

FORMULA NORTH

BARRIE MOLSON CENTER MAY 23RD - 26TH 2013



EVENT PROGRAM

WELCOME

Dear Participants, Sponsors, Visitors and Volunteers,

It is my pleasure to welcome you to the Formula North 2013 competition at the Barrie Molson Centre in Barrie, Ontario. The second Canadian Formula Student event harbors many improvements that our team has worked hard over the past months to add value to your experience. During the course of the event, I hope that you will take the time to participate in our Career Fair showcase, Mini-Lecture series and Electric Avenue event.

The past year has definitely been an exciting one for me. In August 2012, I had the opportunity to volunteer at Formula Student Germany, one of the world's most prestigious Formula Student competitions. I met with the staff who showed me the ropes on how they manage their operations, was introduced as an FS organizer to other FS organizers from UK, Japan, China, Italy and Spain, and made around 200 new friends! It was an amazing experience to say the least. I also volunteered at the Formula Student Hungary event the same month. The venue of the three-year old competition is 1/3rds to that of Formula North's, yet the organizers still managed to host 41 combustion and electric teams in-style! I definitely valued this experience and I wanted to implement all I learned into Formula North 2013 - in small cost-effective steps of-course.

Just like any new startup, Formula North has been a roller-coaster ride. One day you are worried about where the funds are going to come from, and the next day you get sponsored. This year has been a stark difference from FN2012 - in a good way. The venue booked us 8 months in advance, the teams wanted to come back, our sponsors wanted to give more and our team saw increased potential in an innovative approach to FN2013. And we want this to happen every year. With your feedback, in the future, we hope that Formula North reaches the potential of becoming North America's go-to event for teams to showcase their innovation within a fair, competitive setting.

As you may already know this, Formula North 2013 and its improvements would have not been possible without the aid of our sponsors (Honda of Canada Mfg., Magna International, IMechE-CCB, IET, Advanced Test and Automation Inc., C&R Engineering Solutions Inc., Kenwood Electronic Canada Inc., CASC-OR, CTA, MMS, and Liberty Tires), our technical inspectors, our judges and our volunteer staff. A big thanks to them, and to all the participating teams that have considered competing at our event this year. We are glad to have you on-board.

If I may leave you with a saying, it would be that no matter what you choose to do in life, that you may live it to the fullest, contribute to society, travel to all the ends of the earth.... and definitely come back to volunteer at Formula North (We are always recruiting)!

Sincerely,

Cathy D'Souza

Event Chair - Formula North 2013

President - Formula North Inc.

CONCEPT OF COMPETITION



Formula North 2013 is Canada's Formula Student event. The purpose of the competition is to promote the awareness of practical engineering experience and student innovation through creating a competitive Canadian platform for Canadian and International teams alike.

Teams take on the assumption that they are a manufacturer developing a prototype to be evaluated for production and a group of developers are interested in investing in their project. The intended sales market is the non-professional weekend autocrosser. Therefore, the car must have very high performance in terms of its acceleration, braking and handling qualities. The car must be low in cost, easy to maintain and reliable. In addition, the car's marketability is enhanced by other factors such as aesthetics, comfort and use of common parts. In short, would you, the weekend autocrosser, be interested in purchasing one of these vehicles?

The challenge to the design team is to design and fabricate a prototype that best meets these goals and intents. Over the course of a four day competition, a jury of experts from the motorsport, automotive and supplier industries judge the design, cost and business planning of all the teams to determine the best team and vehicle; in addition the team's on-track performance scores will demonstrate how well they hold up under real life conditions.



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SCHEDULE

Schedule Subject to Change

Formula North 2013 - Day 1 Thursday, May 23, 2013

9:30 AM	Grounds open to Visitors Ticket Sales Pits Open to View	Tech Inspection Tilt Test Noise Test Brake Test	Career Fair	Mini-Lectureship	Test Area Open	9:30 AM
10:00 AM						10:00 AM
1:00 PM						1:00 PM
3:00 PM						3:00 PM
5:00 PM	Ticket Sales Closed		Teams' Welcome Ceremony			5:00 PM

- Career Fair Exhibitors: Honda of Canada Mfg., Inventure Engineering & Machinery, IMechE Central Canada Branch, SAE Central Ontario Section, Canadian Automobile Sports Club, Motorsports Marshalling Services
- Exclusive Event. Tickets must be purchased online before May 17th.
Mini-Lectureship Speakers:
10:30AM Laurence Polley, President of C&R Engineered Solutions Inc. - "The Roles, Obligations, And Liabilities Of Engineers Under OSHA"
12:15PM Tausif Agha, Franchisee - Northside Autosports - "The Business of Motorsport"
1:45PM Claude Rouelle, President of OptimumG - "How To Create An 'A' Team & Gain Success In Formula Student"

Formula North 2013 - Day 2 Friday, May 24, 2013

9:30 AM	Grounds open to Visitors Ticket Sales Pits Open to View	Tech Inspection Tilt Test Noise Test Brake Test	Design Event Cost Event	Business Plan Event	Test Track Open	9:30 AM
12:00 PM						12:00 PM
5:00 PM						5:00 PM
5:30 PM						5:30 PM
6:30 PM	Site Closed To Visitors				W&C: Keynote Speaker	6:30 PM
7:00 PM					Wine and Cheese Networking Event	7:00 PM

- Restricted access to only Sponsors, Judges and Participating Teams. Those interested in attending must inform Ticket Operator and Event Organizer's will schedule entries.
- Exclusive Event. Tickets must be purchased online before May 17th.
5:15 pm: Keynote speakers Todd Reichert and Cameron Robertson of AeroVelo Inc.- "Doing More with Less: Human Flight on the Power of a Cordless Drill"

SCHEDULE



Schedule Subject to Change

Formula North 2013 - Day 3 Saturday, May 25, 2013

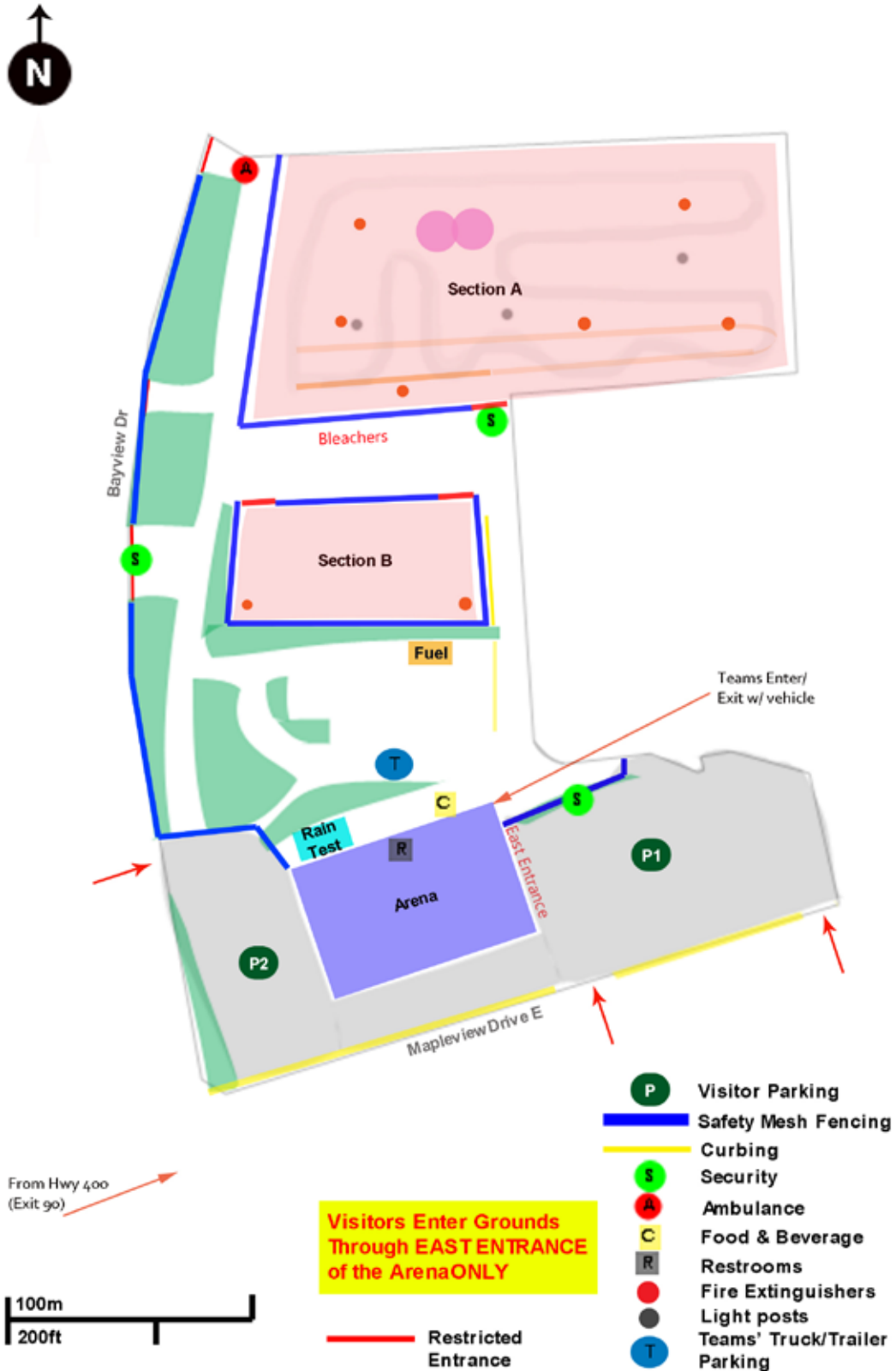
8:00 AM	Grounds open to Visitors Ticket Sales Pits Open to View	Paddocks Open Event Control Open Tech Inspections and Tests open by appointment only from 8am until 5pm	SkidPad Event Acceleration Event	Test Track Open	Cruiser Car Show	8:00 AM	
1:00 PM							1:00 PM
1:30 PM							1:30 PM
2:00 PM			Coursewalk				2:00 PM
2:30 PM			Autocross Event				2:30 PM
4:30 PM						4:30 PM	
5:30 PM	Site Closed To Visitors					5:30 PM	

Formula North 2013 - Day 4 Sunday, May 26, 2013

8:00 AM	Grounds open to Visitors Ticket Sales Pits Open to View	Paddocks Open Event Control Open	Coursewalk	Electric Avenue Event	8:00 AM
11:30 AM			Endurance Morning Session		11:30 AM
12:00 PM					12:00 PM
3:00 PM			Endurance Afternoon Session		
4:00 PM			Design Review		
5:30 PM	Site Closed To Visitors				5:30 PM

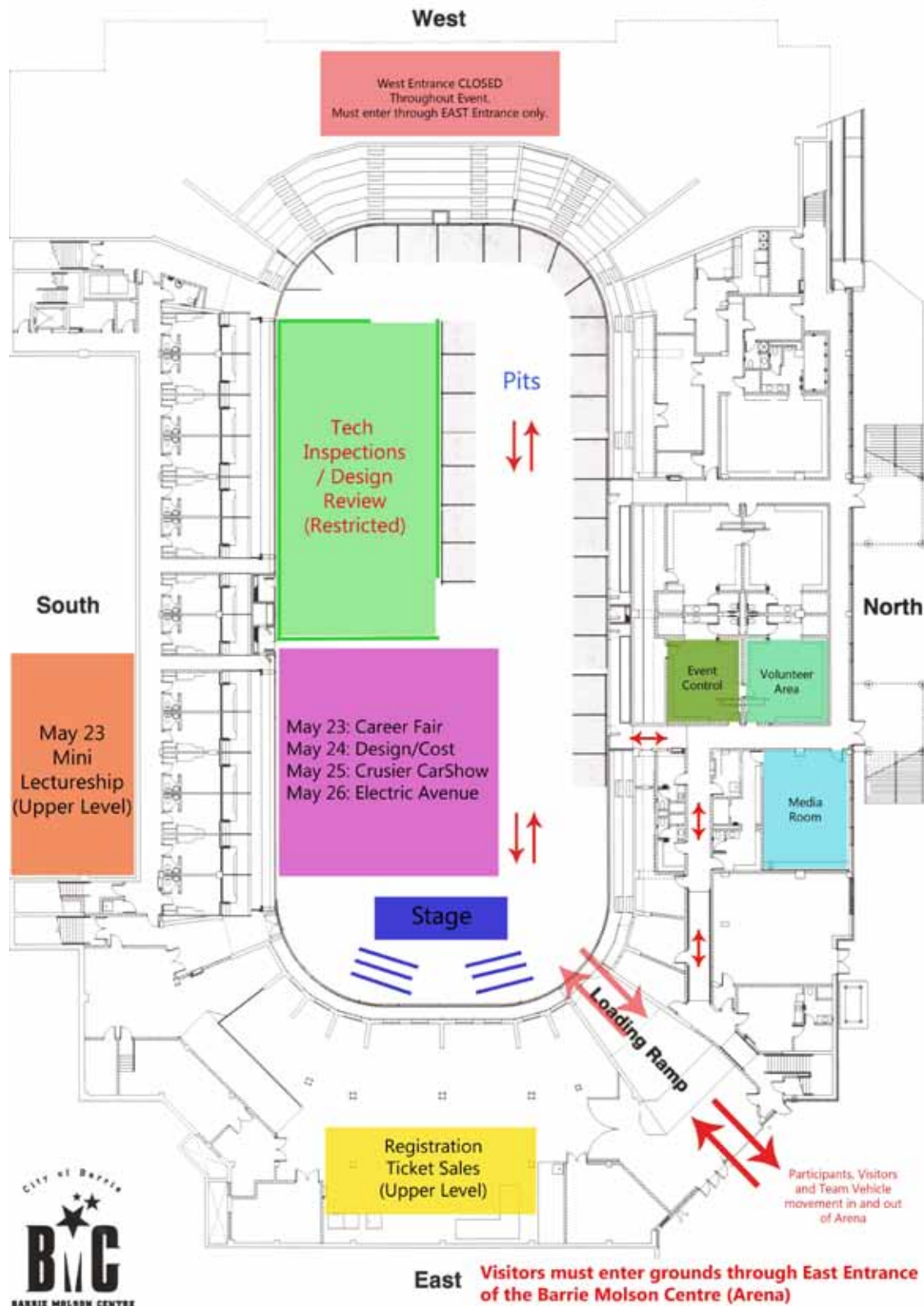
MAP OF EVENT GROUNDS

BARRIE MOLSON CENTER - OUTDOOR EVENT GROUNDS



MAP OF EVENT GROUNDS

BARRIE MOLSON CENTER - INDOOR ARENA MAP



FORMULA NORTH TEAM

EVENT MANAGEMENT

Cathy D'Souza, Event Manager, Marketing Event Lead
Nicholas Burgwin, Track Operations, Electrical Lead
Michael Bakaic, Technical Operations, Design & Cost Event Lead
Simren Gill, Technical Inspections Lead
Patrick McKenna, Cost Documentation Lead
Finola D'Souza, Registration Director
Lauren Patrick, Logistics Director
Trevor Nathaniel, Scales Lead, Hybrid Sustainability Event Lead
Diana Mollicone, Hospitality Director
Chriselle D'Souza, Media Director

DESIGN JUDGES

Claude Rouelle *Chief Design Judge*

Optimum G (Race car engineering consulting) '97-current - Founder

Andrew Wong

Meritor Inc. - Design Engineer, Mechatronics Systems

Chris Stavropoulos

Self-Employed - Engine Design Engineer

Bogdan Oprea

Honda of Canada Manufacturing - Engineering Analyst, Quality Engineering Dept.

John Dillon

Sunnybrook Health Sciences Center - Imaging Researcher

Genevieve Vallieres

Royal Military College - Captain & Lecturer

Sasha Anis

OnPoint Dyno - Owner

Ryan Clark

Bruce Power - Senior Technical Engineer

Arian Khorshid

Mechanical EIT

Akos Toth

Self-Employed

Aakash Barooa

Chrysler Group LLC - Powertain & Electrical Quality Engineer

Neal Persaud

FEV Inc. - Project Engineer

Maciej Hryniewicki

UTIAS - Post-Doctorate - Aerospace Science and Engineering

TECHNICAL INSPECTORS

Ross Eddie *Mechanical Lead*

C.R. Eddie Engineering Inc. - Forensics Engineer, President

Hugues Marceau *Electrical Lead*

Poly eRacing, Polytechnique Montréal - Grad Student, Founder

Laurent Dagenais *Electrical Lead*

Poly eRacing, Polytechnique Montréal - Team Captain

Mickey Brydges

Gryphon Racing, University of Guelph - Team Captain

Niral Fernando

Nanotechnology, University of Waterloo - Student

Nathan Lobo, Noise & Brakes Lead, Scoring Lead, Sponsorship Director
Yashashree Chaugule, Sponsorship Director
Leon Lobo, Sponsorship Director
Ranjani Chari, Technical Volunteers Lead
Tanya Paes, Career Fair Director
Avalon D'Souza, Volunteer's Accomodations Lead
Robert Weekley, Electric Avenue Manager
Amanda Santos, Graphic Material Lead, Event Booklet Designer
Stacey Chan, Associate
Roger Lobo, Associate

Chris Storoschuk

Energy Savers - Energy Conservation Contracting and Research

Peter Dennis

Self-Employed - Engineering Systems Consultant

Victor Vasco

ABC Group - Project Engineer

Vincenzo Libertucci

Multimatic Inc. - Project Engineer

Glen Clarke

Open Road Motorsports - Owner

Gene Lukianov

VRAD Engineering LLC - Principal Partner

Tony Cutner

AECOM - Electrical Engineering Manager

Phil Apperly

IMechE Central Canada Branch - Honorary Secretary

Trevor Vaughan

Morgan Solar Inc. - Mechanical Engineer

Antonio Gomes

Self-Employed

Huang lu

Hydrogenics - Systems Engineering and Development Test Specialist

Jerry Zielinski

Chrysler Group LLC - Powertrain Manufacturing & Quality Engineer





COST AND MARKETING EVENT

Jonathan Weir

Honda Canada Inc. - Process Improvement Consultant

Phil Nelles

Team Canada Motorsport - Founder

Anthony Khoraych

Advanced Test and Automation Inc. - President

Tony Hamilton

Kinectrics Inc. - Program Director, Nuclear Maintenance Services

Beth Ryerse

RDHU - Educational Director

Merv D'Souza

Linearis (RedIron Technologies) - Business Development Director

Harish Iyer

Vale Inco - Process Engineer

Kris Lelliott

Honda of Canada Manufacturing - Electrical Equipment Staff

John Flanagan

International Network Professionals - President

Jenny Yu

The Institution of Engineering & Technology - Webmaster

Andrea Kiel

Morneau Shepell - Senior Marketing Analyst, Client Strategy

Lesley McLelland

Mercedes-Benz Canada - Marketing Coordinator

David Green

Stratmarc Associates - Managing Partner

Tausif Agha

Northside Autosports - Franchisee

SPECIAL THANKS

Jason Gubbels

Madan Mohan Chawla

Vinoj Suthakaran

Richard Fleming

Keene Mendes

Cynthia Vaillant

Katzel Mackenzie

Slawomir Basiukiewicz

Erik

Mark Prelich

Suraiq Sadi

Paige Koenigs

Patrick Dooc

Haseef Agha

Dwayne Fundano

Saloni Sabharwal

Stu Galloway

Imran Salam

Darwin D'Souza

Mike Canner

Doug Hart

Wayne Symington

BEGINNING OF ELECTRIC AVENUE 2013

EV Fest Electric Vehicle Show, which began its history as EV Show & Shine, and grew to become EV Fest, Toronto's Premier Electric Vehicle Fall Festival, is an evolving event and activity, fixed in its goal to show the public - past, present, and future choices in transportation that can reduce their expenses, improve their efficiency, and reduce their waste, both in terms of pollution of the air we breath, and the money we spend to get around!


The culmination of the show on October 17, 2010, was the First of hopefully many 'EV Fests' delivered excellent results. With guests enjoying the selection, choices, and variations on display of this very new, yet well enjoyed Event. Some 500 People attended the Event.

We were encouraged to locate the show at neutral ground and one of our Exhibitors from EV Fest 2010 lead us to the Evergreen Brick Works Facility where we held EV Fest 2011 in the Holcim Gallery and EV Fest 2012 in the Pavilions.

Going forward, we were introduced to the organizer of Formula North as one of EV Fest's 2012 Volunteers, and that lead to us being invited to bring some Electric Vehicles to the coming Formula North 2013 Competition and Event. This ensued into the formation of Electric Avenue 2013 – a new and separate Event, organized by EV Fest, in collaboration with Formula North.

Starting with just an event ticketing page on Eventbrite.ca – it has evolved to create a sub-brand space at <http://electricavenue.evfest.ca/> which will focus on the Electric Avenue Event – under the EV Fest Domain. Our First Show anticipates covering both Production Electric vehicles and Electric Vehicle Conversions with Examples from Tesla Motors, Mitsubishi, Honda and even Jaguar represented. Electric Vehicle Conversion Components and Energy Efficient Lighting will also be seen.

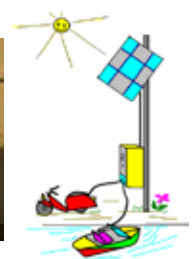
Robert Weekley, EV Fest Organizer

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Manufacturing**

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**SAE Central Ontario
Section**

Organizes events and provides information about SAE for members in the Central Ontario region.



**IMechE Central
Canada Branch**

The IMechE CCB provides a local forum for members to get news and information about the Branch and their activities.



**Canadian
Automobile Sports
Club - Ontario
Region**

CASC - OR is Ontario's governing body of automobile sport.



**Motorsports
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MMS has been training and organizing marshalling services for CASC events since 1978.





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THE COMPETITION

Formula North is divided into 2 disciplines: Static and Dynamic. The Static disciplines challenge students on the overall design of the car, cost and marketability. The Dynamic disciplines challenge the car's performance on track. A total of 1000 points are available at both events. Formula North 2013 will be hosting Combustion and Hybrid vehicles.

STATIC EVENTS



1. ENGINEERING DESIGN EVENT 150

Teams must submit an 8-page design report to convince judges of the construction and performance of their vehicle. At the event, judges examine the car and question teams on their engineering design goals, program simulations and vehicle testing results. Hybrid teams are also judged on how sustainability was incorporated into the design of their vehicle

2. COST EVENT 100

As costs play an important factor in building a race car, teams must put together a 'Cost Report' that contains a list of all components - from wheels to manufacturing processes to labor costs and special tools. Judges then evaluate the clarity and accuracy of the report by comparing the document with the life-size construction.

3. MARKETING EVENT 75

Teams must present a business plan for the built prototype to a group of industry professionals. Teams must try to convince their audience that their car meets the demands of an amateur weekend autocross racer and that it can be produced and marketed profitably. Judges score teams on content, structure, organization and delivery of the presentation.

DYNAMIC EVENTS



1. SKID-PAD 50

The self-built cars drive on a track in the shape of an 8. There are two consecutive laps on each circle, with the second laps being timed. The cars demonstrate with a fast lap time how much lateral acceleration they can generate (up to 1.4g).

2. ACCELERATION 75

The race cars prove their accelerating abilities over a distance of 75 meters. The fastest need less than 4 seconds.

3. AUTOCROSS 150

A course of perhaps one kilometer through straights and curves. The lap time serves as indicator for driving dynamics and handling qualities. The results of the Autocross discipline determine the starting order of the Endurance.




























4. ENDURANCE 300

Providing the highest number of points, the Endurance is the main discipline. Over a distance of 22 kms the cars have to prove their durability under long-term conditions and the drivers' handling skills are put to the test. A driver change takes place after 11 kms.






5. FUEL ECONOMY 100

Fuel consumption is a considerable factor in the development of future cars. Teams that successfully complete the Endurance event are weighed. Their final weight is compared to their original weight when filled up and teams are awarded points based on the amount of fuel used.




FORMULA COMBUSTION

CAR	COUNTRY	TEAM NAME	PAGE
22		Carleton University	15
21		Clarkson University	-
20		Concordia University	15
15		Conestoga College	-
14		École de Technologie Supérieure	15
16		Iowa State University	-
19		Kettering University	-
9		McGill University	15
1		Michigan State University	16
10		Michigan Technological University	16
5		Missouri University of Science and Technology	16
29		Northwestern University	16
3		Oakland University	17
24		Ohio State University	17
31		Polytechnique Montréal	-
13		Queen's University	17
11		Ryerson University	17
23		Sheridan Institute of Technology	-
12		Tallinn University of Applied Sciences	18
32		Temple University	18
7		Université Laval	-
17		Université Du Quebec à Trois-Rivières	18
28		University of Cincinnati	18
26		University of Connecticut	19
6		University of Illinois at Urbana-Champaign	19
30		University of Pittsburgh	19
4		University of South Florida	19

PARTICIPATING TEAMS

CAR	COUNTRY	TEAM NAME	PAGE
22		University of Toledo	20
8		University of Toronto	20
25		University of Waterloo	20
18		University of Western Ontario	20
27		University of Windsor	21

FORMULA HYBRID

CAR	COUNTRY	TEAM NAME	PAGE
33		McMaster University	21
34		Georgia Institute of Technology	21
35		Carleton University	21

AWARDS

Overall Awards	
Overall Champion	Combustion
Overall Second Place	Combustion
Overall Third Place	Combustion
Hybrid Champion	Hybrid

Static Events	
Overall Design - 1st Place	Combustion & Hybrid
Overall Design - 2nd Place	Combustion & Hybrid
Overall Design - 3rd Place	Combustion & Hybrid
Cost Winner	Combustion

Dynamic Events	
SkidPad Winner	Combustion
Acceleration Winner	Combustion
Autocross Winner	Combustion
Endurance Winner	Combustion
Fuel Efficiency Winner	Combustion
Overall Dynamics Winner	Combustion
Hybrid Acceleration Winner	Hybrid
Hybrid Autocross Winner	Hybrid
Hybrid Endurance Winner	Hybrid

OTTAWA
CARLETON UNIVERSITY

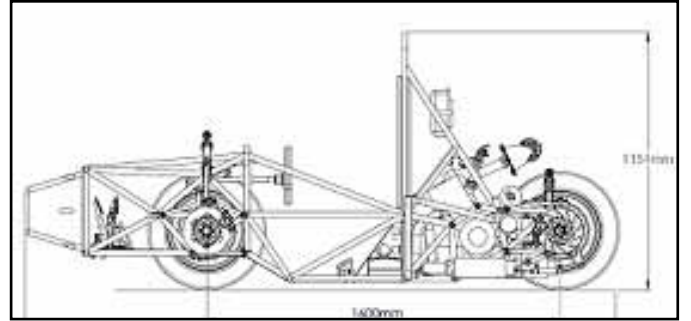


Carleton University Ravens Racing has designed and produced a high-performance race car making it an ideal weekend race vehicle targeting the amateur autocross enthusiast. Design highlights for the 2012 vehicle include: Single-cylinder EFI engine for performance and reliability. Customizable Fuel and Ignition system. Space frame chassis with a high rigidity-to-weight ratio Carbon fibre frontal impact attenuator. In-house manufactured custom aluminum wheel centers. Flexture on A-arms to reduce sticktion. Carleton's design goals emphasize a balance between performance and cost-effective manufacturing. To achieve the design goals, a closed loop design process is used to create an environment of continuous improvement. Design criteria are based on the lessons learned in testing and past competitions. A wheels-in design approach is supported by Pro/Engineer solid modeling, Pro/Mechanica FEA, and Pro/Mechanism dynamic simulation. CFD simulations have also been conducted to improve internal aerodynamics. Vehicle testing is used to verify criteria compliance and provide feedback for future design work, thus completing the design cycle.



CAR 22

MONTREAL
CONCORDIA UNIVERSITY



Because Race Car.



CAR 20

MONTREAL
ÉCOLE DE TECHNOLOGIE SUPÉRIEURE



The AXF13 design is based on ambitious competition objectives. The result is a compact, lightweight, efficient, fast race car. Using a numerical approach, backed by extensive experimental validation the team is able to always push the limits further and further. The AXF2013 marks a new era in the ETS history, being the first car with aerodynamics devices. Using extensive Computational fluid dynamics (CFD) the team managed to design a well balanced and lightweight package.



CAR 14

MONTREAL
MCGILL UNIVERSITY



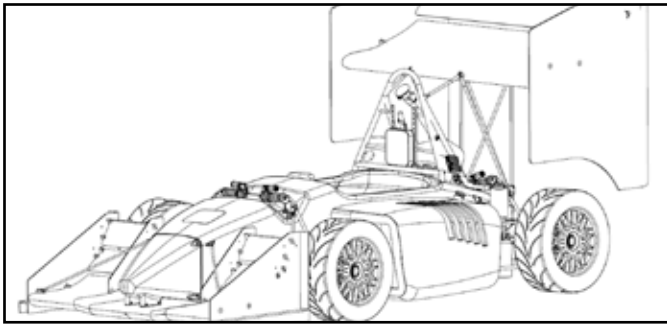
The MRT15 combustion prototype will mark the McGill Racing Team's 15th entry into the FSAE series. For the first time, MRT and the former McGill Hybrid Racing Team have joined forces to design and build both an electric and a combustion vehicle from the ground up. MRT15 is powered by the Rotax DS450 single-cylinder engine and features a full aerodynamics package. Focus has been set on developing a reliable yet competitive package backed by simulation and physical validation.



CAR 9

EAST LANSING

MICHIGAN STATE UNIVERSITY



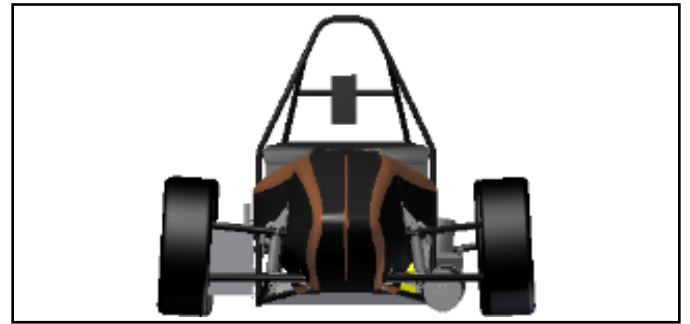
Michigan State University's 2013 Formula SAE entry, the SR-13, is an iteration on the team's previous carbon fiber monocoque chassis. The SR-13 is designed to provide a reliable and tunable race car with a simple human machine interface that inspires driver confidence, and promises to be an exceptional challenger in this year's competition. The SR-13's well-developed powertrain, built around the Honda F4i, provides more power than ever over a broad torque curve. The electrical system features over 90 sensors to monitor car and driver performance and a dash display to relay the information while driving. The SR-13 also features an electro-pneumatic paddle shifting system, traction and launch control, and MSU's first-ever aerodynamics package. We would like to thank Michigan State University and all of our sponsors, friends, and family for their kind contributions and support!



CAR 1

HOUGHTON

MICHIGAN TECHNOLOGICAL UNIVERSITY



The F-151 provides an intermediate level of performance and cost for the weekend racing enthusiast. The three main criteria for the car are (1) performance, (2) drivability and (3) serviceability / maintainability. The performance goal of the F-151 is to create a vehicle that operates at peak acceleration in all directions. The F-151 drivability goals involve designing for driver comfort, vehicle interfacing and simple operating system. The service and maintainability goal for the F-151 were to increase part commonality for ease of vehicle upkeep and repair.



CAR 10

ROLLA

MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY



S&T Racing's 2013 car, "Lily" is a high horsepower and high downforce platform that delivers exceptional lateral and longitudinal performance. A low drag aerodynamic package produces 510lbs of downforce, elevating Lily's lateral acceleration to 2.8g. Lily sits on four 20.5x7x13 Hoosier R25B tires, mounted on 3 piece wheels to lightweight, three lug, steel welded uprights. Loads are transferred to the chassis through double A-arms with a pull rod front and push rod rear suspension. She is powered by a Yamaha R6 that delivers 96Hp and 42ft-lbs to the wheels through a limited slip, salisbury style differential. We would like to extend our sincere gratitude to our loyal and generous sponsors and alumni that helped make this build and test season a success. We would not be able to produce such a formidable vehicle without your continued support.



CAR 5

EVANSTON

NORTHWESTERN UNIVERSITY

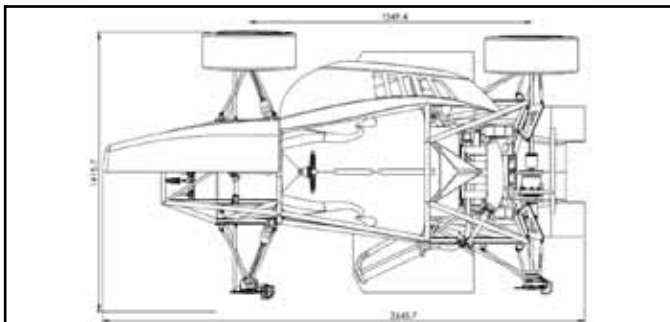


Northwestern Formula Racing (NFR) is competing at Formula SAE Michigan with NFR13, the team's fourth vehicle. The car was guided by simplicity in design, manufacturing, and assembly. As a relatively young team, NFR has been focusing on increasing the reliability of their vehicle and the knowledge of their team. This year's car was made possible by the motivation and passion of all 40 team members.



CAR 29

ROCHESTER OAKLAND UNIVERSITY

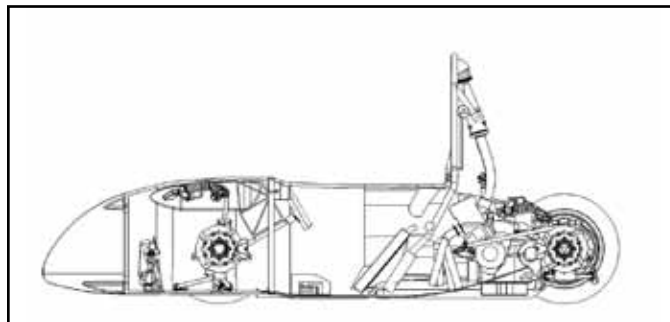


Oakland University has had a long history with SAE collegiate competition. We began competing in the Super Mileage competition where we had much success; 1st -1978, 2nd and 3rd -1994. In the mid 90s our chapter made the switch to the Formula SAE competition. After a few attempts at the competition, 2003 became a breakthrough year as Oakland University placed 13th of 130 teams and set the record for best improvement year to year of any team after placing 123rd in 2002 for a jump of 110 positions! 2012 was another record breaking year for Oakland University. we took 21st place overall in the Michigan competition, 13th in the FSAE West competition and took 3rd place in the new Formula North competition in Canada.



CAR 3

COLUMBUS OHIO STATE UNIVERSITY



The Formula Buckeyes have been hard at work preparing for 2013 competition. Car number 24 is a two-part carbon fiber monocoque that has a passionate emphasis on serviceability. Not out of mind are the aspects of performance and driver comfort. Major contributors to car 24's performance are full-floating MMC brakes, light-weight billet aluminum uprights with center-lock hubs and launch control. Driver comfort on car 24 includes a carbon fiber steering wheel with full color LCD for data feedback, electro-pneumatic shifting system with steering wheel mounted paddles and a programmable CAN-based shift light. The Formula Buckeyes are excited for competition and wish all other teams good luck!



CAR 27

KINGSTON QUEEN'S UNIVERSITY

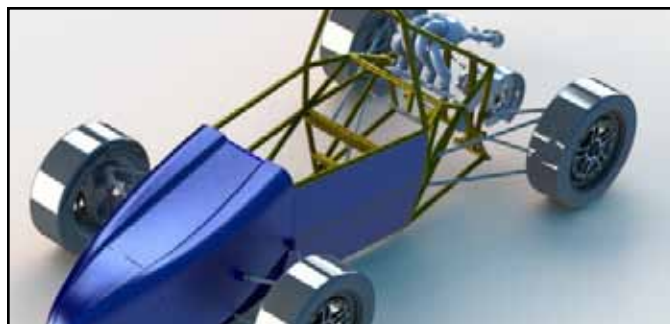


Building on two decades of experience, Queen's Formula celebrates its 20th anniversary with the Q13. The 2013 entry is an evolution on the successful platform created in 2012. Combining the simplicity of the steel spaceframe, the power of the 4 cylinder Honda CBR-600 powerplant, and the superb handling of a push and pull rod actuated suspension system, all of which are complimented by the addition of front and rear wings, the Q13 aims to be the fastest and most reliable Queen's car to date. New systems to this year are AP Racing rear calipers, a PE3 ECU, an onboard Race Technology dash, and a host of new sensors. For the first time in recent years, the car will incorporate adjustable front and rear anti-roll bars, improving both handling and trackside tuning capabilities. The combination of these elements will allow the drivers and the development team to maximize the vehicle's performance during testing and competition.



CAR 13

TORONTO RYERSON UNIVERSITY



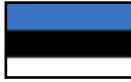
The 2013 car has been redesigned from the ground up to find the optimal balance between performance, reliability and cost effectiveness. Weighing heavily throughout the design process were aspects of maximizing fuel economy while preserving power and enhancing driver ergonomics and safety. Several main design concepts were kept in the forefront to advance the performance of the 2013 car such as reducing the mass and bulk of the chassis by designing an effective suspension system and increasing the specific power output of the engine while reducing fuel consumption and improving drivability. In addition, a reduction of rotating mass within the driveline has allowed for variations in final drive ratios, depending on performance preferences.



CAR 11

TALLIN

TALLIN UNIVERSITY OF APPLIED SCIENCES



FEST12 or Formula ESTonia 12 is a race car that combines light weight and performance, achieved by innovative thinking and learning from experience. FEST12 is powered by a 600cc Yamaha YZF-R6 engine that has proven to be worthy over the past five competition seasons. The performance of FEST12 is enhanced by developing and fitting complete aerodynamics package – a diffuser, front and rear wings. Mentioned elements create extra dynamic downforce to increase the cornering speeds. FEST12 is a performance car meant to dominate the race-track. All components are developed and fine-tuned to achieve the best results and to excel. The refinement of the details is no less important than the function. FEST12 is meant to please the eye as well as be fast on track. The manufacturing was kept in-house to guarantee quality and maximum student involvement in the process.



CAR 12

PHILADELPHIA

TEMPLE UNIVERSITY



Temple Formula Racing has been working hard to develop the shortest, lowest and lightest car the team has ever had. This years car features a chassis, suspension and intake manifold redesign, while utilizing an identical motor and engine control computer as our 2012 car. We are excited and anxious to see how our hard work pays off.



CAR 32

TROIS-RIVIÈRES

UNIVERSITÉ DU QUEBEC À TROIS-RIVIÈRES



The 2012 uqtr racing car is based off it's 2011 predecessor. Our approach is still based on reliability and simplicity, but it now packs more efficient technologies. One major goal of this year design was to reduce weighth. Almost every section of the car have been redesigned with this in mind. The result is a car 40 pounds lighter than last year. Power comes from a honda cbr600rr. Camshafts, intake and exhaust have been optimized to deliver a flatter torque curve in order to increase drivability. Our electronics team have developed an electro-pneumatic shifter system in order to make the car faster and easier to drive. The UQTR racing is well prepared and look forward to good results at the Formula North event.



CAR 17

CINCINNATI

UNIVERSITY OF CINCINNATI



The 2013 car from the University of Cincinnati is a cornerstone. Bearcat Motorsports has a history of several successful years followed by lean years of the recent past. The 2012 team set a new design direction by changing car concept from the 600cc engine, 13" wheel packaging to a 450cc, 10" wheel package. After a summer of testing and revisions, the 2013 design takes the lessons learned and lays the foundation for a winning car concept the team will refine year after year. The car is a reliable test bed for instrumented testing and driver training capable of directing a team with high yearly turnover into the future. To build a car to compete and continue developing of the program, our design goals are: Safety: Exceed minimum safety required per FSAE rules. Reliability: Finish all events of competition, accumulate 2000 miles of track testing. Ease of Manufacture/ Maintenance: tuning parameters easily adjusted and repeatable Efficiency of fuel, tires, and part count: approximately 0.5 gallon fuel use in endurance. High acceleration capability: Expand driver's friction circle to its limits



CAR 28

STORRS

UNIVERSITY OF CONNECTICUT



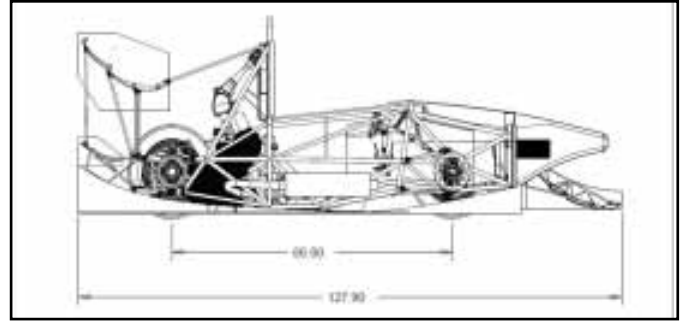
This year's car marks the fifth car produced by UConn Formula SAE since reforming the team in 2007. The frame is a tubular steel space frame made from 4130 chromoly with vacuum infused carbon fiber stress panels and body for increased torsional rigidity and weight reduction, respectively. A 2003 Suzuki GSX-R600 underwent a complete rebuild accompanied by a modified 13.3:1 compression ratio, slipper clutch, and the removal of first, fifth and sixth gear. A load cell in-line with the shifter allows for clutchless downshifts. The intake and throttle body were SLS printed from glass-filled nylon with a flapper valve added to relieve pressure in the event of a back fire. The exhaust is constructed of mild steel in a 4-2-1 configuration with ceramic coating both inside and out. A Salisbury differential enclosed in a cast magnesium housing with chromoly stub axles provides added drivability and reliability, while cast magnesium uprights provide additional weight savings. A steering rack manufactured in-house utilizes custom rack and pinion gearing enclosed in an aluminum housing with welded support tubes to reduce mounting compliance.



CAR 26

ILLINOIS

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN



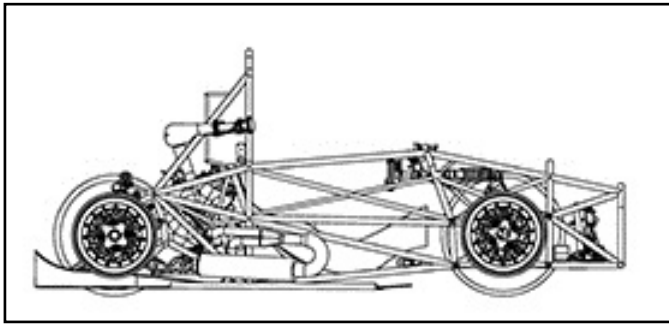
Illini Motorsports 2013 competition entry has been designed using points analysis coupled lap simulation and a renewed focus on reliability. We would like to give a special thanks to our friends, families, and sponsors for their continued support.



CAR 6

PITTSBURGH

UNIVERSITY OF PITTSBURGH



Panther Racing's 2013 entry is a steel tube space frame chassis with a 4-cylinder engine. This combination was selected due to the low cost and ease of manufacture of the chassis as well as the high power output of the 4-cylinder powertrain. The suspension was designed from the ground up starting with a switch to Hoosier tires. A host of electronics upgrades along with an improvement in engine performance will ensure the PR-002 remains competitive. New to the team is aerodynamics development in the form of an undertray aimed at reducing lift and drag.



CAR 30

TAMPA

UNIVERSITY OF SOUTH FLORIDA



USF Racing is a team of seventeen mechanical engineering students that includes graduate students through freshmen. F2013 represents the eighth Formula SAE vehicle produced by USF Racing since 2005 and the third iteration of our current design concept.



CAR 4

TOLEDO

UNIVERSITY OF TOLEDO



This year's car, UTR-19, was built around simplicity and reliability while also taking on some new design features. Utilizing tyre consortium data as a starting point, UTR-19 features a rigid tubular chassis, CBR600 F4i, and Penske shocks backed up with extensive durability testing. Serviceability and weight reduction were also considered with every component designed. With a large amount of time dedicated to testing and refining we hope to have an all around reliable and fine tuned car for competition.



CAR 2

TORONTO

UNIVERSITY OF TORONTO



The University of Toronto presents UT13 for the 2013 Formula North competition. The past 16 years of experience have come together to bring UT13 – a vehicle defined by design for manufacture methods. This mentality provided distinctly new design features for the 2013 vehicle. Features such as a single rear brake and pocketed a-arms have served to drastically decrease our manufacturing time without sacrifice for reliable high performance. This is our second installment of the 10" wheel vehicle powered by the Honda TRX450 single cylinder engine. The chassis has been lengthened by 2 inches and the driver has been angled back to increase driver comfort. The efficient packaging of all components over a 23kg chassis allows us to achieve Toronto's highest stiffness to weight ratio. The result is a lightweight, drivable and simple vehicle.



CAR 8

WATERLOO

UNIVERSITY OF WATERLOO



Continuing from previous cars, University of Waterloo Formula Motorsports has built a four cylinder engine, steel tube frame, 13 [in] wheel car for 2013. This year's design was driven by the results of a lap-time simulation; an aerodynamics package was added to the car as the lap-time simulation indicated a significant benefit from downforce. In addition to developing the aero package, ergonomics were a major focus with significant research and testing invested in determining a good driver position, adjustment and control strategy, as well as developing a car with predictable handling and engine behavior. The importance of vehicle testing on performance and reliability was paramount so projects and timelines were scoped to ensure that adequate testing time would be allowed. The end result is a vehicle that satisfies the goals of driver-centricity, reliability and performance.



CAR 25

LONDON

UNIVERSITY OF WESTERN ONTARIO



This year, the Western Formula Racing Team is celebrating their 25th anniversary since first attending the FSAE-Michigan event in 1988. The team has been pushing hard to make this year the best yet. The 2013 team started vehicle design in May of 2012 with emphasis on the teams' goals Excellence, Endurance, and Enthusiasm. Over the summer, the 2012 car was heavily tested giving the team a good foundation for the 2013 car. Utilizing the data gathered from a summer of testing, this year's design is an evolution of past vehicles. Careful evaluation of data and past designs allowed the team to focus their attention on certain areas of the car. Some of the main design focuses include ergonomics, wheel assemblies, body and aero, and engine systems. The 2013 team has been focusing on improving the team as a whole, and on small design changes that will result in large gains. Look for us at the finish line of endurance!



CAR 18

WINDSOR

UNIVERSITY OF WINDSOR



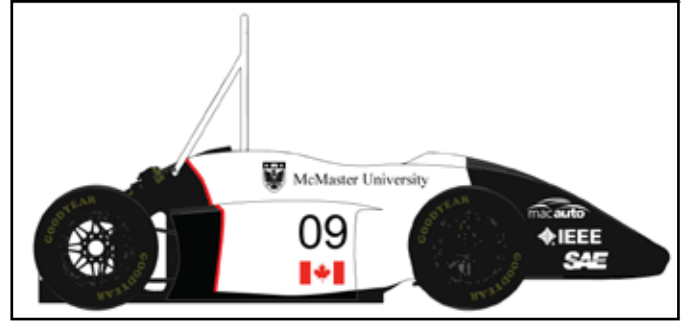
In 2013 Lancer Motorsports focused on optimizing and simplifying many key features of the car. The main goals during the design and build were to reduce component weights, enhance driver support systems, improve system integration and allow for quicker and easier adjustments. With the addition of square tubes into the tubular chassis and custom tabs, suspension components can be easily adjusted for variations in both camber and caster. The improved power of the DTA S80 ECU allows for development of a 4 wheel traction control system as well as launch control. The power developed from our Honda CBR600RR engine, custom intake and custom exhaust has been tuned for a flatter torque curve and improved throttle response. With adjustable head rest, brake pedal and innovative 4 bar link throttle pedal, the car can fit a wide variety of driver sizes. A reduced size impact attenuator allows for greater body design freedom while maintaining energy absorption characteristics. Sectioned body panels allow for quick and easy access to various areas of the vehicle and reduce body manufacturing complexity. The 2013 team is expecting another great season in our quest of continuous improvement.



CAR 27

HAMILTON

MCMASTER UNIVERSITY



As a second year competitor in Formula Hybrid, our team focused on building a car that accomplished a proper design iteration of our previous years race vehicle. In order to be competitive, our team has set our primary goal to achieve an overall weight that is less than our previous car (465lbs). This constraint forced both mechanical and electrical divisions to be mindful of the end goal of building a high performance hybrid autocross racecar that would rival its gas-guzzling counterparts.



CAR 33

ATLANTA

GEORGIA INSTITUTE OF TECHNOLOGY



HyTech Racing formed in the fall of 2011 with the intent of producing open-wheel plug-in hybrid-electric race cars for international competition. Our project is highly interdisciplinary and allows all of our team members to cross engineering boundaries and seek creative solutions to challenging problems. We work in a shop with four other racing teams with whom we collaborate on everything from manufacturing processes to competition strategies. Car 34 is our first competition-ready vehicle. It is a series hybrid which operates as an extended-range electric vehicle with electric-only traction and an on-board gasoline generator.



CAR 34

OTTAWA

CARLETON UNIVERSITY



With 14 years of experience in vehicle engineering, Carleton University's Ravens Racing Team has recently expanded its program by introducing the Formula Hybrid fourth year project. In the past, the Formula SAE team has been successful, placing as high as 25th out of 120 competitors all racing, designing, and manufacturing gas powered cars. Carleton's relatively new Formula Hybrid initiative allows fourth year undergraduate engineers to explore alternative forms of energy to be used in transportation; a trending theme worldwide. During the 2012-2013 academic year, the F-Hybrid Team will continue to optimize Carleton's hybrid automotive technology with use of electric motors as a front drive system. The current hybrid prototype is the RR13 which is an all-wheel drive formula hybrid style race car.



CAR 35

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A SPECIAL THANKS TO OUR VOLUNTEERS WHO CONTRIBUTED SIGNIFICANTLY TO THE REALIZATION OF THE 2013 FORMULA NORTH COMPETITION