both comfortable and safe for the driver, as well as stiff for vehicle performance. The previous vehicle platform used a three-fourths monocoque, which means that the front three-fourths of the vehicle is composed of a carbon fiber monocoque, and the rear fourth is a steel space frame. Those two parts mate together with the engine in the middle, completing the chassis.

This upcoming platform, however, will be a half-monocoque design. The primary difference between the two



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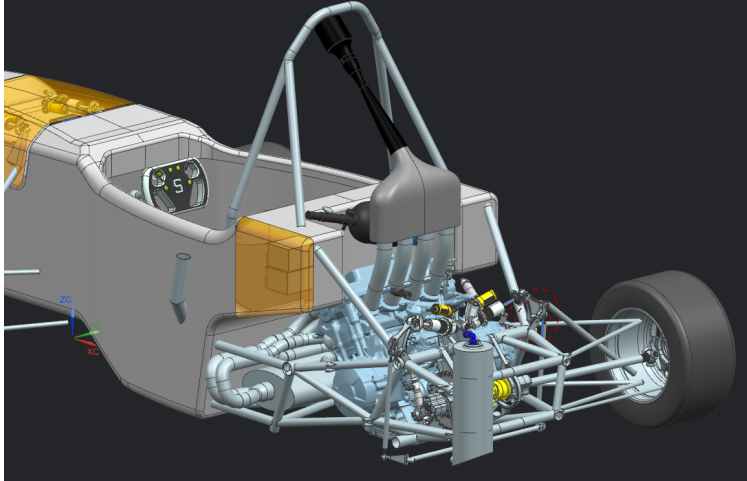
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is that the halves are not mated with the engine in the middle. The engine is now fully outside of the monocoque and enclosed entirely by the rear sub-frame, as where last year it was half-inside.

The rear subframe lead, Calum Walton, mentions that he's "been working with the powertrain system to make sure that the new subframe interfaces well with the engine and supporting equipment. Manufacturing, repairs, and maintenance will be much easier, too, since it will be possible to detach the subframe assembly from the monocoque to help with larger and more-intensive maintenance—something that's been a hindrance before.



*The proposed rear subframe assembly.*

"In terms of safety, the driver will now be fully isolated from the engine by a monocoque wall, which is much safer than the removable aluminum firewall that we had before," adds Colasinski. "We've been putting driver safety at the forefront of the design this year. Instead of just following the bare-minimum safety requirements within the FSAE rulebook, a lot of time has been spent by looking at how the driver interfaces with the vehicle and how we can keep them safe. After all, we're strapping our best friends into these things."

## Driver Focused

Before a new design is started, the team utilizes Pratt & Miller Lap Time Simulation software to determine high-level vehicle targets, such as horsepower, weight distribution, aerodynamic lift vs. drag, etcetera. Although the competition track layouts change slightly from year to year, one result remains constant, and it's that the driver's skill is singlehandedly the biggest difference between top and mid-level teams.

"You can build the fastest car that FSAE has ever seen but still finish in last place," explains Anissa Sant, the team's ergonomics lead. "Since driver skill is a major factor in competition outcome, it's critical that the driver focuses as much as possible about the track, rather than worrying about sliding around in an ill-fitted seat or something similar. That's where I come in.

"Earlier this year, we built a driver jig to test different driving positions. The goal was to find the most comfortable position while also raising the driver's feet to allow for aerodynamic improvements. We've been designing the entire chassis around the measurements that we collected, so I'm happy to have had such a big impact on the chassis design from the start."



*A view of the driver jig in action! Thanks again, Framing Tech, for making this possible!*



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## Featured Members

**Name:** Calum Walton  
**Role:** Rear Subframe Lead  
**Hometown:** Birmingham, MI  
**Major:** Mechanical Engineering  
**Class Standing:** Junior  
**Year on the Team:** 2nd



**Name:** Noah Goldman  
**Role:** Cooling Lead  
**Hometown:** Denver, CO  
**Major:** Mechanical Engineering  
**Class Standing:** Sophomore  
**Year on the Team:** 2nd



### Why did you choose to join MSU Formula Racing?

Formula SAE offers a unique experience where students can be exposed to situations that they will encounter in their future careers. Everything students learn while in Formula is incredible valuable. Being a part of the team allows me to practice design and fabrication, as well as teaches me valuable skills that I will use for many years after I graduate.

### What are you most excited about for this season?

I'm extremely excited to see the car we worked so hard on last season to finally go to competition. Due to COVID-19 restrictions, we were not able to compete in-person last May, but my fingers are crossed that it won't happen again this year. We'll finally be able to show off MSU Formula Racing's fastest car ever out on track.

### What is your dream job upon graduation?

Ideally, I'd like to work in prototyping or testing and development position. I would love to have a career where I can work heavily hands-on and utilize my fabrication skills to develop aerospace or automotive prototypes, short-run productions parts, or vehicles. I love the idea of working in an environment where the possibilities are endless.

### Why did you choose to join MSU Formula Racing?

I had heard of FSAE in the past, but when I saw the car at the beginning of the year in person, I knew I wanted to be a part of the organization that built it.

### What is your favorite part about being a member of the team?

My favorite part of being on the team is all the amazing friends I have made and getting the opportunity to actually build something concrete. All throughout my life, I've been a tinkerer, but I never had the opportunity to really get my hands dirty and build something undeniably impressive, and FSAE gave me the opportunity to do that.

### What is your favorite memory from your time on the team so far?

Staying up for two straight days trying to fix the oil pressure before going to Florida for testing, eventually getting it to work, and then immediately seeing the car drive for the first time.

### What are some of your favorite activities or hobbies outside of the racing team?

Outside of FSAE, I enjoy skiing, hiking, and almost anything outdoors. I also play the electric guitar. Jamming with other musicians always puts a smile on my face.



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## Featured Alumni

**Name:** Dan Riggs  
**Hometown:** Battle Creek, MI  
**Degree:** B.S. Mechanical Engineering (2016)  
**Years on the team:** 2012-2016  
**Roles:** Aerodynamics Team Lead (2014-2016)  
Chief Engineer (2014-2015)  
Project Manager (2013-2014)  
Powertrain Member (2012-2013)

### How did you contribute to the advancement of MSU Formula Racing?

I took over as the aerodynamics team lead when FSAE organizers enacted a large restriction on the maximum size of the vehicle's aero package. This posed significant challenges such as 1) maintaining overall down-force while decreasing package size, 2) designing around complex flow field interactions within a tighter design envelope, and 3) higher aero sensitivity to yaw, pitch, roll, and steering. Even with the additional challenges, we maintained similar aero performance compared to previous years. This gave us a strong advantage during competition.

### What is your favorite memory from the team?

My favorite memory on the team was finishing the car before spring break junior year and road tripping down south to our friends at the University of Florida for a full week of testing. It was the first time we completed the car on time in several years for early season testing.

### What is your current professional role?

I am currently a Suspension Design Engineer at General Motors. My responsibilities include the design, release,



management, and execution of several suspension components for future battery electric vehicles.

### How did your experience as a member of MSU Formula Racing help to shape your future?

My experience on the team helped shape the foundation of my engineering skill-set and design thinking. However, most importantly, it has helped me form strong relationships with teammates and friends that I still talk to today. Additionally, FSAE experience continues to help me build professional relationships with those who have either participated in FSAE themselves or even simply know of the program.



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## Featured Sponsors



**Name:** Trelleborg Applied Technologies  
**Location:** Boston, MA

Before the team's carbon fiber parts are laid up and cured into their permanent form factors, molds must be created for each carbon fiber component. These molds range from sizes as large as the vehicle's under-tray (the largest aerodynamic component), to as small as a simple brake-light enclosure. To create these molds, team members CNC designs into tooling board, which is then used as a mold.

Trelleborg has previously been a generous donor of tooling board to the team, and we're excited to have them back! Although their latest donation arrived to our shop just as it was closed down due to COVID-19, team leaders have been programming CNC parts while away so that the tooling can be used right away to create molds for this year's aerodynamics package. Without their generous contribution, the aerodynamics package wouldn't be possible. Thank you again, Trelleborg!



**Name:** Texas Instruments  
**Location:** Dallas, TX

The MSU Formula Racing Team has one of the most advanced FSAE electronics systems in all of North America, but that wouldn't be the case if we didn't have the amazing industry support that we do. Texas Instruments (TI) is a relatively new sponsor to the team, but has already made a huge impact in the team's electronics R&D.

Although you'll be able to learn more about what our electronics sub-team is up to in the next newsletter, exciting projects are currently underway, such as the development of an electronic throttle controller as well as an overall vehicle controls unit. Both of these projects heavily utilize TI components, so their support is genuinely appreciated.

As well as using TI components, the electronics team also utilizes TI launchpads. These are advanced microcontroller breakouts that enable fast prototyping and R&D. Thank you, TI!



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