

Western Formula Racing 2014: A Season of Excellence

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Formula SAE - Executive Manager
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After a successful year in 2013, WFR thrust itself into the upper echelon of Formula SAE racing, earning some of its best results in the team's history, including **earning the title as the fastest car in Canada**. The 2014 year produced the first competitive aerodynamic package, an increased use in 3D printed technology, and an in-depth look into ergonomics and the powertrain systems. Western Formula Racing also placed a renewed importance on the non-technical side of racing; developing leadership skills with the Ivey School of Business, undertaking a large renovation, and putting stock in the team's long-term success.



Mike Hogg driving the 2014 Western Formula Racing car during the 2014 U of T Shootout at Mosport Raceway

Summer of 2013

The 2013 summer was largely dedicated to testing prototyped aluminum wings. This was the first time that a Western Formula Race car had ever gained aerodynamic appendages. Initial results were very promising. The vehicle became WFR's fastest car and it was decided to move forward with the design and development of a full aerodynamics package for the 2014 vehicle.



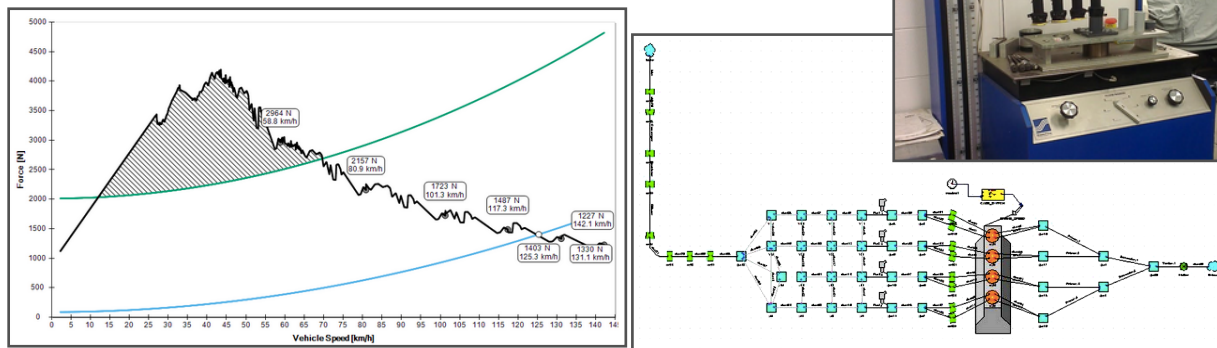
Ryan Alexander with prototyped aluminum wings on the 2013 car

Mass Reduction

To combat the extra weight of the wings, the new aerodynamic package utilized carbon fibre-foam composites. The team was able to achieve an aerodynamic package with twice the down-force, for near the same weight. Significant weight was also reduced out of the chassis and powertrain, as well as many other systems by paying attention to every detail. This resulted in a total weight reduction of 22 kg over the 2013 model!

Powertrain

The powertrain team, lead by Allison Waters, Nathan Leifer, and Patrick Mecan, produced one of the most powerful, yet fuel efficient, engine and drivetrain to date. An emphasis was placed on theoretical simulation, and validation.



Tractive Effort from Custom Acceleration Simulator

Flow Testing & 1D Engine Simulation

Ergonomics:

A long-term area of weakness on the team has been ergonomics. This year, the team invested in a more “driver-centric” design. We began by constructing a test rig to simulate the driver’s position with respect to the pedals, steering wheel and dashboard. Everything that the driver interacts with, was custom designed for maximum comfort and ease of use.



Carbon Fiber Bucket Seat



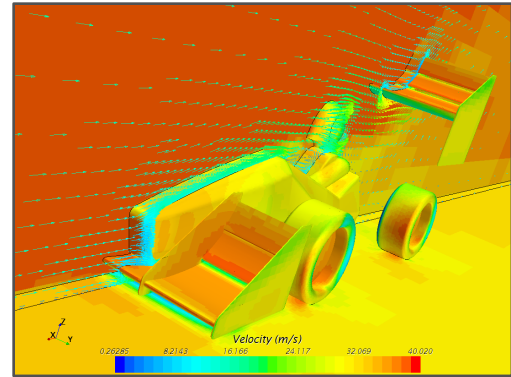
3D printed, custom molded Steering Wheel



Carbon Fiber Pedals

Aerodynamics

One of the main focuses for development on the 2014 vehicle was the Aerodynamic Package. The team, including Jeff Mock, Issi George, and Colton Harisson-Steel, utilized aerodynamic downforce to increase the grip in our tires, therefore allowing us to corner much faster. This package was instrumental in achieving a 9th place finish in the Skid-pad event (a figure 8) at Michigan and a 3rd place finish at Formula North.



Airflow simulation using CD Adapco's Star CCM+

Competition Season

There is a famous saying in motorsports: "A racecar is never finished; it just becomes time to race". This definitely held true for our team, as we only just finished installing our aerodynamic package in the wee hours of the morning before our first competition. We had just enough time to put in a few test laps before packing everything up and heading to our first competition, FSAE Michigan, against 119 other teams.

FSAE Michigan (16th)

The first day of competition, was spent setting up the pit, and making some final adjustments to the car, as we would not be able to make it through the tech inspection that day. The second day of competition brought on tech inspection along with all of the static events: Design, Cost, and Business. It was a scramble all day as we pushed our car from judge to judge while we split our static tech inspection up into two rounds. With only a few minutes left in the day, we pushed to go through the dynamic inspection, but were only able to pass the Tilt Table test (which determines whether or not our car is fit to handle intense cornering without rolling over). Our initial attempt to pass the sound test (car must be quieter than 110 dB) did not go perfectly, but we had the night to solve our problems.

We returned the next day and quickly passed both the sound and brake testing and made our way over to the first dynamic events: Skid-pad and Acceleration. The Skid-pad event challenges car's lateral acceleration capability by running on a tight figure-8 like track. The acceleration event challenges the car to accelerate for 75m in the least amount of time. With four attempts over two drivers, our times continued to drop as the events went on. By the end of the day, we were able to secure **a 9th place finish in the skid-pad event with a time of 5.08s, and a 4th place finish in the acceleration event with a time of 4.304s!** By the end of the day we also received our results for the static events: T38th in the Design Justification Event, 48th in The Business Presentation and a disappointing 103rd in the cost event, due to a large penalty.



The team celebrating after FSAE Michigan.

Left to Right (visible):

Brandon Tartaglia, Ryan Alexander, Steve Ochotta, Geoff Hockin, Miguel Achtymichuk, Mike Hogg, Conor Hunt, Pat Mecan, Issi George, Chris Kornas, Colton Harrison-Steel, Allison Watters, Jeff Mock, Bennet Heidenrich, Adam Wiggers, Nathan Leifer, Mike Adamovsky

In the next event, Autocross, the team was challenged to achieve the fastest lap around a short but very technically difficult circuit. We had four attempts from two drivers to try to set down a fast time. However, because of a few driver errors on a tricky track layout, we had to settle for **28th place in the Autocross Event**.

The final event of the competition is the Endurance event. This event requires teams to cover 22km of hard driving, with a driver change at the halfway point. For over 50% of the teams, just trying to complete the 22km was a challenge, as the vehicles are built for speed and agility, sacrificing some reliability. Having to race in reverse order of the Autocross event, our team was stuck behind slower teams for most of the event. Regardless, we managed to be among the 40% of the teams to finish the race, and even managed our best ever **10th place finish in the Endurance event!** This marked the 3rd successfully completed endurance event in 2 years. This 10th place finished helped our team to repeat our **overall 16th place** finish from 2013.

Formula North (5th)

After the Michigan event, we didn't have much time to recuperate and make the necessary repairs before our next competition. We invited the team from Montreal, École de Technologie Supérieure (ETS) to stay at our shop for the week. It was a great opportunity to get to know them and share different design and team management philosophies.

The Formula North competition follows the same outline as the Michigan Event. Having passed all of the tech inspections and events at Michigan, the team was feeling much more prepared for this event. During the static events our team was able to make adjustments to our presentations and reports and achieved a 17th place in cost, 7th place in Design, and a **3rd place finish in the Business Logic Case!**

On track, we were able to achieve similar improvements. We finished **3rd in both the Skid-pad event, and the Acceleration event.** Having learned from some of our mistakes, we were able to improve our ranking to a remarkable **5th place in the Autocross event!** We were able to hold on to that **5th place in the Endurance event as well!** These combined results allowed us to achieve a **5th place overall**, earning the most points and one of our best placements at Formula North to date!



In Car: Jeff Mock. **Left to Right:** Nathan Huffman, Mike Adamovsky, Allison Waters, Colton Harrison-Steele, Michele Lyle, Graham Griffin, Geoff Hockin, Issi George, Ryan Alexander, Devin Hulshof, Sebastian Vallejo, Matt Crossan, Nathan Leifer, Pat Mecan, Adam Wiggers.

Summer of 2014

The summer was a very busy time for the team. We used this time to improve the car, the team, and our involvement in the community.

Ivey Workshop

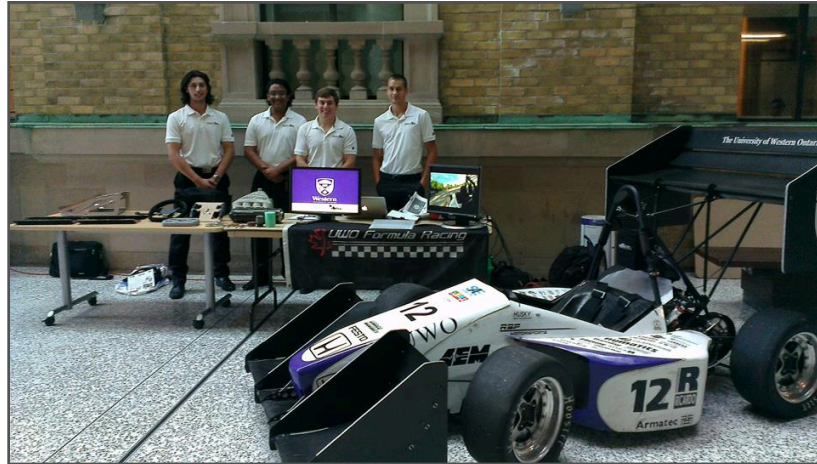
Our first event of the year was a **Workshop with the Ivey Business School.** The day was spent aligning the goals of every individual, with the goals of the 2015 team, and the long-term goals of the organization. We learned about the value of developing our character, competence and commitment; about leadership being a disposition, rather than a position; and worked on improving the relationship between the engineering and business aspect of the team.



The team at the Ivey Business School - Leadership and Organization Workshop. **Left to Right:** Geoff Hockin, Jordan Lloyd, Graham Griffin, Matt Crossan, Steve Ochotta, Adam Wiggers, Allison Waters, Devin Hulshof, Ana Ruiz, Prof. Mary Crossan, Chris Kornas, George Konstantinopoulos, Mike Adamovsky, Nathan Leifer

SAE Students Night

The next event of the summer was the **SAE Students Night**. The Society of Automotive Engineers invited the local SAE teams to give presentations about their team's design, as well as team management. Because of our these, our outstanding presentation, and competence answering the judges questions, our team was **awarded 1st place, and \$1,200** for our efforts; a repeat of last year's winning performance.



Left to Right: Matt Crossan, SamehKhan, Nathan Leifer, and Adam Wiggers at the SAE Students Night

ShOptimization:

Months of effort were also invested into renovating and organizing our shop space, or "**ShOptimization**" as we liked to call it. The goal was to transform our shop into a professional workspace. The team was lead by George Konstantinopoulos in this endeavour, with special contributions from Nathan Huffman and Doors Plus. The hope is that our members and future cars will reflect the professional quality of our shop.

Open House

To replace our usual "Unveiling" event, the team put on an **Open House** to showcase the 2014 car, and the newly renovated shop. The event was a great success, and the team thoroughly enjoyed getting to know the Faculty who have continued to support us throughout the years.



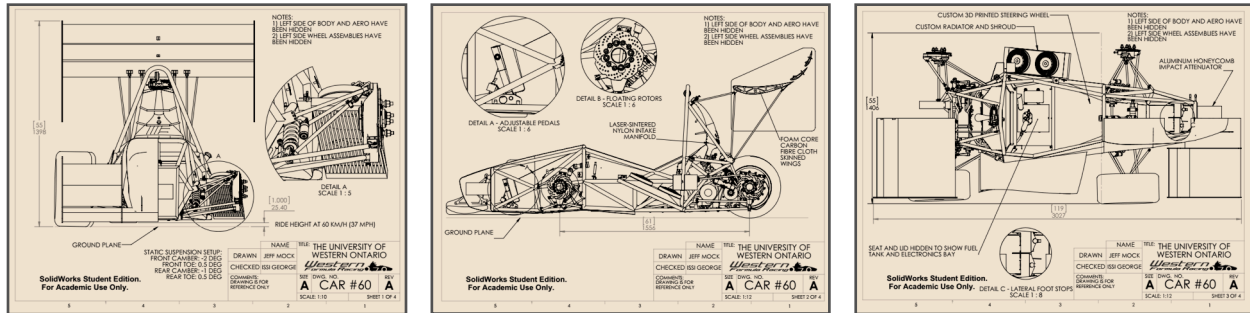
Showcasing the newly renovated shop at the team's Open House

Website Overhaul

Keeping in line with the idea of professionalism. The team spent the summer working on **developing a new website**. The task, headed by Sameh Khan, built on the existing website platform, to provide a better experience for its visitors, and an easier avenue for team members to contribute to.

Team Workshops:

In an attempt to improve our **transfer of knowledge** from the Alumni and upper year members, we also held **Team Workshops** on various topics such as Team History, Structures, and Vehicle Dynamics. These workshops will be continued throughout the year.



U of T Shootout (2nd)

The University of Toronto's FSAE team, hosted the last official event of the season at Mosport Raceway. The shootout is a pure performance based competition. Teams take turns throughout the day to try to set down the fastest lap. Each team is given two laps, and then must wait in line for another opportunity. Having had some recent issues with our shifting system, we began the day severely hindered, without the ability to shift reliably. The team worked hard all day to try to find a solution to the problem, and continuously tune the car to suit the track. Our times kept dropping throughout the day, and with only one lap to go, our team was sitting with the 3rd fastest time. On the last lap, our driver, Mike Hogg, managed to lay down our fastest time of the day, which was good enough for our best finish of the year: the **2nd Fastest Driver and 3rd Fastest Team!**



In Car: Matt Crossan **Left to Right:** Arun Ravishankar, Nathan Huffman, Conor Hunt, Jordan Lloyd, Bennet Heidenrich, Devin Hulshof, Steve Ochotta, Graham Griffin, Jesse Sandhu, Miguel Achtymichuk, Patrick Mecan, Kara Hendriks, Nathan Leifer, Jeff Bars, Ryan Alexander, Nick Kaketsis, Brendan Evans, Allison Waters, Mike Hogg, Geoff Hockin, Hallie Martin, Adam Wiggers, George Konstantinopoulos, Sebastian Vallejo

Looking Forward

The 2015 season is already shaping up to be a very successful year. The team will be saying goodbye to over 15 graduating team members at the end of the year. This prompted the team to initiate one of the largest and most successful recruiting campaigns to date. For the coming year, the team is looking forward to an increased use of composites to aid in our goal of improving the mass properties of the vehicle. Stay tuned to see what the Western Formula Racing team has in store for the coming year:

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