

Spring Newsletter: Michigan Competition



Knickerbocker Motorsports 2016 Team (from left to right): Mohamed Haroun, Oliver Gruterich, Trevor Docter, Ricardo Fritzke, Gwen Archambault, Karim Abdallah, Connie Zhang, Josh Hu, Patrick Naughton, Andrei Shylo, Sydney Sherman, Simon Anuszczyk, Blair Kania, Brett Harrington, Thomas Orr, Bill Miller, Aziz Ketari, Joe Wihbey, Ronan Rice, Jon Chang. Not pictured: Keenan Albee, Kristina Andreyeva, Joe Campo, Julia Di, Alex Freemantle, Jason Liang, India Madisetti, Pedro Piacenza, Peter Richards, Tamas Sarvary, Matt Sheridan, Tom Snyder, Chad Tarpley, Nicho Villalobos, Brian Wang, Emanuil Yanev.

Knickerbocker Motorsports would like to thank you all for your support this season. We recently finished our first competition in Brooklyn, Michigan with our newest racecar, KMR16. We ranked 49th overall out of 115 teams and we completed all dynamic events, including the endurance event. Most notably, we scored 7th in the acceleration event.

Although the academic year has ended, our team is continuing to prepare our car for the next competition in Lincoln, Nebraska next month. For those of you who couldn't join us, here's a recap of the Michigan competition:



Day 1: Tech Inspection



Team in the tech inspection bay

When we arrived at competition, we knew some details of our vehicle needed adjustments. There were many bolts without the minimum of two threads on the other side of their locknuts and we needed to safety wire fasteners. Additionally, we had installed the body the night before leaving and it needed decals and a bit more dremeling for clearance. Our team persevered- the car never had less than 12 hands on it throughout the first day. We were one of the last teams to make it through tech inspection, but it went smoothly. The highlight of tech inspection was angle grinding a 1" hole in our floor pan for fuel to drain out (we had difficulty accessing the floor pan with a drill and hole saw). In the bay, all 12 teams and tech inspectors, at least 50 people, stopped and watched our team grind away, which the inspectors said they hadn't seen in a long time. After a good hour and a half of rigorous inspection, we were awarded our sticker, which only 60 teams achieved on the first day.



Team after first tech inspection sticker

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Day 2: Static Events

We went through the static events, where we achieved 53rd place in cost, 71st in presentation and gained 80 points in design (out of 150). The judges placed all teams into 5 groups for designover 100 points (top 10 teams), 100, 80, 60, and 40 points, so we were in the mid to upper range. Additionally, we passed the tilt, brake and most surprisingly noise test without issue. We already made a contraption to stick on the end of our Supertrapp muffler in anticipation of failing noise; however, it was not used since we were 111 dBc the first time (close enough to 110 for the inspector to pass us). Just as we went through drivers' egresses, it started to storm so we packed up for the day. One of the tech inspectors spotted a drip on the floor during the egresses- luckily he thought it was from the brakes and he couldn't find any leaky lines. The leak was from our oil pan, a part we've struggled sealing the entire semester. Aside from more sealant, we devised what we call "oil pan inception", which was a pan that could catch all drips underneath our oil pan. Additionally, we stepped on our 3D printed paddle shifter during the drivers' egress and we replaced the paddle. At that point it was clear the team was well prepared for all technical incidents.

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60 degree tilt test

Day 3: Dynamic Events

At 7:30 AM we began by setting up the car on corner scales, adjusting camber, toe, and preloading springs. During that process, I over torqued the spring on the shock and it started leaking fluid, setting us behind an hour before finding a spare shock from RPI. Once we entered acceleration, we realized shifting wasn't working due to a wiring issue with the new paddle. This was debugged within the hour and we pulled awesome times, our best being 4.261 seconds at seventh place. The previous day I mentioned to our design judge that our car is a powerhouse for acceleration- we have a four-cylinder engine, 10" rims and the paddle shifter. Even though we are slightly overweight at 212 kg (wet with a full tank), that statement holds true.

Shortly after acceleration, the judges stopped by our pit for design review, giving us good suggestions for next year car and improvements we could make for Lincoln. Following the debriefing, we headed toward skid pad, which was crowded. After our first driver ran, we stood in line again in hopes of pulling a better time, knowing we may only be able to get one autocross run due to the number of teams waiting in line. Our final place in skidpad was 73rd at 5.724 s.



Unfortunately both drivers were unable to walk the autocross course due to the electronics fix on the paddle shifter, and we went off course in our autocross run- a 20 second penalty on a 55-60 second course. After waiting in line for a second autocross run for over an hour, we were unable to run our second driver. Due to our poor autocross performance, we were required to run early morning in endurance the next day.

Day 4: Endurance



Ronan Rice, pre-endurance

We entered the endurance course at 9am, just after filling our tank for an efficiency score. Our powertrain lead devised a lean tune so that we could get through the 22 km using less than 1.3 gallons of fuel. Unfortunately, it rained the night before so we had a disadvantage of running on wets before the course dried out mid-morning (although there was plenty of water on the course in the afternoon after two bouts of hail). We were the first team to finish endurance, with a flawless driver swap. We passed many cars on the track and only got passed during one spin out- our driver was challenged enough to pick up the pace and get in front of that driver on the same lap. It was an excellent feeling to complete endurance, which we have not done in the Michigan competition since 2012. Formula SAE has not officially posted our individual rankings for endurance and efficiency, but we scored 74.9 points out of 100 in efficiency and 135.5 out of 300 in endurance.





Post-endurance walk of pride

After endurance, we egressed several more team members who didn't have a chance to drive the car during the semester. We sent them to the drivers practice area to have fun with the car and celebrate our accomplishments.

The Team

It's been an amazing experience working with 30 developing engineers to design, manufacture, and test a race car. Formula SAE has allowed us to practice our theoretical knowledge learned in the classroom and obtain hands-on experience. This is one of the largest, most tight-knit teams Columbia has seen and I'm proud to have been one of your leaders. We set our goals high- to be top 30 at competition. Although we didn't reach that, we are in the top 40% and ranked higher than any previous Knickerbocker team. We have improved immensely over the past year and I'm confident next year's team will progress even further with our new platform. I look forward to working with you all to prepare KMR16 for our next competition in Lincoln.



The team after all four tech stickers

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Thank You

I want to extend a huge thank you to our sponsors- this feat would not be possible without you. Our design and build cycle is extremely tight, and we really appreciate all the help at the last minute and rushing deadlines to get our race car built.

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Keith Goggin, we greatly appreciate the corner scales and are so grateful that you supported Dean of Dean's Hot Rodz and Racecars. You helped us keep our deadline of a rolling chassis before spring semester, which really set us ahead of the game and allowed us to have a running vehicle by mid March. Dean, your knowledge has been transferred to the next generation- many of our underclassmen have been practicing welding since your visit.

EVS Metals, you guys have been extremely accommodating at laser cutting and bending our last minute parts. Nathan Lee, our developing engineers are constantly improving their sheet metal designs based on your suggestions.

Global Machine Brokers donated a huge chunk of 7075 for our pedals and wheel assembly. Quick Manufacturing machined our hubs at the very last minute and hit tight tolerances perfectly. SKF answered all of our bearing questions and provided us with our wheel and differential bearings. Monster Tool Company donated machining tools last year which have proved essential in our manufacturing process. Steinjager was extremely generous and supplied rod ends and weldable thread bungs for our suspension.

KDF, thank you for not only CNCing our body panel plugs but also vinyl wrapping our car. We earned some stylish, creativity points in the design event with this beautiful body. A shout out to **Coastal Enterprises** for donating the high density foam last year and **Zoltek** for providing us carbon fiber for the past two years. Thank you, **Anne Zhou** for designing the graphics and making an iconic design. **P&M** helped us out with powder coating very last minute, and we are extremely grateful. Thank you, **Seidel**, who anodized our rockers

Thank you, **Kulite**, for providing us with brake pressure transducers so we can adjust brake bias and acquire data from our vehicle. **Deatschwerks** supported our fuel tank this year by providing us with pumps and testing fuel injectors. **Radium** supplied our fuel pressure regulator and gave us a discount on our titanium lugbolts.

Josh Browne has been meeting with us weekly throughout the spring semester, and we truly appreciate his vehicle dynamic knowledge. Josh, you are the closest person to a coach that we have, and I hope that you'll continue to drop by next year to support the team.

A huge thank you to our advisors, **Mohamed Haroun**, who has been essential in our manufacturing process by teaching us how to machine and helping Mastercam parts. Thank you Professor **Fred Stolfi**, who has helped us navigate the Columbia administration and **Bill Miller** for the continued support. Of course, we could not have done it without the financial support of the Columbia Engineering School.

I hope all the alumni recognize how much we appreciate their assistance throughout the year. Some of you guys traveled a long way to go to our design reviews and took time off work at odd hours to Skype with us. Without you we wouldn't have had a running engine in early December, we would



have incorrectly designed pull-rods, and overall we'd be a mess. KMR16 wouldn't be the car it is without all the knowledge we've gained and passed down since our team started. Thank you for the documentation of your designs, late night phone calls, and of course the server. You guys exemplify Columbia's Formula SAE community. I look forward to my role as an alumni next year, in which I will provide support to the next generation.

Cheers, Sydney Sherman Chief Engineer of Knickerbocker Motorsports 2015-2016