Dear reader,

The Spring semester has been a productive one for Penn State Racing. The 2018 car’s carbon-fiber monocoque chassis, which is the most extreme design change on this year’s car, has seen significant progress. It’s development has proven a challenging endeavor, however our capable members have learned and executed the necessary new techniques impressively. The Powertrain and Suspension systems are almost completely assembled as well, so a completed monocoque will hopefully mean a near immediate rolling chassis.

With the arrival of the Spring semester, we must also begin preparing for the static events at the Formula SAE Michigan competition. During the Design event, extremely qualified automotive engineers from across the globe scrutinize each of our subsystems on their design, manufacturing, and most importantly, validation. We must be able to justify and defend each design decision we made throughout the entire development of our vehicle. We will soon begin compiling binders full of data and calculations which will help us do so. Additionally, we have begun preparing the report for the 2018 Cost event. This report is meant to give an estimate of the production cost of our vehicle, accounting for raw materials, fasteners, tooling, and labor. Lastly, in the Business event, we must present to a panel of industry professionals a plan to mass produce, market, and distribute our vehicle as a consumer product. Ford, continuing their trend of generosity, has offered to lend some of their employees to perform a mock design review and critique our presentation before competition.

In this newsletter, you will see recent progress made in each subsystem, as well as a “Member of the Month” page in which we feature members who have made significant contributions.

Thank you for your continued support!

Penn State Racing
This month, Aerodynamics & Composites compiled an entire aerodynamics package model for the 2018 car in Solidworks. Now, the effectiveness of the models will be tested in our Computational Fluid Dynamics programs. The data collected in these simulations, once interpreted, will be useful during the design event.

Aerodynamics & Composites also began developing a testing plan for our upcoming trip to Ford’s Wind Tunnel 8 facility (WT8). We have been allotted enough time to imitate and gather data from dozens of different driving scenarios, adjusting parameters such as wind speed and yaw angle. We will collect data on drag, lift, and side forces, and pitch, roll, and yaw moments. Given that this testing will take place during spring break, we will need to finalize and fabricate our entire package in the next few weeks. Our first priority will be the diffuser, side pods, and nosecone, followed by the front and rear wings.

Alongside the design work, Aerodynamics & Composites is aiding the mold preparation and carbon layup for the monocoque. Thanks to our generous sponsors, we have no shortage of foam, vacuum bagging, or carbon fiber. In January, our fiberglass female mold components were released from the precisely machined foam male mold. Our Chassis team then spent many hours at our storage facility mating, shaping, gel coating, and sanding those components. Next, we will lay up the raw carbon fiber, coat it with a resin, and vacuum bag with materials generously donated by Airtech. Once the carbon fiber is laid up, we will need to wait up to two days for it to completely cure. We will check for imperfections, remove any excess material, and prepare to mate it to the rear sub-frame. The completion of our monocoque this month will allow the front suspension assemblies, including the a-arms and steering rack, to be mounted.

2018 Car Renderings
As of February, nearly all powertrain components have been mounted into the rear sub-frame, including the engine, differential, fuel rail, and newly printed mock intake. The early assembly of the major components has allowed Powertrain to focus their efforts on the 2018 wiring harnesses. Electronics have been a weakness on previous cars, and our deliberate early start is an effort to better understand the control and power systems on our vehicle. Our shifting system is also coming together earlier than in previous years, with a fully functional test bed completed and a shifting control unit currently being built.

Although the 2018 powertrain is largely similar to last year’s, we have targeted specific systems for improvement. Firstly, we are moving away from a single-radiator cooling system. This year, we will be connecting two smaller radiators in parallel. They will be mounted on each side of the car, giving our car a more symmetrical frontal area. The smaller radiators will also allow more room for aerodynamically effective sidepods. Another change for Powertrain is the new intake. We have reduced the volume of our intake plenum significantly, which we hope will promote better throttle response and low-end power. To test the packaging restraints of our new design, we have 3D printed a prototype. Once the shape and mounting solutions are confirmed, we will send a model to RealizeInc to be 3D printed out of the requisite material.

Sub-frame powertrain assembly (top), 2018 pedal tray rendering (bottom).
This month, we received our new air shocks, courtesy of Fox. They are lighter and much more easily adjusted than last year’s traditional spring-damper shocks. Their smaller size also made packaging our new pushrod actuation much easier. They will soon be coupled to the newly designed rear bellcranks, which were manufactured and mounted this month. As for the front, custom clevises will be mated to the monocoque to support the A-arms. Then, holes will be cut to accommodate the steering rods.

We plan to return to Akron, Ohio over spring break to visit our sponsor, Bridgestone. There, we will conduct kinematics and compliance testing on a complex jig that simulates road and track driving. This testing is done by only a handful of Formula SAE teams, and has earned us valuable points during the Design event. Mounting our new chassis to the jig may prove difficult, but we will develop a solution upon completion of the monocoque.
MEMBER OF THE MONTH

ANNE ORTH

Annie, a junior, has been a dedicated member of our team for several years now. Last year, she assisted the Aerodynamics & Composites subsystem in the design and fabrication of our aero package. Now, Annie is applying the skills she learned to help develop our carbon-fiber monocoque. She has devoted many hours to the preparation of our fiberglass molds, which she will soon help to lay carbon into. Given the importance of an on time chassis completion, Annie’s efforts have not gone unnoticed. Outside of Penn State Racing, Annie makes time for the Engineering Ambassadors program and a research project within the Mechanical Engineering department. Her work ethic and positive attitude also makes her a welcome presence!

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

Dr. Thomas Juska  
Applied Research Lab

Dr. Karen Thole  
Department Head, Mechanical and Nuclear Engineering

Admiral Paul Sullivan  
Executive Director, Applied Research Lab

Dr. Matthew Parkinson  
Learning Factory Director

Dr. Todd Palmer  
Applied Research Lab

Cindy Winkelblech  
Program Administrator

Becky Benson  
Administrative Support Assistant

Bill Genet  
Learning Factory Supervisor

Dr. Stephanie Stockar  
FSAE Faculty Advisor

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!

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Penn State Formula SAE would like to express our most sincere gratitude for the generous university and corporate partners who made our project possible—it would be impossible without your continued support. Thank you for your support!

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