



Warrior Racing

Another Record Breaking Performance !

Warrior Racing once again shattered expectations and records at Lincoln Airpark. Formula West gave our team another chance to grow our reputation and prove Warrior Racing is becoming one of the top teams from the United States. The details of our journey start on page 2!

Event	Time	Points	Place
Cost	—	89.36	1st
Presentation	—	60.0	15th
Design	—	90	T-15th
Acceleration	4.98	33.69	33rd
Skid Pad	5.29	27.21	19th
Autocross	62.72	108.78	21st
Endurance	1624.25	179.3	11th
Fuel Efficiency	3.4 Liters	73.5	13th
Overall		661.8	10th

Issue 23 - August, 2016

Chief Editor -

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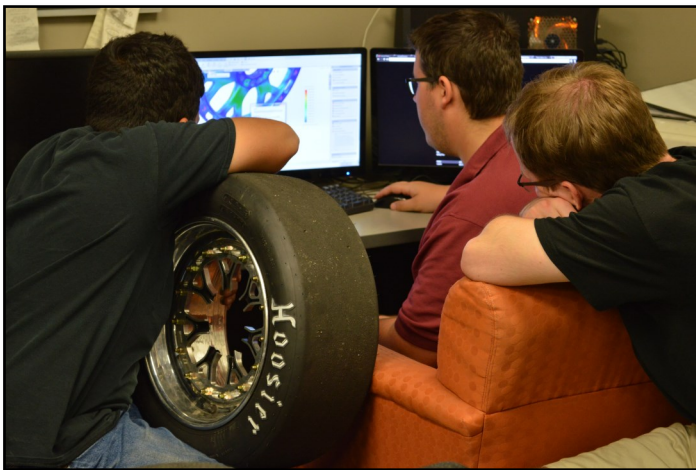
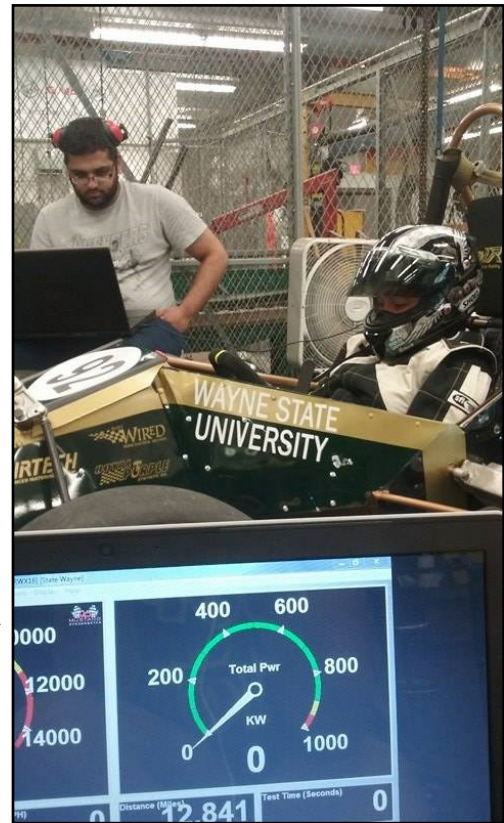


Formula West 2016 - Warrior Racing's Journey

After Warrior Racing's return from Formula Michigan the team had just under a month to prepare Road Warrior X for Formula West. The team was pleased with the success in the static events at Formula Michigan, but not as much with the dynamic events, especially not finishing endurance with only a half lap to go. To ensure success in the dynamic events at Formula West, the team spent a great deal of time testing Road Warrior X and making crucial adjustments.

We tested the car in acceleration and skidpad runs while making adjustments to the suspension of the vehicle in order to get the very best times possible. In addition to the many hours spent testing, the team was able to utilize a chassis dynamometer to further develop the engine tune of RWX. We would like to thank Kettering University's and Lawrence Technological University's Formula SAE teams who allowed us to use their equipment. Testing and tuning is one of the key factors that allowed us to perform so well in the dynamic events and secure a high place finish overall.

Our testing did not go without incident, however, as we had some unfortunate mishaps during some of our testing sessions. One of these incidents was a broken wheel center which happened during autocross testing. We were fortunate to have dedicated hard work from Michael Warmbold, Pranav Sridhar, and Richard LePage for diagnosing the failure quickly and making a more robust design. We would also like to thank Cammand Machining for manufacturing our replacement wheel centers in time to continue testing before competition. All of these improvements and further preparation of our static events had the team ready to succeed in Lincoln.



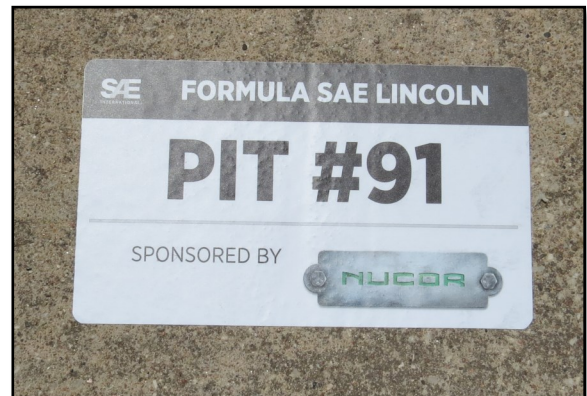
Warrior Racing arrived at the Lincoln Airpark on Wednesday morning after a long drive from Detroit, ready for the first day of competition. The morning was spent getting ready for technical inspection and setting up the paddock. After RWX was unloaded, we passed pre-tech with no problems. Back at the paddock each team member carefully checked over the car, subsystem by subsystem, to make sure everything was ready for technical inspection. After these final subsystem checks, the team took the car over to the technical inspection bay.

While looking over the car the judges were concerned with the packaging of the battery on the side of the car.

They requested that we add zip ties to further secure the battery, which was a quick and easy adjustment. The second problem the judges had with the car was that the seat belt bolts “pinched” the lap belt. To solve this problem we decided we needed spacers and we were able to manufacture some with spare tubing we brought with us from our shop. After that, the car met the standards of the inspection judges and we were able to pass technical inspection on the first day of competition.



The remainder of the day was spent conversing with other teams and looking at their cars and what they brought to the competition. Everyone was happy with the success at competition so far and was able to get rest and prepare for the static events on Thursday.





On the 2nd day of competition, we were prepared to take on the static events and the rest of technical inspection. The static events comprised of cost and manufacturing, a marketing presentation, and design.

To score well in the cost event, we had to make sure that every member used inexpensive materials, reduced amount of material used, and use cost effective manufacturing processes. Our cost team consisting of Erin Kronell and Hunter Hollister, and assisted by Richard LePage and Kristina Vujic had a thorough cost report that validated our vehicle's price. We came in 1st place for the cost event at \$9,432 with 89.36 points!



After the cost event, we had the design event. The design event score reflects how well we understand our vehicle's design and how well we can validate our engineering design decisions. Our three judges were either experts in powertrain systems, suspension, or frame. During the design event, each member tried to cover as much material as possible while making sure to explain concepts and calculations clearly enough for judge to understand. Mahesh Umasankar and Justin Bekker led the design presentation, which went well, but received lower scores than we had previously achieved at MIS

Finally, we had the marketing presentation. Ty and Erin scored very well at MIS and came prepared. Teams must be able to deliver a comprehensive business case that will convince the judges that their design best meets the demands of consumers, and that it can be profitably manufactured. Ty and Erin made sure to deliver a powerful message for production, marketing, finance, and manufacturing. We came in 15th place with 60 points.



The rest of Thursday was dedicated to the remaining parts of technical inspection. This included the tilt test, noise test and brake test. We started the morning off by going to the fuel station before going to the tilt test.



The tilt test consists of raising the car to a 45 and 60 degree angles to first check if any fluids are leaking, then to simulate a 1G turn at 60 degrees. During the 60 degree test, the car must keep all four wheels on the platforms. Our team struggled with this test at Formula Michigan, but after some final checks to make sure all fuel fittings were tight, we passed with flying colors.

Next was the noise test, which had plagued our team for the past three competitions. We tested for sound before the competition and were under the allotted level of 110 dbc but even at Formula Michigan we were over the level on our first attempt. The car ramped up to the testing level and to the joy and relief of the whole team we were given the thumbs up from the inspectors.

During the brake test, Justin Bekker wanted to use the test as a final opportunity to practice launching for the acceleration event. As he released the clutch there was a sputter and soon after the car came to a stop. The sprocket and sprocket adapter on the differential had sheared. Without skipping a beat, the team sprung into action to fix the sprocket and get the car back out to pass the test. With some help from Taylor Race Engineering, Michael Warmbold, Richard LePage, and Mohammed Kakli were able to make the repair within a couple of hours. Once the repair was made, Mohammed Kakli attempted the brake test and passed on his second run.

With all parts of tech complete, Warrior Racing was ready to race! Overall, we had successful day. Every member worked hard the night before and during the static events. It was around 100°F, so we all made sure to stay cool and hydrated. After completing the static events, we prepared our vehicle for the dynamic events. We all went back to our house, ate, and made sure to get plenty of rest for our upcoming competitions. Everyone worked very hard for this and it really paid off in the static events.



Day 3 was the first day of dynamic events. We jumped in line at skidpad to use the first run to help scrub in the tires that we had swapped earlier in the morning. We soon found out there was a timing issue and no cars were running in that event. Since time was running out, we made the decision to go to acceleration as we did not know when skidpad timing would be fixed.

During testing, with Justin and Ty behind the wheel, times were consistently in the 4.3 to 4.4 second range. Needless to say we were confident we could meet our goal of a top 10 time. After we completed our 4 runs, our fastest time was 4.8 seconds. This was extremely disappointing considering the amount of practice our drivers had for this event.

Being pressed for time, we went back to the skidpad event. During testing, Justin and Brandon were completing skidpad runs consistently in the 5.3 to 5.5 second range. We were expecting a 5.3 second run with a well tuned car. Brandon went first as he showed in testing he was a little faster in this event. There was fear that we may not get another run in before they shut the event down. We got all 4 runs in, and our best time was a 5.292! We were happy with a 19th place finish in this event.

In the afternoon, we had the autocross event. After watching other competitors on track set times anywhere from the low 57 to 68 second range, we had no idea what to expect. Our first run with Mike in the car was 65.14 seconds. We all knew Mike could easily bring his time down for his second run. Our feelings about Mike going faster were correct and his second run came in at 62.70! We were elated to be only 5 seconds off the pace set by a car with a heavily developed aerodynamic package.

It was time for our second driver to make his runs on the course. Mohammed pushed hard on both runs setting times very similar at 62.815 and 62.871 second. Mike and Mohammed felt the car was the best it had been since it hit the ground running back in April. The team was ecstatic after autocross even though we just missed the top 20 with a 21st overall placement in the event. Only one other non-aero car finished in front of us in this event.





After successfully making it through the first day of dynamic events and finishing all the static events, we set our sights on the endurance event. Our time in the autocross event determined our start time for the endurance event. We were set to start mid-pack. Some final adjustments and checks were made to ensure RWX was ready for the big race. To further ensure that all subsystems and components were ready for the race, Ty did some practice laps on the practice track early in the morning.



Our first driver, Ty, took to the track and successfully completed 7 out of the 15 laps. After the 7th lap, we had a smooth and successful driver change for our second endurance driver, Mohammed. RWX continued to perform exceptionally well lap after lap. Mohammed continued to push RWX to its limits and crossed the finish line. Not only did we finish the endurance event at Lincoln for the second year in a row but we were once again ranked the highest finishing team from Michigan.

At the award ceremony, Erin and Hunter accepted the 1st place trophy for the cost event. A big cheer went up from the whole team as our name was called for Top 10 overall teams. Ty and Filippo accepted the award for the 10th place overall team at Formula West. Being top 10 overall and ranking highest from all of the Michigan teams is a huge accomplishment and another record breaker for our team. We look forward to continue to grow and excel in the future.



New Records!

	Previous Records		2016
Overall Points	2015	12th - 587.7 Points	10th - 661.8 Points
Cost	2015	2nd - 84.5 Points \$9,342 Kristina Vujic Richard Le Page	1st - 89.36 Points \$9,334 Erin Kronell Hunter Hollister
Presentation	2014	17th - 66 Points Adam Niner Tirath Matharu Richard Le Page	15th - 60 Points Tirath Matharu Erin Kronell
Design	2010 (CA)	38th - 97 Points Sanket Sirpotdar Andrew Vaitkevicius	15th - 90 Points Mahesh Umasankar Justin Bekker
Acceleration	2015	27th - 51.29 Points 4.614 seconds Justin Bekker	33rd - 33.69 Points 4.98 seconds Tirath Matharu
Skidpad	2015	26th - 22.68 Points 5.394 seconds Brandon Horsch	19th - 27.21 Points 5.29 seconds Brandon Horsch
Autocross	2015	31st - 87.52 Points 66.569 seconds Mohammed Kakli	21st - 108.78 Points 62.72 seconds Michael Warmbold
Endurance	2015	15th - 149.1 Points 1665.558 seconds Michael Warmbold Mohammed Kakli	11th - 179.3 Points 1624.25 Tirath Matharu Mohammed Kakli
Fuel Efficiency	2015	20th - 69.8 Points 0.998 gallons / 3.777 L	13th - 73.5 Points 0.898 gallons / 3.4L

New Season, New Goals

With the 2016 season in the books, Warrior Racing is looking forward to another year of continued success and improvement. We would like to thank all of those that supported Warrior Racing through another record breaking year, and hope to continue our great relationships with our supporters and sponsors. Stay tuned for more updates on the continued testing of RWX and RW9, and the exciting process of building the next road warrior, RW11!

Warrior Racing 2015-2016 Sponsors

Our team's success is made possible through the generous donations and support from the following companies. Without them our team would not have the resources needed to provide invaluable hands on experience and to manufacture our formula cars. From all members of our team, thank you Warrior Racing sponsors!

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