February 2024

Over the month of February, the team has been hard at work all across the board from participating in multiple interclub events and events run by the School of Engineering to manufacturing and design reviews. The car is getting closer and closer to competition and we are beyond excited to share with the world our challenger for the 2024 Formula SAE Electric competition.
Dear Nittany Motorsports Supporters,

The team has been hard at work this month. With Spring Break right around the corner, we are preparing for the final stages of the season before we travel to Michigan for our annual competition.

We are all very excited to have yet another opportunity to travel to Michigan. The highlight of our year is competing with the car. We have started to make travel arrangements and finalize our roster. The NMS leadership takes the roster selection process very seriously. Choosing just 30 members from our highly dedicated team is no easy task.

I would like to thank all of our dedicated team members who have put in countless hours this year to help our team achieve our goals. I also want to thank our sponsors and supporters; without supporters, we wouldn't be able to do any of this. We are very excited to reveal our car proudly displaying all of our partner's logos.

Thank you for your continued support,
Joel VanSkiver, Team President
Events

IPAC STUDENT CAREER PANEL AND NETWORKING EVENT
We were invited by the PSU Mechanical Engineering Department to attend the Industrial and Professional Advisory Council (IPAC) Student Career Panel and Networking Event! Our members were able to hear from industry professionals about career advice and were able to connect with them. We really appreciate hearing their inspiring success stories, and thank the ME department for including us.

DESIGN REVIEWS
Throughout February, our Systems Integration Lead, Josh Kaleida, did in-house design reviews for all of our technical subsystems. Each subsystem had to present their designs and validation to him as if he were a design judge at competition. A lot of great insights were discovered, and it has put our team in the right direction heading into manufacturing season. Thank you Josh for your wisdom and guidance for our subsystems!

MERCHANDISE PHOTOSHOOT
Our outreach subsystem put together a photoshoot of our fall 2023 merchandise items to help advertise our public merchandise launch this semester! Members came to both the library studio space and outside Old Main to take some pics. Thank you Outreach for having some fun with our merch and helping us share our designs with those outside the team! If you’re interested in getting some NMS merch, our spring public sale will happen in March.

EWEK EVENT WITH AVT/ECO MARATHON
We participated in Engineering Week through the College of Engineering by having a joint social with Shell Eco Marathon and the Advanced Vehicle Team! We spent time with the members of each team and even participated in a Mario Kart Tournament! We’re happy to continue building connections within the automotive engineering teams on campus.
Aerodynamics

This past month saw the front wing become fully assembled, awaiting final touches and clear coating before it is completed. The front wing mounts will also start to become designed and manufactured shortly which will hold the front wing securely to the car and prevent ground impacts. The rear wing is near completion, only needing assembly which should happen this coming week before our spring break. The undertray is full steam ahead in its aerodynamic design phase so that it will be ready to be manufactured once we are back from break. Over the next few weeks, the front and rear wings should be finalized, and the mounts for them made, as well as the undertray mostly manufactured!

Chassis

February has been a month of finalization as many subsystems are working on final designs. Chassis however has been hit with a variety of issues due to other subsystem designs that have left us without a final tubeframe design. Other sub-projects have been coming near the end of the design cycle. The firewall has finally received the finalization of information to confirm the angles for the double-angle firewall as well as ordering most of the materials that will be needed for manufacturing. Body panels have been on a roll this month as we have investigated multiple materials and have settled on going for denim over carbon fiber. This choice means that we can save an exorbitant amount of money with a near-negligible weight addition. We have also finally solved the age-old problem of the nose cone and body panel mounting by finding some quick-release buttons that can be used on the chassis to allow for a solid mount but accessibility when working on the car. As we near manufacturing season materials are being bought to help construct a jig to weld the tube frame together. Ideas are also being thrown around about how the firewall will be manufactured. Overall we hope to soon have our chassis finalized and begin manufacturing to ensure we have enough time to test.
Controls, Brakes, and Safety

We have started manufacturing for the Pedal Tray! We started with the arms, getting mounting holes drilled on the sides. We will be transitioning to the tray as well as the smaller holes for the pedal faces. Our Steering and Dash team is close to a final design, and we will be starting manufacturing this coming week. Lastly, our SBR team has been hard at work identifying the best-shaped rotor for heat dissipation.

Drivetrain

Drivetrain has been working hard in the month of February. Big strides have been made in terms of the motor mount. The motor mount should be ready to go into manufacturing within the coming two weeks. We have begun on a new venture of integrating the sprocket adapter into the sprocket with a custom design that will be manufactured with a wire EDM. This will greatly reduce the rotational inertia of the assembly that came before this design. The reduction of rotational inertia is ever so important as it directly impacts how fast the motor can accelerate. The diff mounts have finished the design phase and are ready for manufacturing. This is a rather clever design allowing for the integration of chain tensioning with the use of rod ends. Cooling testing occurred, which provided just as much excitement as it did data! All jokes aside, we did get very useful data regarding constants specific to the radiator that the manufacturer does not supply. We can now use these experimentally determined constants to create a Matlab model of the system and virtually put it through its paces! We hope that in the month of March, we will be able to hit the ground running on the manufacturing side of things so we can see our designs come to life!
Finance

Finance has continued to work hard throughout February to make sure everything financially related to the running of a race team has gone as smoothly as possible. We have been hard at work reconnecting with past sponsors, connecting with current sponsors, and reaching out to possible new sponsors. The team has also been working with all of the members in the team to make sure everyone is up to date on the resources within the team that have to do with the finance subsystem. We have started to work on some competition restated stuff such as the business presentation and cost report. We look forward to continuing working on these things and presenting on them in the upcoming months. Finance looks forward to continuing working towards our goals as we look towards the end of the spring semester and competing at competition this summer!

High Voltage Electronics

This month, HVE has been putting all our efforts into finishing our accumulator. We successfully manufactured the whole battery casing and are working on finishing up the wiring. We are very excited about how this iteration is turning out. This year’s battery will be much more serviceable than last year. Additionally, we have implemented a number of features that we project will reduce our installation time for putting the battery in the car by 300%. With this year’s chassis being a tube frame, we have put a lot of thought into water ingress protection and are in the process of cutting out gaskets for all potential points of ingress. We have begun looking towards the future this month as well and have laid out some ideas and timelines for RnD project. We will finish HVE work well before the rest of the car, so we will be looking to get some fine-tuning done and turning our eyes towards next year. WE ARE!!
Low Voltage Electronics

This month in the Low Voltage Subsystem, most of the PCBs for the car have been ordered, most notably the primary front and rear boards that will collect sensor data and send it to the dash, as well as process the driver input into the car. Other boards that were ordered include the high voltage indicator to be inside the accumulator, the IMD and AMS latches that are a part of the shutdown system in the car, the pre-charge circuit for the accumulator, and the Tractive System Light which indicates the status of the vehicle. On the software side of things, the team has continued to tune the implementation of the analog-to-CAN functions for our data and our controls and began to test the ready-to-drive functionality. These software features are then tested by our Hardware-in-the-Loop (HIL) testing setup to verify that the car is going to pass certain tests. The wiring harness team is continuing to update their harness design and more specifically the pinout of the front and rear boards as they change. The sensor team has continued to collaborate with the software team on the implementation of the wheel-speed sensors and how we will quickly and reliably collect data from them when the car runs. That is it for Low Voltage Electronics. This month we prepare to receive the second round of board orders, test the circuits individually, and finally integrate them into the test setup to see how they will work together.

Outreach

This month has been filled with creativity in Outreach! We have been working diligently on our spring 2024 merchandise by making new designs, switching up our products, and looking at alternative ways to run our sales. There will be another public merch sale available in March, and we will post about it through our many social media platforms. Speaking of social media platforms, we now have active YouTube and Facebook accounts! This was a huge step for our team to broaden our audience, and we’re very thankful for the Project Managers who have taken this on. Check us out @Nittany Motorsports on Instagram, TikTok, LinkedIn, Facebook, and YouTube for team content. Lastly, we’re continuing the planning of our full team DEI&B Workshop, and it will take place in March. We’re super proud of the dedication to improving our team culture from all members, and we’re excited to roll into March with our big deliverables.
Suspension

In February, the suspension has managed to hit some major milestones as we prepare to start our manufacturing season. We are happy to announce that the material selection for the decoupled roll-heave system has been finalized. The suspension team was able to select and purchase a new set of Coil-Over Dampers to serve as the heart of our new suspension system this year. Alongside, we have started to put together a master manufacturing plan detailing our timeline for the fabrication and assembly of critical subsystem components including the bell cranks, clevises, control arms, and mountings as well as finalizing stock orders to start manufacturing as soon as possible. In addition, the suspension budget and BOM were organized as we prepared for our cost-even presentations following some streamlining of procedures. We would like to extend our thanks to systems integration lead Josh Kaleida for his role in ensuring that the subsystem has a robust and clear design presentation outline, and in making sure that all of the subsystems are able to find parity in design and overall packaging. We anticipate that the metal stock will arrive in time for a productive manufacturing session during spring break and expect a fully realized suspension component assembly no later than late April. Finally, we are currently planning a new design of the suspension upright geometry to be installed on PSR25, and hope that the team will have a solid foundation to continue efforts throughout the summer and into the next season.

Systems Integration

This month, Systems Integration was focused on a series of design reviews for each subsystem to better understand the design event at competition. Over the course of a week, each subsystem presented their designs in a similar format to that of the design review at Michigan. All the subsystems did really well with the event. It is the hope that in future months, the team will be able to host an alumni design review so that each subsystem can be assessed with an external set of eyes. If you are interested in helping in such a design review, please email me at jpk6130@psu.edu so I can gather more judges. Some other highlights throughout the month include a system integration meeting to determine the radiator placement, aero packaging, and drivetrain updates. Another meeting between all the subsystems to iron out any final issues with designs before major manufacturing begins also occurred. For next month, another round of design reviews and more systems integration meetings are set to take place.
Sponsorships

Thank you to our sponsors for the year thus far:

- Altair, Altium, BEST Center, Calspan Tire Research Facility, Hyper Racing, MasterCAM, Penn State Department of Mechanical Engineering, Penn State Engineering & Entrepreneurship Program, Penn State Engineering Undergraduate Program, Penn State Institute of Energy and the Environment, Rapid Harness, Remington Industries, Rock West Composites, SimScale, Stackpole Engineering, The Piper Group, Uline, Tenneco, and VI-Grade

We are looking forward to your continued support!

Acknowledgments

We would like to take the time to acknowledge the following groups:

- The Learning Factory Staff
- The FAME Lab Staff
- The Larson Transportation Institute
- Stadium Clean-Up Staff and Coordinators
- PSU Homecoming

And thank you to all others who have provided us with constant support throughout our switch to electric! We are looking forward to a great year of car development!

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