

# PENNSYLVANIA STATE RACING

OCTOBER

2018



## TEAM NEWSLETTER



## A MESSAGE FROM THE TEAM

Dear Reader,

This past month has been a month full of testing and design. We have continued taking our car to the test track almost weekly—recording both driver times and testing data. We fine tuned our suspension and aerodynamics packages, and as we continue to go to the track we plan on testing 2019 components on the 2018 car. We have put a newly rebuilt motor with high compression pistons into the 2018 car, along with other auxiliary components, and we will be validating them in the upcoming weeks.

Driver training was our priority at the test track. We got many new people in the car, as well as a lot of seat time for returning members, and also attended a local autocross as a way to connect with the automotive community in the State College area. Now that we have made some design choices, validation for these new parts takes priority, and we will be focusing on getting consistent drivers in the car so that we can see the changes that the different parts have made.

Getting as much track testing and validation time in before it is too cold is very important to us, and we will return to the track as soon as the temperatures allow in the Spring. For now, we are enjoying the brisk track days, and anticipate continuing our driver training on a driving simulator once it is built and we can no longer take the car out to the track. After all, nothing beats the real thing!

*Thank you for your continued support!*

# *PENN STATE RACING*

# AERODYNAMICS & COMPOSITES



The Aerodynamics and Composites subsystem has worked hard on designs for our 2019 car. The designs for the rear wing, front wing, and nose cone are in the process of being finalized. Last year's spar and rib wing was made with balsa wood. We are trying a new manufacturing process using EPS foam.

In the next few weeks, this year's lead, Annie Orth will finish manufacturing and assembling our front wing. After completion, validation will be performed on the 2018 car. All aerodynamic elements will hopefully be tested on our 2018 car.

Most of the 2D CFD for our aerodynamics is complete so the next step is to move on to 3D CFD to further verify the designs. We are excited to be working on optimizing our aerodynamics package, and are fortunate to be able to use last year's platform to validate the redesigned front and rear wing in a physical environment in terms of track testing rather than only having software validation.



# CHASSIS



Our chassis lead, David Hoffeditz has been hard at work designing this year's chassis. The subframe design for the monocoque this year will be more lightweight and allow the driver to have more room. The rear chromoly steel section of our frame that surrounds the engine and its components has also been altered to lose weight this year. Currently, we are assembling our welding jig that will hold all of the chromoly steel tubes in place so we are ready to weld once we have them sized and cut. Last year, BLM Group was an excellent diamond level sponsor for our rear subframe and we look forward to working with them again.

Boeing and Textreme have been tremendous assets for monocoque production this year, supplying us with much needed carbon fiber. In addition, we are looking to have the monocoque feature an easy access port in order to accommodate varying driver heights and bleed brakes.



*2018 competition*



*2018 competition*

# CONTROLS, BRAKES, & SAFETY



The Controls, Brakes, and Safety subsystem has been busy with data-driven design. After hours of research, we have chosen to change our brake caliper selection for this year. We are planning to utilize a larger 4 piston front brake caliper and a smaller 2 piston brake caliper in the rear opposed to having the same calipers all around. By making this change, we hope to improve our braking performance; making the car more drivable with a proper brake bias. Due to the change in brake caliper selection, we redesigned our upright to accommodate the different mounting locations.

Aside from design work, the subsystem has been working hard on making a mock cockpit out of plywood nicknamed the "mockpit" in order to test the ergonomics of different driving positions. We also plan to utilize the mockpit as a driving simulator during the winter months in order to help with driver training when it is too cold to test the car.



*2018 Car*



*2018 Car*

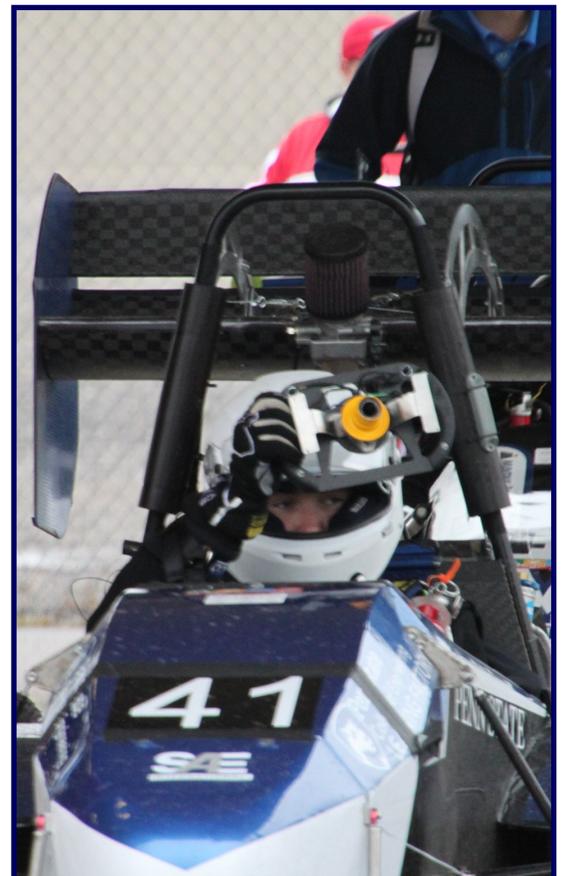
# POWERTRAIN



To solve potential problems now rather than later, powertrain has fitted the 2019 engine into the 2018 car. Our engine for this year features high compression pistons and fresh machine work that we must slightly modify for peak performance. Also, we replaced the 2018 fuel pump for a smaller, appropriately sized fuel pump with a simpler wiring harness. For driver training purposes, powertrain also began installing a manual shifting unit into the 2017 car.

The powertrain team has big plans for October. The car has been fitted with new components that we eagerly look forward to testing on the track. We are also working on an upgraded oil pan. The plan is to 3D print a lighter, plastic oil pan with a new pressure relief valve. We are currently investigating a type of plastic that is not too porous and will stand up to the heat.

We will also be designing and manufacturing the fuel tank during the month of October and have that ready to be mounted to the 2019 car.



*Preparing to drive*

# SUSPENSION



Many changes are being made this year to increase performance and overall driver feel. The 2019 car will maintain its razor sharp handling because of numerous changes. A redesigned steering arm will improve turning radius, allowing the car to maneuver tight turns with ease. Steering geometry is also receiving an overhaul, with a reduced anti-Ackerman to give better grip and a more consistent feel when cornering.

Continued testing with the skid pad course has allowed the team to hone in on the optimal suspension setup. Adjusting stiffness, ride height, and driver techniques are just a few of the variables we need to consider. But as more testing is done, we are getting closer and closer to the perfect setup.

Off the track, the team tensile tested new carbon-fiber suspension members. The results prove that the epoxy bonds attaching the carbon tubes to the inserts are strong enough to handle the pullout forces applied to the suspension system.



*Driving on a wet track at competition*



*Members at competition*

# MANUFACTURING



*Car at Competition*

As things start picking up around the workshop, new parts are needed to facilitate the rebuilding of the 2017 and 2018 cars. Because many components on Formula cars are custom, the manufacturing team is often tasked with machining parts by hand; an important responsibility. With the influx of parts being requested, new members have a chance to gain valuable experience using machines like the lathe and the mill. Such machining skills often come with a steep learning curve. However, the suspension team has asked for numerous parts to be made, among them being titanium inserts, which are relatively simple to machine. This allows for novice machinists to get hands on experience in a low stakes environment.



*Waiting...*



*Finishing touches*



*Endurance 2018*



# MEMBER OF THE MONTH

## GARRETT DOUB



Garrett is a freshman who is an aspiring Mechanical Engineer. Garrett joined Penn State Racing at the very beginning of the semester, and immediately fit in with the team and began getting involved with every sub-system possible. He has spent his first month on the team getting involved with as multiple projects, and is showing an incredible amount of willingness to learn. Some of his projects include the “Mock-pit” design for ergonomic design within the Controls, Brakes, & Safety subsystem, and has even contributed to this newsletter. Garrett has found a way to be involved and learn in almost every aspect of our club, and we look forward to his continued contribution!

**Congratulations, Garrett!**

# **BRIDGESTONE**

*Your Journey, Our Passion*



# THANK YOU!

In addition to our sponsors, we are thankful for the unending support of the following individuals:



**Dr. Thomas Juska**  
Applied Research Lab



**Admiral Paul Sullivan**  
Executive Director,  
Applied Research Lab



**Dr. Matthew Parkinson**  
Learning Factory Director



**Dr. Todd Palmer**  
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**Cindy Winkelblech**  
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**Dr. Gary Gray**  
FSAE Faculty Advisor



**Bill Genet**  
Learning Factory Supervisor



**Rob McAllister**  
Learning Factory Supervisor

**We also thank all of the Penn State Formula SAE alumni that continue to provide us with invaluable guidance and assistance every year. Thank you!**

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## CONTACT US

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**Team email:**

[Pennstateracing@gmail.com](mailto:Pennstateracing@gmail.com)

**Team address:**

Penn State Racing  
212 Sackett Building  
University Park, PA 16802

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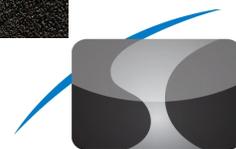
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