

THE QFSAE REPORT



CONCEPT MODEL OF THE 2011 CAR

MID SEASON REVIEW

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QUEEN'S FORMULA SAE

FORMULA SAE

For those of you who need a refresher, Formula SAE (FSAE) is a competition organized and sponsored by the Society of Automotive Engineers. The competition is open to engineering faculties worldwide and consists of the design, construction, and testing of an open-wheel race car. The cars are constructed according to engine and frame limitations that promote engineering creativity. All cars must pass through a 100 point technical inspection before being allowed to compete. The cars are built over a time period of one school year which consists of 8 months. There are currently 500 teams and 7 different competitions worldwide which makes Formula SAE the biggest and most prestigious engineering student design competition in the world. The Queen's team of 12 puts in over 10000 hours to get the car rolling each season.



The 2010 Car in action in Michigan



The 2010 Endurance course at Michigan International Speedway

RECENT HISTORY

2010 was the best year ever for Queen's FSAE. We finished 16th at Michigan International Speedway, and for the first time ever competed at England's famous Silverstone Circuit! At Silverstone we were just two laps away from a record top 10 finish when a critical sensor failed, stalling the engine and ending our day. We finished in the top 8 in design in both events, including tied for 4th in Michigan and finished the season as the most successful team in Canada!

Turn the page to find out more about our new 2011 car!

QUEEN'S FORMULA SAE

2011 GOALS

While 2010 was a breakthrough year for the Queen's Formula SAE team, 2011 represents a challenging year with a much younger team, overcoming inexperience with hard work and dedication. We are placing a heavy emphasis on project management to ensure that we have a reliable, well built car finished as early as possible to maximize testing and driver training time. To achieve this, we fully scheduled our year during the summer, to ensure that all systems remain on schedule and all members are accountable for their work.

CURRENT STATUS

The design of the 2011 car is now complete with the team fully into the fabrication stage. Our frame was completed earlier than ever before and machining of suspension components is nearing completion. Our new aerodynamics package is taking shape along with our electrical system. Data acquisition and testing will help validate our designs and tune the car. We are excited to build off of last year's successes by once again attending two international competitions: FSAE Michigan & and for the first time, FSAE California.

2011 TECHNOLOGY

ENGINE

The 2011 engine package features an innovative carbon fibre intake system to deliver maximum air to the CBR600 F4i engine. Engine management will be taken care of by the Electromotive TEC GT and tuned on the Queen's dynamometer. A 4→2→1 exhaust manifold design will help us achieve a flat torque curve, increasing drivability and a two stage dry sump system will provide lubrication. A custom radiator and fan setup will be implemented with a duct to increase cooling efficiency.

AERODYNAMICS

One of our biggest changes for 2011 is the introduction of a new aerodynamics system including front and rear wings and a ground effect undertray. With these new additions providing over 35% of the car's mass as down force at 60km/h, we hope to achieve significantly increased cornering and braking power. The wings are constructed from lightweight carbon fibre and you can see a preview on the next page.

CHASSIS

The chassis for the 2011 car is a Chromoly space frame designed to be as light and stiff as possible within the competition rules. The chassis tightly packages all components of the car, features pullrod/pushrod front/rear suspension and a new engine mounting strategy which vastly reduces engine removal time. The chassis is once again taking advantage of CNC cut chassis tubes provided by VR3 engineering.

SUSPENSION

The 2011 suspension kinematics has been analyzed in Optimum K to produce the best conditions possible for our Goodyear Eagle D2696 tires. Competition minimum 60" wheelbase was selected for increased agility and reduced moment of inertia. Innovative carbon fiber A-Arms reduce mass, and a driver adjustable antiroll bar allows car balance to be quickly adjusted for different drivers. Changes in suspension geometry have been designed to reduce steering effort and increase camber gain for increased grip.

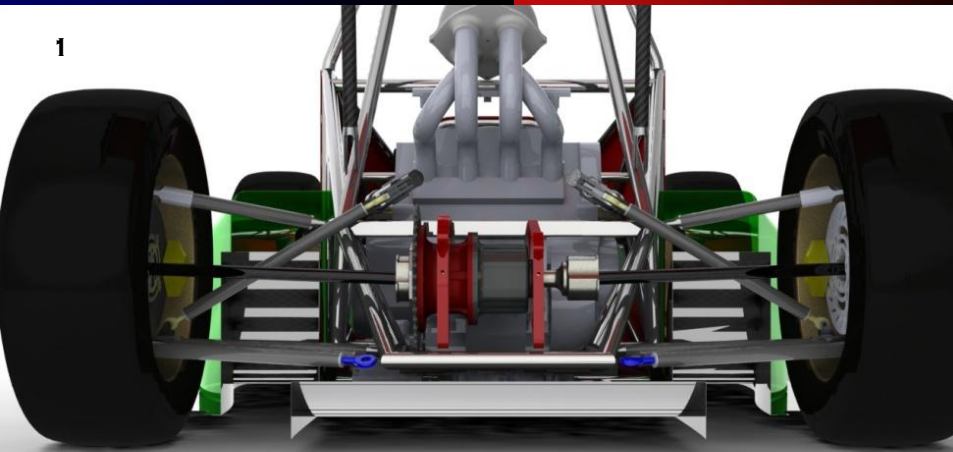
DRIVETRAIN

The 2011 drivetrain features a Salisbury style limited slip differential with a custom aluminum housing. All Equal length, single piece driveshafts are utilized to transmit the torque to the wheels and all drivetrain components were machined in house by the students. This year also features a new chain tensioning system to save weight and improve reliability.

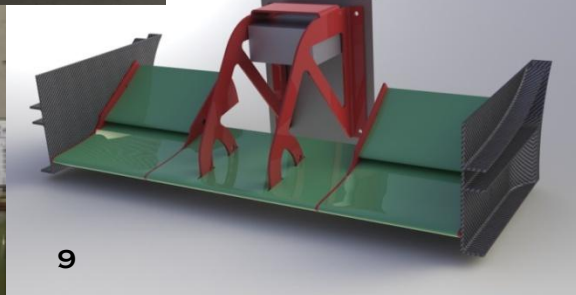
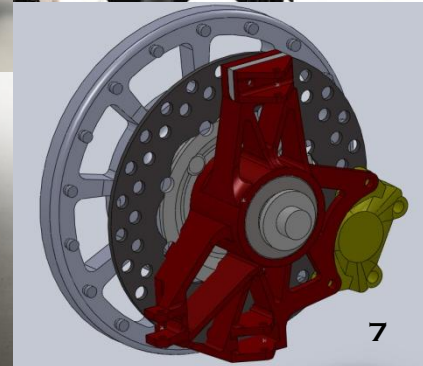
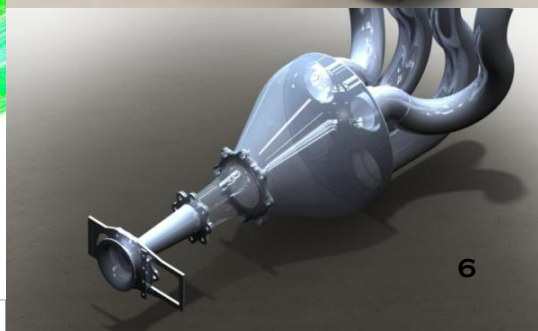
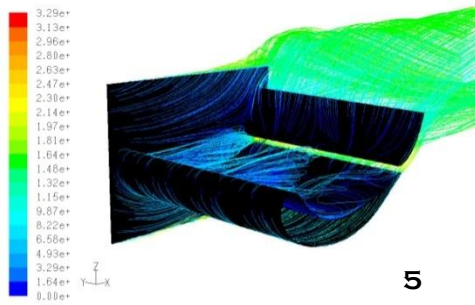
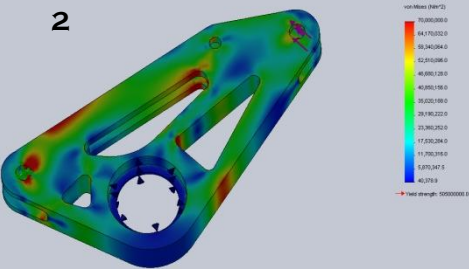
Turn the page for some design highlights!



QUEEN'S FORMULA SAE



- 1: Rear assembly
- 2: Rear Rocker Finite Element Analysis (FEA)
- 3: Car overview
- 4: Driver interface
- 5: 3D-Computational Fluid Dynamics (CFD) analysis of Rear wing assembly
- 6: Intake manifold and throttle assembly
- 7: Front wheel package assembly
- 8: Dynamometer setup in McLaughlin Hall
- 9: Front Wing Assembly



QUEEN'S FORMULA SAE

FUNDING

On an administrative level, the Queen's team has worked hard to raise necessary funds, reaching out to over 100 companies for support. Although it has been difficult to find new support, this season we have brought in over \$11000 in new funding including:

- \$2000 in Carbon Fibre donated by Toho Tenax
- \$4000 increase in faculty funding
- \$2000 in tooling donated by ISCAR
- \$2500 in truck rentals by Penske
- \$500 in high performance oil donated by Universal Contract Logistics of Belleville

The Queen's team is still aggressively recruiting new partners for the 2011 racing season. As can be seen in the budget outline to the right, the team has not met their fundraising goals for the year. We need your help to raise the remaining funds that will allow us to travel to competition in California. In light of this, we are reaching out to any Alumni, private, or corporate potential partners. If you are interested, please contact us and review the sponsorship package at www.qfsae.com/partners.html. You can also make a donation directly to the team through the University, and you will automatically receive a tax refund. Just visit www.givetoqueens.ca/formulasae

BUDGET OUTLINE

Monetary Funding:

Dean's Donation	\$15000
Opt Out Fees	\$4500
Honda Canada	\$4000
Department of MME	\$4000
Student Initiative Fund	\$500
Alumni Donations	\$1000
Ontario Center of Excellence	\$2000
Team Member fees	\$1800
Total:	\$32800

Expense Summary:

Engine	\$2534
Suspension	\$5261
Chassis	\$2211
Brakes	\$505
Electronics/Sensors	\$1500
Shop Supplies	\$2780
Bodywork & Aero	\$2255
Travel	\$13991
Total (inc. 15% contingency)	\$36826
Year End Balance:	(\$4072)

IN CLOSING...

Please do not hesitate to contact us with any questions you may have. We would love to provide more details about the car, year plan, or budget to anyone interested. We also need fans at our competitions in the spring! Let us know if you are in the area and we will give you more details, or visit www.sae.org. Look for more details on our website in the coming months about our spring reunion information session and driving demo. Thanks for reading!