Dear reader,

In only three months, Penn State Racing has made incredible progress on the 2018 vehicle. November’s design projects brought new challenges, along with innovative solutions. The complete redesign of the 2018 car has been a rigorous exercise in engineering and design, but our devoted and capable team members have exceeded expectations and produced impressive results. The difficulties our team faces this year will undoubtedly prepare us for the intense environment at competition and sharpen our focus for next year.

In November, we were able to finish machining, repairing, and assembling the positive monocoque mold. Following a gel coat and curing process, we will fabricate the negative mold and begin laying up the carbon fiber. We also completed our steel tube rear sub-frame this month, which will be fastened to the back of the monocoque. This milestone has allowed Powertrain to begin mounting it’s major assemblies and validate their packaging. We set an aggressive goal at the beginning of the year to finish our car by spring break, no matter the sacrifices in appearance. We hope that by completing the car as early as possible, and maximizing track time, we will better test our car’s reliability and improve where possible.

Included in this month’s newsletter are updates from each subsystem, as well as a “Member of the Month” feature. We would also like to take a moment to thank our new and returning sponsors. At the end of the newsletter, you may find our many supporters from inside and outside the university who make our project possible.

Thank you for your continued support!

Penn State Racing
The Aerodynamics and Composites subsystem lent their efforts this month to the development of our carbon-fiber monocoque chassis. The Aero team cannot begin fabricating the aerodynamic package until the completion of our monocoque since mounting solutions are contingent on the final chassis form. Consequently, they spent November producing CAD models of potential diffuser, sidepod, and nosecone designs. These three components will be our first priorities; front and rear wing designs will follow shortly thereafter. Aiding the development of this subsystem is an engineer at the Ford Motor Company with extensive experience in aerodynamic design and Formula SAE. We are grateful for all of Ford’s support and confident that it will contribute to a more competitive vehicle.

However, Ford has decided to lend resources far beyond expertise this year. This spring, we will head to Allen Park, Michigan to test our aerodynamics in the Ford wind tunnel facility. Specifically, our car will be evaluated in Wind Tunnel 8, the same wind tunnel used to develop the all new, high performance Ford GT road car. As a team dense with car fanatics, we are excited to share testing grounds with such a capable and historically significant vehicle.
Chassis’ hard work in November yielded significant results. The steel-tube rear sub-frame is completed, meaning the powertrain and rear suspension were able to begin mounting. In previous years, we have had to wait until the entire chassis was fabricated to begin assembling these systems. With the early frame completion, we can finalize and validate packaging well before our spring break deadline. The timely finish can be partly attributed to this year’s all new frame jig. It’s robust construction and precise mounting points allowed little room for error when orienting and welding the tubes. Also, we had our tubes professionally cut and profiled by our partner BLM Group.

Our carbon-fiber monocoque also saw progress this month. The male mold has been machined and has been rid of imperfections in the surface. Next, we will apply a gel coat to obtain a smoother finish. Lastly, we will form a female mold into which the carbon-fiber will be laid.
The upcoming month will be devoted to mounting powertrain assemblies onto our recently completed sub-frame. Thanks to diligent efforts from our Manufacturing subsystem in November, we were able to machine all the necessary hardware and mount our differential package. Over Thanksgiving break, some members stayed behind to continue progress on our exhaust and fuel tank, which will also be mounted this month. Finally, the newly printed mock intake will be bolted onto the engine.

One area of deliberate focus this year has been our pneumatic shifting system. The 2017 car suffered from consistent issues with the downshift function, halting many testing efforts at our track. One freshman member has been especially helpful with the system this year, having completely dissected and replicated the system on a test bed. In addition to resolving the weak areas of the 2017 system, the 2018 shifting will incorporate a long awaited creep function. Previously, our car’s only method of accelerating from a standstill was the launch control function, which allowed only for a violent albeit lightning fast start. The creep function actuates the clutch more gradually and will allow us to better control the cars acceleration at low to moderate speeds. We are eagerly awaiting the engine’s start so that we can move the system directly from the bench onto the car.
The a-arms were manufactured, welded to the balljoint holders, and painted this month. Upon completion of our uprights, which are halfway done, the entire rear suspension can be mated to the chassis. The uprights will be the primary focus of our Manufacturing subsystem in December. We are in a good position to have a rolling chassis soon after the monocoque is complete. Our speedy progress is especially impressive considering this year’s suspension was completely redesigned.

We are very excited to test our new Fox Shox on the 2018 vehicle. The new shocks use compressed air to suspend the vehicle, as opposed to the 2017 car’s traditional spring-damper setup. The effective spring rate increases as the shock compresses, promoting better handling characteristics and a more supple ride. Fox was also kind enough to donate accompanying electronic pumps, which will allow us to tune the shocks with heightened precision. Most importantly though, the shocks are smaller and lighter. Having a compact shock will help us to package our brand new pushrod actuation, and the weight saved will result in increased agility and speed.
MEMBER OF THE MONTH

SALMAN ALHUMAID

Salman is a sophomore who, like many of our team members, studies mechanical engineering. In his first few months on the team, Sal has contributed primarily to the Manufacturing subsystem. Included in his resume of parts are differential carrier inserts, oil pan plugs, and more, all of varying grades of aluminum, steel, and titanium. Sal has very much enjoyed making parts for the team, saying that with each part he gains confidence in his machining abilities. Sal cites working in manufacturing as a rewarding experience, knowing that each part he fabricates, although small, will contribute to the completion of a much grander product. In the little free time he has outside of classes and the race team, Sal frequents Mount Nittany, Bald Eagle State Park, and Raystown Lake. Quite the outdoorsman!
THANK YOU!

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!

CONTACT US

Email:
Pennstateracing@gmail.com

Website:
http://sites.psu.edu/pennstateracing/

Facebook
https://www.facebook.com/PennStateRacing

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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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