We’re one month into the semester and we’re making significant progress! Official university recruitment has ended, but we’re always accepting new members. Each subsystem has its project managers and members settled in and moving forward with designs and early systems integration. Additionally, we’ve had some unique fundraising opportunities that we’ll discuss below.

Continue reading to learn more about how Nittany Motorsports is rolling into our second EV car!
Dear Nittany Motorsports Friends, Family, and Supporters,

September was a busy month for the team. Classes are in full swing and so are we! Our first few track days of the season proved to be great learning experiences for new and returning members.

One of our highlights this month was our Member Major Survey. With over one hundred and sixty responses we learned a lot about the people who make up our team. The results show that we have members from 24 majors and 8 different colleges! A huge step up from last year, as we had 10 majors from 5 colleges.

Another highlight of the month was our first-ever stadium clean-up. The morning after the Penn State White Out we had over 60 dedicated members show up to Beaver Stadium at 6:30 am to help clean the north endzone bleachers. We were very excited with the attendance and will be a part of another stadium clean-up following the Michigan game.

Recently, the team held a fundraiser hosted by Teadori in downtown State College. Many members attended the event and purchased tea and/or food to help the club raise money to support our efforts this year.

Everyone here at NMS is extremely excited about the future of the club. The growth we have seen after the COVID-19 pandemic has been unprecedented. We will be continuing the work we have been putting in and look forward to seeing the completed PSR24.

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

SMEAL INVOLVEMENT FAIR
For the second year in a row, we attended the Smeal College of Business Involvement Fair. We spoke with students from a variety of majors within Smeal who were interested. We are super excited to continue our recruitment efforts from Smeal!

LEARNING FACTORY OPEN HOUSE CLOSED SHOP
We attended the Learning Factory Open House Closed Shop in the new Engineering Design and Innovation Building this month. We were able to connect with other engineering clubs that use the space and with students! We are very excited to use the updated equipment in the new LF building!

STADIUM CLEAN UP
For the first time ever, we participated in a Beaver Stadium Clean Up after the Whiteout game. We had over 70 members attend and were able to raise a good amount of money for the team by doing so. It certainly was an early morning, but we are very appreciative for the Stadium Clean Up program and to the members who participated!

TEADORI FUNDRAISER
We partnered with a local Bubble Tea Shop to do a fundraiser for our team. Members and friends went and got a sweet treat after our weekly electronics meeting. We even brought our front wing to the shop (pictured to the right). Huge thank you to Teadori for working with us! If you are in the State College area, they are definitely a worthwhile stop.
Aerodynamics

The aerodynamics group has finalized the front wing design, with the main element, outer and tall section, and endplate design being chosen. It has been given proper tolerances and works with the chassis and suspension layout, so it is good to go for its manufacturing which will start in about 3-4 weeks! The structures group has decided on two rods with a moment arm/clamp for the front wing mounts, and once a chassis design is finished it will be a quick turnaround to get the mounting design finalized. The testing group had a successful track day last week and has been getting used to the dash and data recording software. We are planning on another track day this coming week and we are hopeful to collect some useful drag, downforce, and CoP data as well as validate the lap time simulations we have been running. Over the next month, the front wing manufacturing should be about halfway done, and the rear wing design is nearing finalization, with the front wing mounting being prototyped as well!

Chassis

Chassis has been working with every subsystem this month in order to release multiple different new designs for the full monocoque. We worked hard at this month's full team design meeting, fondly known as the Chassis v. World meetings. At this meeting, the focus was on trying to ensure that the main requirements of each subsystem integrate well with the chassis. With this in mind and even more feedback, we are hard at work to release yet another design!

Moreover, the mini-projects have officially kicked off! Each project manager had the opportunity to present their project to the new members and form project groups. Each group is now hard at work on design iterations and material choices. This month we had our Systems Integration meeting with Suspension and we are eagerly taking all the feedback to ensure that our next integration meeting can provide us with even more valuable knowledge! Finally, the project managers had the opportunity to present their "soft skills" to the subsystem to push forward and make the subsystem even more efficient. These mini-projects include a historian which will aid in documentation, and a planning group to aid our subsystem in staying on schedule throughout our whole process. We are excited to have put yet another successful month in the books and can't wait to see what October has in store for us!
Controls, Brakes, and Safety

September has been a month of research and preliminary design. Our focus has been on developing CAD skills for new members and joining project groups based on individual interests. As a team, we cleaned up Beaver Stadium after the Whiteout game. To say thank you, I hosted a family-style dinner for the CBS members who assisted in this effort! We have a first draft of the components we want to manufacture for our pedal tray. We are going to spend this upcoming month iterating on this tray to fit inside our chassis, reduce weight, and improve the integration of master cylinders, return springs, and linear potentiometers.

Our Steering and Dash team has been doing research on u-joint angles, comfortable tilted angles for the steering wheel, and the overall sizing of our steering column. We will continue to iterate on this design and make headway on the steering column mount and steering wheel design for the upcoming month.

Our Spindles, Brakes, and Rotor project group has been heavy on research with most of our designs being in a two-year design cycle. We are focused on fixing the braking imbalance from the front braking system to the rear. We have recalculated what we expect the brake ratio to be and believe we have located the source of issues for years. Thermal studies will begin next month as we look into any changes we want to make to the rotors.

Drivetrain

Drivetrain has been working hard in the design phase in the month of September. The first draft of the differential mount has been finished, and it is ready for interfacing with the first draft of the motor mount, which is going to be finished very shortly. At track days, drivetrain has been able to gather useful data regarding the cooling system and the tuning of the limited slip differential. Additionally, after running at 4 track days, there are no major issues with the drivetrain system on the 2023 car! This is a good indication that there are no major flaws in the system design. The CV joint/axle team is beginning to do some in-depth research and testing on carbon fiber axles to see if they may be a viable option for the 2024 car. On the cooling side of things, the team is doing a great job in figuring out the radiator sizing in placement, which is much easier said than done. The first prototypes of the adjustable differential are ready for 3D printing and test fitting, so stay tuned to see the outcome in next month's newsletter!
Finance

Finance has been buzzing this past month, fueled by enthusiasm and hard work. We've been meticulously managing our finances, ensuring every dollar is strategically allocated for the upcoming competitions. Fundraising has also been a notable success. We've partnered with local businesses, securing essential funds for our journey. Additionally, our recent team-wide stadium cleanup not only raised funds but also demonstrated our commitment to community involvement and team building.

We have also been busy contacting past sponsors and reaching out to new potential sponsors. We've been nurturing existing partnerships and exploring exciting new opportunities. These connections are vital for our success in the 2023-24 competition, providing the support and resources needed to build a winning car. We're genuinely excited about the road ahead and the potential it holds for Nittany Motorsports!

High Voltage Electronics

This month HVE focused on training our new members and tuning the 2023 car. This provides great early learning for the 2024 car as we are running a very similar powertrain. We have put a lot of effort into understanding the physics behind launching the car and how to prevent a persistent overcurrent issue we are having in the 2023 car. Project manager Cooper Denmark is doing a great job working on the redesign of the accumulator this year. We are focusing on serviceability and simplicity for this year’s design. His team is working on prototype CAD and will be 3D printing models to see how the wiring will be packaged efficiently.

Additionally, the launch control team is installing wheel speed sensors this week so we can work on the first version of launch control code. We have also secured a sponsor for this year’s wire, huge shoutout to Josh Hagen with Remington Industries. This wire is nicer than what we used last year and will provide us the ability to prototype our wiring harness before wiring it up on the car. This will give us a much cleaner final product. HVE will be looking for machine shop options in the next few weeks to start some physical manufacturing.
Low Voltage Electronics

This month in Low Voltage, all of the projects have been moving towards the development phase. Both PCBA's (Printed Circuit Board Assembly) that are going to be on the vehicle are now entering the stage of schematic design and are soon to enter the phase of being placed onto the PCB. By the end of this month, we will have completed both of the Mega-Board Front and Mega-Board Rear and have them in the shop for validation and integration with the software team. The Power Management Team has also been working on the hardware solution for powering our PCBAs, sensors, and all other low-voltage components on the vehicle.

On the Sensor Integration Team, the members have been looking into all of the potential sensors that will be on the car for next spring. Additionally, several of the members have also been working to integrate wheel speed sensors into the existing car. This will allow for the Launch Control team to test their code during the next couple of track days before the winter months when we conclude testing. The members of the Software Team have been taking the time to get familiar with the coding toolchain and our code repository. Now, each member has an assigned task to complete and implement into the new codebase for the new hardware. This code will be tested on the hardware when it arrives in October.

Finally the Wireless Communication Team has continued to work on getting the wireless uploading process tested for the vehicle before it makes its way onto the hardware. The goal for this is to have the ability to test uploading code wirelessly once the hardware arrives in October. That is it for the updates from the Low Voltage Team and stay tuned for next month's exciting updates!
**Suspension**

Suspension has had a very eventful first full month of classes. We kicked September off by setting goals and metrics with our new and returning members, who are full of energy to deliver an excellent design this season. We have incorporated a brief presentation at every meeting for the project managers to introduce suspension concepts so that we can continue our knowledge transfer for future years. All projects have kicked off and are showing good progress!

Elijah and Ethan have started modeling parts for the roll-heave shock assembly and plan to start manufacturing and assembly once the Learning Factory metal shop is active. Braden is taking the lead on performing engineering and cost analyses for material selection, which will be a crucial first step in determining what our control rods, uprights, and bell crank assemblies will be made out of.

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**Outreach**

September has been a fun month for Outreach! We attended a few more recruitment fair events including the Smeal Involvement Fair and the Learning Factory Open House Closed Shop which were very engaging for new and returning members. Additionally, we started working on our team merchandise collection for the fall semester. We are excited to announce that we will be having a public shirt that ANYONE can purchase! Details on how to order one will be posted on our Instagram once we hear back from our merchandise vendor. The goal with this shirt will be to act as a fundraiser for our team and to promote us throughout the campus (and beyond)!

Additionally, we organized a fundraiser with Teadori, a local bubble tea shop downtown which was very successful. We also participated in a stadium clean-up after the famous Whiteout game with the team- that was a great opportunity for us! Outreach is moving right along with our rebranding and social media presence with our new LinkedIn page set up and operational. Check us out on our social media pages @nittanymotorsports to see more of our week-by-week updates. Lastly, we’ve set up a media team that rotates and attends track days to get media for our team to use! I am very pleased with and proud of the Outreach members this year, and we’re looking forward to another fun month promoting a fun and inclusive team culture!
On the steering side, we reached out to Hyper Racing, the manufacturers of the new steering rack and we are excited to collaborate with them as we make the transition to a steering more adjusted to NMS application. Deva and Kaelea are working with CBS and Chassis on the overall steering geometry with regard to the placement of the front tierods and on the final assembly to make packaging simpler. We expect that these efforts combined will improve the steering and handling characteristics of the car.

The team has been able to run the car on two separate track days, which were very productive, especially for suspension. Data acquisition from shock potentiometers, acceleration, and autocross setups, as well as dynamic feedback from drivers have given us good data for validating our design from last year, but more crucially gives us an idea of the tuning setups that are preferred by our drivers while improving lap times. The plan going forward is to start testing dynamic events analogous to those at FSAE Michigan to validate the car’s performance with setup changes and also to create a benchmark for future designs and testing.

Suspension and Chassis were also able to meet together with Systems Lead Josh Kaleida towards the end of September, which was very productive. We established constraints with our design process and were able to communicate our needs and deliverables moving into October. Moving forward, we will be testing components and start making our ideas into physical parts, collaborating with the rest of the team, and doing our best to deliver a top-notch suspension design!
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!

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

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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