THE SPARTAN RACER

GO GREEN! GO WHITE! GO FAST!

MARCH 2021

Team Updates

CNC Action

A handful of team leaders are back in the Engineering Building to resume manufacturing for our 2021 vehicle! Like mentioned in previous editions of *The Spartan Racer*, the aerodynamics package is one of the last things that the team needs to manufacture in order to complete SR-21. With limited time available on the CNC, team leaders Jimmy Provax, Garrett Colasinski, Mitch Clark, and Justin Yan are all working together to use every available minute. With just under sixty days until competition in May, as much prep work is being done as possible to ensure efficient and timely assembly.

One of the many aerodynamics molds machined this past week

Early Competition Success!

The operations team kicked off the 2021 competition season with the FSAE Business Presentation on February 4th. After a few weeks of suspense, we're happy to announce that the team placed ninth with a score of 69.4! This was perhaps the largest presentation event in FSAE history, with over 140 teams competing in the internal combustion class alone.

The early success of the operations team puts the rest of the team in an excellent spot for the remainder of the 2021 competition season. The final round of virtual events are in April, and the validation event (FSAE Michigan) is in May, but leaders have already been prepping for those events in light of recent success.

System Spotlight: Powertrain

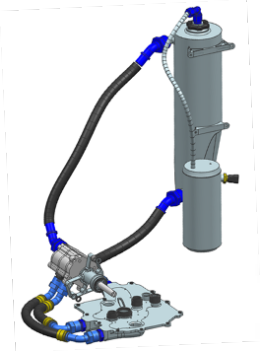
A Deep Dive Into Oil

Often regarded as one of the many strengths of our team, the powertrain system has been researching new designs to increase the reliability of current engine configuration. A series of unfortunate events led to an engine failure in 2019 that was the catalyst for a complete investigation into the dry-sump oiling system. After an in-depth analysis of testing data, powertrain members set out to find solutions.

"The oil pressure was great in some spots, but terrible in others," explains Rob Walston, the team's powertrain lead, as he hovers over previous testing data with his computer mouse. "It's not that the previous oiling system didn't work at all, but it just wasn't suited for sustained high RPMs and high-speed maneuvers. Additionally, with the dramatic increase of down-force over the recent years, the vehicle experiences much higher lateral accelerations than when the oiling system was initially designed. Essentially, it was time for a refresh."

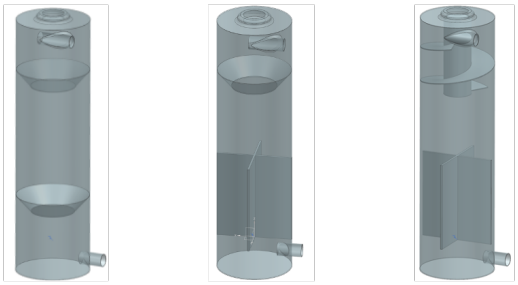
Over the last several months, the dry-sump oil pan was redesigned to relocated scavenging ports from the back of the pan to the front and sides. That, combined with a change in the internal routing, should yield bet-

ter oil scavenging during braking and sustained lateral acceleration.



The updated dry-sump system

"Another area of focus has been the oil reservoir," mentioned Bhanu Makkapati, the team's oiling lead. "I've been working with one of the new members, Hailey Kelley, to design an interchangeable baffling system for testing days. The team has tried many different baffling designs over the years, however, it's unclear what designs work better than others. This new system should allow us to finally answer that question."



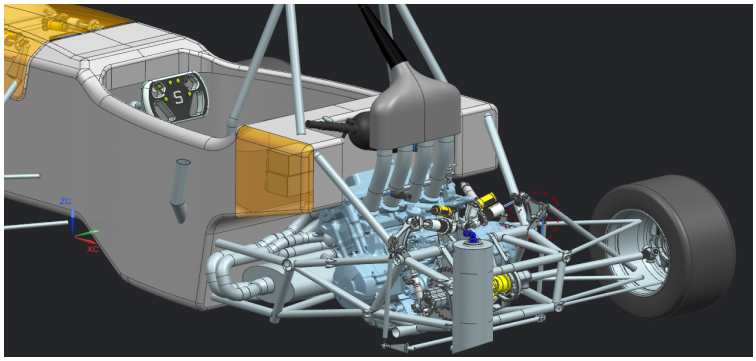
A few of the potential baffling designs slated for testing

Chassis Changes Welcomed

The move to a half-monocoque from a three-quarters monocoque has been welcomed by the powertrain system. Almost the entire powertrain can be removed in one piece from the vehicle with the removal of the rear sub-frame, which now houses most of the critical engine systems aside for cooling and fuel.

Olivia Reyes, the team's intake and exhaust lead, mentioned that "it was hard to package the exhaust entirely in-front of the engine, but after many nights of unsuccessful attempts, I was able to make something that conformed to the parameters determined with the help of Ricardo WAVE 1-D engine simulation."

The main goal for this vehicle redesign is an enhanced focus on system integration. Moving both the exhaust and oil reservoir off of the side of the car allows for better airflow to aerodynamic elements downstream, as well as a reduction in overall drag. Furthermore, the chassis firewall was simplified and made much more safe.



A view of the updated powertrain system CAD

Little Things in the Big Picture

"In previous redesigns, things like the differential mounting and pneumatic shifting arm were always afterthoughts. Sometimes they'd be our Achilles heel, too. In 2019, the differential was slightly out of alignment when the chain slipped and caused failure out on track in Lincoln," explains Mitch Clark, the drivetrain and shifting lead. "This year I've been redesigning all mounts to be tightly integrated with the systems that they belong to. For example, the differential is now mounted to the engine instead of the chassis, which will eliminate any misalignment between the two due to strenuous use."

Team Apparel

Team apparel is back! It's been over a couple of years since the last team apparel order, and by popular demand, we're opening it up to folks outside of the team!

If you're interested in ordering State Racing gear, contact the team's project manager, Dave Yonkers, at yonkers4@msu.edu by **March 7th, 2021** at the latest.

Embroidered Carhartt Crewneck - $45

Hanes Tagless Tee - $14

Embroidered Team Polo - $27

Independent Trading Co. Hoodie - $35

Embroidered Hats:
Nike Heritage 86 Cap (left) - $31
Anvil Unstructured Cap (right) - $17

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Featured New Members

Name: Hailey Kelley
System: Powertrain
Hometown: Rochester, MI
Major: Mechanical Engineering
Class Standing: Sophomore

Why did you choose to join Michigan State Formula Racing?

Around this time last year, I had just switched from being an astrophysics major to a mechanical engineering major. I didn't know much about the Michigan State Formula Racing Team until I met a friend who told me everything that the team had to offer. After reading a bit more about the team, I realized that it'd be a great way to apply the knowledge that I gained in the classroom to hands-on problem solving scenarios.

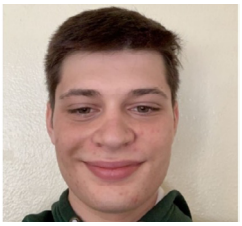
What is your favorite part about being a member of the team?

Before I decided to join the Formula Racing Team I knew nothing about how a car worked. It was not until I started forming friendships with those on the team when I started to have a real interest in what I was learning. So, I would say my favorite part about the team is expanding my knowledge and being able to continuously learn more about the different systems of the vehicle.

What has been your favorite project that you've contributed to so far?

Working with the oil lead to improve our oil system has definitely been one of my favorite projects this year. Learning how to use software such as Ansys and WinDarab, as well as conducting research has helped with the design of a brand new oil reservoir for vehicle.

Name: Cameron Hesano
System: Chassis
Hometown: Lake Orion, MI
Major: Mechanical Engineering
Class Standing: Freshman



Why did you choose to join Michigan State Formula Racing?

When I was looking for engineering student organizations to join in the fall semester, something about building a race car from the ground-up and getting hands on engineering experience in my freshman year was too cool to pass up.

What is your dream job upon graduation?

My dream job would be to work as an R&D engineer for a defense company. I have always loved to design and develop new things and the defense industry is where I want to focus this drive.

What has been your favorite project that you've contributed to so far?

My favorite project that I completed was when I designed a new track cart for the team. The previous cart was unorganized and not large enough to carry everything that was needed. My favorite part of the project was putting everything together and seeing my ideas come to life through the design.

Why did you choose to enroll at Michigan State University?

I chose Michigan State University due to its size and resources available to its students, along with how many student organizations there were.

Featured Alumni

Name: Adam Zemke
Hometown: Ann Arbor, MI
Degree: Mechanical Engineering (B.S. 2005, M.S. 2008)
Years on the team: 2005-2009
Roles: Project Manager *(2008 - Car 51)*
Operations Manager *(2007 - Car 9)*
Project Manager *(2006 - Car 41)*

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

I helped create the Operations Team in order to establish a formal team focus on marketing, sponsor development and recruitment to support such activities. With this effort, we dramatically increased public awareness of MSU's FSAE program, educational outreach efforts, and exponentially increased sponsorship participation with our program. Combined with past and then-current competition successes, these efforts helped elevate MSU's Formula SAE program notoriety within the College of Engineering, broader MSU community and externally.

What is your favorite memory from the team?

Honestly, there are too many to count. They range from a host of sleepless nights at the shop, to the time that I managed to splash acetone all over my eyes (and was forced to use the eye fountain), to the long days and nights at the North American International Auto Show, to driving to California to compete and having the privilege of the team being featured by Jay Leno. MSU's Formula Racing Team shaped so much of the life and friendships I have today that I will forever be indebted.

What is your current professional role?

I serve as the President of Launch Michigan, a broad policy coalition that is focused on improving the lives of public school children from early childhood through post-secondary. This coalition was created by K-12, philanthropic, civic and business sector advocates when I was a member of the Michigan House of Representatives. Having worked with many of it's members on education policy as a legislator, I knew then that it had tremendous potential to do good. I was honored to be hired to lead its efforts in 2019, but will admit that it is easily the most difficult job that I've ever had.

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

Michigan State's Formula Racing Team taught me a lot about working with people to advance both individual and common goals. I learned about what motivates people to lead and to follow, how to help push yourself and others when everyone is approaching their breaking point, the importance of enabling a family-esque camaraderie amongst members to enable the team's success, and that building a successful project like a Formula SAE car is dependent upon it never becoming 'work.' I also learned a lot about the power of this project to inspire people who weren't on the team, and that programs like FSAE have the unique ability to light up the eyes of future engineers and creative thinkers/doers in ways I didn't realize beforehand. That latter point has directly influenced my career path and motivates me to improve our systems of public education every day. So, in many ways, MSU's Formula Racing Team has directly shaped the last 11 years of my life.

Featured Sponsors

Name: Mathworks
Location: Natick, MA

Mathworks has provided the team with their student-competition software bundle, which includes licenses to just about everything the electronics team could ever ask for! Their toolboxes for tasks such as CAN, SPI, and serial communication make the painful aspects of embedded software engineering a breeze. They've played an integral role in the development of the team's electronic throttle controller, and new uses for the software are being thought of almost daily.

The addition of Simulink to the team's arsenal of programming methods has been critical for complex algorithm design, development, and testing. Algorithms can be designed and tested in Simulink before moving to hardware. This has enabled the team to implement designs that we wouldn't otherwise consider – without having to write C, C++, or HDL code.

Name: iRacing
Location: Boston, MA

iRacing Motorsport Simulations has previously sponsored the team with licenses to their ultra-realistic simulation software for driver development and training. Although nothing beats being behind the wheel of a real race car, iRacing puts you in the driver's seat by allowing members to experience today's newest form of competitive motorsport: virtual racing. iRacing is a fun, inexpensive and highly-competitive way for race fans and gamers to break a sweat by braking hard at the apex, while overcoming head-to-head racing challenges usually reserved for professional racers.

iRacing is the ultimate global racing portal. Whether you want to experience a NASCAR Cup car, a World of Outlaws Sprint car, an open-wheel IndyCar, an Australian Supercar, an IMSA Prototype or Touring Car, or the ultimate: an FIA Grand Prix car, iRacing's online racing simulations offer them all.

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