The team was excited for our first full year in the new shop down at 271 India Street. The focus for 2013 was to design a more reliable and drivable vehicle while adding additional data logging and processing capabilities, to improve our tuning ability and allow our vehicle to serve as a test-bed for future years. The team additionally continued to work towards its goal of enabling amateur drivers to take full advantage of the car’s potential.

The team was happy to welcome back Therice Morris (’13), who studied abroad at Cambridge and returned as the 2013 Chassis/Suspension Lead. Therice redesigned the bellcranks to provide an approximate constant motion ratio between the wheels and the dampers, which results in an overall linear rising rate. This enabled us to match the overall goals of improving drivability by reducing understeer while braking and oversteer during acceleration.

Stephen Weinreich (’14) and Sam Friedman (’15) redesigned the team’s custom electronics board for shifting to have greater tolerance to noise and to introduce a Controller Area Network (CAN) node at the board. This provides the microprocessor access to all data from the Engine Control Unit (ECU). In addition to improving data accuracy, having CAN also provides the team with a test-bed for future advances in shifting algorithms and other vehicle electronics.

Evan Lester (’13) and Beverly Xu (’14) developed a superior all-aluminum gas tank design which improved fuel availability in high-acceleration scenarios. Rather than using anti-slosh foam as in previous years, Evan and Bev opted to design a surge tank. They were able to keep the weight of the system approximately constant by developing ultra-lightweight custom one-way check valves based on those used in NASCAR vehicles.

Finally, Steven Klurfeld (’13), designed a two-piece, aluminum enclosure and acrylic housing sleeve for the Torsen T1 Universality Special differential gearset to dramatically reduce weight over the stock cast iron housing and to facilitate attachment to the chain and chassis. This design eases assembly while reducing overall mass by 7.5 percent and rotational moment of inertia by 25 percent compared to our previous year’s design.

### ‘13 Vehicle Statistics

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-60</td>
<td>~3.2 sec</td>
</tr>
<tr>
<td>Overall weight</td>
<td>442 lbs.</td>
</tr>
<tr>
<td>Weight distribution</td>
<td>49.0F / 50.3L</td>
</tr>
<tr>
<td>Wheelbase</td>
<td>62 in</td>
</tr>
<tr>
<td>Front Track</td>
<td>40 in</td>
</tr>
<tr>
<td>Rear Track</td>
<td>39 in</td>
</tr>
</tbody>
</table>
THE COMPETITION

The competition held at the Michigan International Speedway in May never fails to provide grounds for an eventful and exciting competition! The team is thankful for the continued support of our dedicated faculty advisor, Chris Bull ('79), who ensured that the car made it safely to Detroit in one piece. Having packed the entire shop into the truck, the rest of the team followed in three rental cars, excited and ready to go for the next day.

The static events went well, and the design judges were particularly impressed with the shifting system that Jeanette Miranda ('14) performed admirably to make the necessary changes under the time constraints. These last-minute fixes put the team behind schedule, but late on Friday afternoon, Max passed brakes to a round of cheers from the team. Thanks to the time saved by passing the noise test on the first attempt, there was just enough time for Stephen to get in an autocross run.

The car completed the autocross event successfully. Unfortunately, during Enduro, the car was pulled because of a broken brake light. The wire from the brake pressure sensor to the light fatigued, and eventually broke in the middle of the race. This happened to two other teams at competition this year as well. While the team was frustrated and disappointed at not performing nearly as well as competition as would have been possible given proper testing time, the takeaway is overwhelmingly positive. The team is excited to push forward towards this year's competition and develop quite simply the best car in Brown FSAE's history!

The dynamic events were more of a learning experience. The six drivers for the dynamic events were Thibere Morris, Max Gottesman ('13), Morgan Walti ('13), Golden Eldridge, Jeanette Miranda, and Stephen Weinreich, all of whom had experience. There were some hold-ups at technical inspection, but the team performed admirably to make the necessary changes under the time constraints. These last-minute fixes put the team behind schedule, but late on Friday afternoon, Max passed brakes to a round of cheers from the team.

The car completed the autocross event successfully. Unfortunately, during Enduro, the car was pulled because of a broken brake light. The wire from the brake pressure sensor to the light fatigued, and eventually broke in the middle of the race. This happened to two other teams at competition this year as well. While the team was frustrated and disappointed at not performing nearly as well as competition as would have been possible given proper testing time, the takeaway is overwhelmingly positive. The team is excited to push forward towards this year's competition and develop quite simply the best car in Brown FSAE's history!

THE FUTURE

This year brings many new and exciting opportunities for the team. The team jumped straight into teaching new members to weld and machine back in September and has continued passing knowledge on through competition and into the summer. With Brown’s Formula SAE Team, the learning never stops.

This year, the team is continuing to follow the spring-design and fall-build process, initiated by Max in 2012. This year's car is being designed by both new and returning members who worked tirelessly to ensure that manufacturing began by the beginning of the school year.

One of the major goals for 2013-2014 involves increasing the allotted time to tune the car. Tuning is a significant factor in operating the car to its full potential, and in the past, has been cut short in the face of the fast-approaching competition. With the new schedule, the team will have more of the spring semester to bring the car to its peak performance. To this end, the team is performing a cost-benefit analysis on time-intensive areas such as composite mold-making to determine whether it is worth having these done out of house to free up additional time for tuning.

In other exciting news, the team has used donations received this past year to fund the purchase of a CNC milling machine for our Tockwotton shop, which was quickly put to use. The new CNC has a very easy-to-use interface, and we are very excited to take full advantage of it while machining many of the complex parts of our car.

THANK YOU!

The team would like to extend their most heartfelt appreciation to all of the sponsors who made this year possible. The diversity of Brown’s team adds a wonderful dynamic to the manufacture and design of the car each year. The valuable skills gained from being on the car team are not merely confined to engineering, but also extend to industrial design, collaboration, software applications, budgeting, and time management. The team is grateful to all of the sponsors for their resources, knowledge, and perpetual support.

One very special acknowledgment goes to Chris Bull, the team’s amazing faculty advisor, who has time and again proved an invaluable resource. Chris, for putting up with us through the best and the worst, thank you!