The University of Texas at Austin
Society of Automotive Engineers

2006-2007
Corporate Sponsor Information
Mission Statement

The University of Texas at Austin ChallengeX Team mission is to promote and achieve advancements in alternative and green automotive technology while providing our student members with hands-on engineering experience and industrial interaction.
2006-2007 Team Leaders

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munguian@mail.utexas.edu  
956-645-9409

2006-2007 UT Austin ChallengeX Team: Starting from left to right: Tom Ryan, Sean Steuck, Mario Pulido, Dino Sasaridis, Ted Kane, Chris Heustis, Ben Parker, James Sung, John Maringuran
Background Information

A Competition like No Other

*Challenge X: Crossover to Sustainable Mobility* is a new four-year engineering competition that challenges 17 universities across North America to explore vehicle solutions that will minimize energy consumption and reduce emissions. Students will follow General Motor’s (GM) real-world Global Vehicle Development Process and integrate their advanced technology solutions into a Chevrolet Equinox, a GM crossover vehicle that combines elements of both a sport utility vehicle and a passenger car.

The Challenges

The freedom that personal mobility provides is a building block of North America's culture and strength. Over the last decade, the United States (U.S.) automotive market has trended toward purchasing larger vehicles. At the same time, there has been an increased emphasis on reduced vehicle emissions and a growing concern over petroleum consumption. The issues of energy efficiency, global climate change and cleaner air pose challenges not only in the U.S. but across the globe. To address these challenges, government, industry and academia have sponsored several student engineering competitions to demonstrate and extend the progress toward a common goal: sustainable mobility.

Introducing Challenge X

Since 1987, the United States Department of Energy (DOE), Natural Resources Canada and various academic and industry partners have sponsored more than two dozen engineering competitions. Building on the success of these programs, GM and DOE, joined by other government and industry sponsors, have developed a new competition series, Challenge X: Crossover to Sustainable Mobility. Seventeen North American universities were selected through a competitive process in 2003 to participate in Challenge X. Each university team will have an opportunity to participate in hands-on research and development with leading-edge automotive propulsion, fuels, materials and emissions control technologies.

One Competition - Four Distinct Phases of Vehicle Development

Each of the four years of the Challenge X competition will emphasize four distinct phases of the GM Global Vehicle Development Process.

**Year One**

In the automotive industry today, a large amount of design work is performed in a virtual or math-based computing environment before any work on hardware is initiated. Mimicking this real-world development process, year one of Challenge X will focus on the use of math-based modeling tools for vehicle design and vehicle and subsystem control. In addition, teams will spend much of the first year researching, comparing and selecting advanced technologies that meet the Challenge X goals. Students will use computer-based math modeling tools to objectively compare and select the advanced technologies that will be used in the overall design of their Challenge X vehicles. One of the objective comparisons considered in this process is the "well-to-wheel" analysis used to select the fuel.
This analysis includes upstream energy use and emissions produced from refining, as well as regulated vehicle emissions. Teams will also develop and use rapid prototyping and hardware in the loop (HIL) tools to validate their models and control systems. With the help of Challenge X industry sponsors, many different products and solutions will be made available to support the students' efforts in developing their own rapid prototyping and HIL tools. After the selection and approval of their Challenge X vehicle design, each team will procure hardware, develop software, perform subsystem testing and design a plan to integrate their selected strategy in a vehicle. With continued use of math tools, correlation with the acquired subsystems and development of control strategies, the teams will have the chance to showcase their mastery of their chosen propulsion and supporting subsystems. Teams that complete this first year of Challenge X will earn their keys to a new Chevrolet Equinox and a place in the second phase of the competition.

**Years Two and Three**

The focus to year two and three is to build upon the modeling and testing results from year one. Each university team will integrate and refine their advanced power-train and other vehicle subsystems into their Equinox. Year two will focus on power-train development and demonstration of the energy use and emissions goals of the competition. Year three will require further refinement of the vehicle with the goal of delivering a "showroom" vehicle that addresses the requirements of consumers. At the conclusion of each competition year, teams will be judged on their execution, progress toward meeting the Challenge X goals, and ability to predict their performance using math-based tools.

**Year Four**

The culmination of the teams first three years of hard work will be showcased in year four during a continental road rally. A journey from Ottawa to Washington D.C. is in the works to highlight the various technologies in use and allow local communities to experience the teams’ technical know-how first hand. A series of events will be held along the way to promote awareness of North American mobility issues and demonstrate the various solutions developed by the teams.

**Unique Approach to Engineering Education**

Challenge X is a unique student engineering competition with a groundbreaking approach to engineering education. Teams will follow a real-world approach modeled after GM's Global Vehicle Development Process. This process gives students valuable experience in real-world engineering practices, resource allocation and meeting deliverables. And, while previous student engineering competitions focused primarily on hardware modifications, Challenge X includes a unique focus on modeling and simulation, as well as subsystem development and testing. By broadening the technical focus of the competition to include more aspects of the entire vehicle development process, the university teams will have a greater opportunity to expand their learning and refine their vehicle solutions.
Unparalleled Resources

Participating teams will be provided with a variety of resources to help achieve their objectives, including substantial technical support and mentoring from GM and other sponsors. Each team will also receive a 2005 Chevrolet Equinox, $10,000 in seed money, additional production parts from GM and considerable software and hardware donations from other sponsors. Teams will foster their business development and fundraising skills as they are tasked to solicit additional support to finance their projects.

Government and Industry Sponsors

GM and DOE are the headline sponsors of Challenge X, providing major funding, mentoring and product donations. The MathWorks will provide the latest computer modeling simulation tools and training and National Instruments will provide the instrumentation and control tools for subsystem development and testing. Other major support will be provided by the Canadian federal government through Natural Resources Canada. Argonne National Laboratory, a DOE Research and Development facility, will provide competition management, team evaluation and technical and logistical support. Other government agencies, such as the U.S. Environmental Protection Agency and the U.S. Department of Transportation will provide expertise in emissions measurement, corporate average fuel economy (CAFÉ) standards and safety. Finally, other co-sponsors will contribute such key elements as fuel cells, propulsion systems, fuels, emissions technology and raw materials.

Sponsor and Student Benefits

Sponsors have the opportunity to meet and work with hundreds of the nation’s most motivated and talented students. They provide donations, training, and support to the teams so students can gain real-world experience prior to venturing out into the workplace. Unlike traditional textbook learning, Challenge X gives students hands-on experience in a realistic vehicle development process that will better prepare them for careers in industry. As students struggle to overcome significant program obstacles and technical challenges, they also build leadership and teamwork skills, not only in engineering but also in business development, fundraising, and public relations.
The goals for the UT Austin Challenge X modified vehicle are as follows:

- Significantly reduce well-to-wheels energy consumption
- Incorporate technologies that increase energy efficiency and reduce fossil energy consumption and emissions on the basis of on a total fuel cycle (well-to-wheels analysis)
- Significantly reduce criteria tailpipe emissions and greenhouse gases
- Increase pump-to-wheels fuel economy
- Maintain or exceed consumer acceptability in the areas of performance, utility, and safety.

In order to achieve these goals, the team is developing a High Efficiency Dilute Gasoline Engine (HEDGE) system that runs off a mixture of bio-diesel and reformulated gasoline. In addition to design and developing a more efficient engine we have incorporated a state of the art Alternator/Starter system. The 42 volt Belt-Driven Alternator/Starter (BAS) is estimated to increase combined fuel economy by 9%, based on our computer models. The BAS system allows for burning of fuel only when it moves the vehicle. This technology is now being incorporated into the next generation hybrid power-train system by General Motors.
Community Outreach

Community outreach is an effective way of teaching the public about the importance of improved fuel economy and the impact of vehicle emissions and fuel infrastructures. The ChallengeX project also serves as an interesting tool in which to motivate young students to pursue a degree in engineering. Our outreach plan is broken up into two main categories: Youth and Community/Sponsorship. Projected outreach events include an open exhibit of the vehicle, and an exhibit board that explains the technology behind the product. Figure 1 is an exhibit board created for the 2005-2006 ChallengeX Winter Workshop and serves as an example of what the UT Challenge X exhibit boards will look like. The projected outreach events are listed as Table 1 for Youth Outreach and Table 2 for Community/Sponsorship Outreach.

Figure 1. National ChallengeX exhibit board seen at the 2005-2006 ChallengeX Winter Workshop.
### Youth Outreach

Table 1. Projected UT Austin ChallengeX youth outreach events.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Tentative Date</th>
<th>Overview of Event</th>
<th>Audience</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edison Lecture Series</td>
<td>Jan 10-12, 2007</td>
<td>This is a renewable energy themed lecture series held on campus and is sponsored by the Electrical Engineering and Computer Engineering Department.</td>
<td>The Public, Students, Researchers, Professors</td>
<td>Sean Steuck, Ted Kane and others TBD</td>
</tr>
<tr>
<td>Explore UT</td>
<td>March 3, 2007</td>
<td>This is an open house event open to the public and held at the University of Texas. This is an opportunity for Texans to get acquainted with the various university projects.</td>
<td>Kids, Parents, Students, Professors</td>
<td>Nicole Munguia, Sean Steuck, Ted Kane and others TBD</td>
</tr>
<tr>
<td>40 Acres Fest</td>
<td>April 1, 2007</td>
<td>Forty Acres Fest (FAF) has grown to become one of the largest student-run events held on campus. From famous headliners to the fun and games, there have been some great moments in the FAF's history.</td>
<td>The Public, Students, Kids, Parents</td>
<td>Nicole Munguia, Sean Steuck, Ted Kane and others TBD</td>
</tr>
</tbody>
</table>

### Community/Sponsorship Outreach

Table 2. UT Austin ChallengeX community/sponsorship outreach events.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Tentative Date</th>
<th>Overview of Event</th>
<th>Audience</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewable Energy Round-up and Green Living Fair</td>
<td>Sept. 22-24, 2006</td>
<td>This is a fair held close to Austin, in Fredericksburg, Texas. This event is open to the public. Keynote speakers in the various areas of renewables gave lectures and held workshops.</td>
<td>Public, Experts in the various areas of renewables, Kids, Students</td>
<td>Ted Kane, Tom Ryan, Sean Steuck</td>
</tr>
<tr>
<td>National Bio-Diesel Convention and Exhibition</td>
<td>Feb. 4-7, 2007</td>
<td>This is a rich educational program that includes General Sessions featuring some of the best-known experts in the field.</td>
<td>National Bio-Diesel Board Members, Special Guests (i.e. Merle Haggard), Experts in the field of Bio-Diesel</td>
<td>Nicole Munguia, Ted Kane, Sean Steuck and Tom Ryan</td>
</tr>
</tbody>
</table>
Publicity

In February 2007, the annual ChallengeX Winter Workshop will be held in Austin, Texas. The Winter Workshop is primarily geared towards bringing all of the teams together mid-year to discuss progress on the projects and provide support as needed. It is also a time to recognize sponsors and the help they have provided. The main goal of this year’s workshop is to offer teams that are in good running condition an opportunity to obtain on-road emissions testing data for their vehicle using the same instruments that will be used at the 2007 competition. Events will be held at the University of Texas at Austin J.J. Pickle Research Center from Thursday, Feb. 1 - Monday, Feb. 5, 2007. The workshop will consist of technical sessions, a ride and drive media event, and a series of evening activities hosted by the two Austin overall Competition Sponsors Freescale Semiconductor and National Instruments.

2005 Winter Workshop panel discussion with Texas Governor Rick Perry on right, President of Freescale Semiconductor Scott Anderson and Austin Mayor Will Wynn. (Source: www.challengex.org)

President of Freescale Semiconductors visiting with ChallengeX team members from various competing universities. (Source: www.challengex.org)

ChallengeX team members visiting corporate sponsor booths displaying latest technology in the automotive-hybrid systems industry. (Source: www.challengex.org)
Finances

The 2006-2007 projected finances are as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate Research Salary</td>
<td>$80,000.00</td>
</tr>
<tr>
<td>1 - PhD Student Salary</td>
<td>$40,000.00</td>
</tr>
<tr>
<td>1 - Masters Student Salary</td>
<td>$40,000.00</td>
</tr>
<tr>
<td>Travel Expenses for 07 Competition</td>
<td>$4,500.00</td>
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<tr>
<td>Rental Cars</td>
<td>$1,000.00</td>
</tr>
<tr>
<td>Food</td>
<td>$1,500.00</td>
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<tr>
<td>Lodging</td>
<td>$2,000.00</td>
</tr>
<tr>
<td>Media Supplies</td>
<td>$1,000.00</td>
</tr>
<tr>
<td>Vehicle Artwork</td>
<td>$500.00</td>
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<tr>
<td>Presentation Boards</td>
<td>$250.00</td>
</tr>
<tr>
<td>Shirts and Misc.</td>
<td>$250.00</td>
</tr>
<tr>
<td>Travel Tools</td>
<td>$1,650.00</td>
</tr>
<tr>
<td>Socket Sets</td>
<td>$500.00</td>
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<tr>
<td>Screw Driver Sets</td>
<td>$100.00</td>
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<tr>
<td>Wrench Sets</td>
<td>$250.00</td>
</tr>
<tr>
<td>A/C Tools</td>
<td>$300.00</td>
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<tr>
<td>Electrical Tools</td>
<td>$300.00</td>
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<tr>
<td>Misc.</td>
<td>$200.00</td>
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<tr>
<td>Shop Supplies</td>
<td>$900.00</td>
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<tr>
<td>Solvents</td>
<td>$300.00</td>
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<tr>
<td>Paint</td>
<td>$300.00</td>
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<tr>
<td>Towels and Rags</td>
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<tr>
<td>Cleaning Supplies</td>
<td>$100.00</td>
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<tr>
<td>Adhesives</td>
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<tr>
<td>Shop Equipment</td>
<td>$3,550.00</td>
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<td>Jacks</td>
<td>$1,000.00</td>
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<tr>
<td>Stands</td>
<td>$250.00</td>
</tr>
<tr>
<td>Tool Boxes</td>
<td>$2,000.00</td>
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<tr>
<td>Creepers</td>
<td>$300.00</td>
</tr>
<tr>
<td>Safety Equipment</td>
<td>$900.00</td>
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<tr>
<td>Fire Extinguishers</td>
<td>$300.00</td>
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<tr>
<td>Safety Glasses</td>
<td>$150.00</td>
</tr>
<tr>
<td>Gloves</td>
<td>$150.00</td>
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<tr>
<td>First Aid Kits</td>
<td>$300.00</td>
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<tr>
<td>Burnt Orange Paint Job</td>
<td>$2,000.00</td>
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<tr>
<td>2006-2007 Donations</td>
<td>($11,000.00)</td>
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<tr>
<td>Total</td>
<td>$83,500.00</td>
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</tbody>
</table>
Sponsorship Opportunity

The University of Texas Challenge X Team needs your support to successfully compete in years three and four of the U.S. Department of Energy’s sponsored student competition. Help the Longhorns go green and compete with the University of Michigan, Ohio State University, Penn State University, Virginia Tech University, the University of Tennessee, Texas Tech University, as well as 10 other universities. The Longhorns novel approach in the ChallengeX competition will provide a dual-fuel, mild-hybrid vehicle that uses a combination of BioDiesel and Reformulated Gasoline to maximize performance and fuel economy while minimizing emissions. This innovative spirit spurred the team to victory in the 2000 Ethanol Vehicle Challenge, and with your support will enable us to keep the UT championship tradition alive. You can become our sponsor today by filling out the Corporate Response Form on the next page and return it via email or standard mail at the addresses listed on the form. For more information please view our team website at www.me.utexas.edu/challengex/ or the competition website at www.challengex.org.

~ Thank you for your support. Hook ‘em!
Corporate Response Form

Company Name: ________________________________
Phone: ( ) _______________ Fax: ( ) _______________

Please indicate one of the following:
We would like to become an official supporter of the UT Austin ChallengeX Team:

___ Longhorn Level ($10,000 and up) $__________
   All Bevo Level Benefits
   Team Event with the Sponsor

___ Bevo Level ($5,000 - $9,999) $__________
   All Hook ‘Em Level Benefits
   Acknowledgement at all Press and Community Events
   Logo on team shirt

___ Hook ‘Em Level ($500 - $4,999) $__________
   Logo on Competition Vehicle (see Appendix)
   Logo on website

___ We would like to donate our services in a different manner.

Please specify: ____________________________________________________________
________________________________________________________________________

Signature: ______________________________ Date: ________________

Thank you for your support!!!

Phone Number: 512-471-3108
E-mail: challengex@me.utexas.edu
Web: www.me.utexas.edu/challengex/
Corporate Logo Artwork Release Form

Company Name: ________________________________

hereby grants UT SAE the right to use the aforementioned company’s trademark, logo, or likeness for the purposes of indicating local sponsorship of the UT SAE’s ChallengeX project.

This likeness may be used on the UT SAE ChallengeX competition vehicle, team website, team posters and presentations, and team shirts.

Competition vehicle local sponsorship likeness artwork is limited in size and placement based on the ChallengeX Competition Rules generated by the competition’s managing body, The United States Department of Energy.

The aforementioned sponsor may choose the specific likeness artwork desired on the vehicle, website, and when applicable on posters, presentation, and team shirts.

Signature: ________________________________ Date: ________________

Please mail to:
UT SAE – ChallengeX Team
The University of Texas at Austin
Department of Mechanical Engineering
ETC Building
204 E. Dean Keeton Street
Austin, Texas 78712-0292

Phone Number: 512-471-3108
E-mail: challengex@me.utexas.edu
Web: www.me.utexas.edu/challengex/
Appendix: Required Decal Placement

Team Decals
Put decals on the body between the C & D Pillars and below the rear window. The limit of number of decals that can be applied follows side requirements.

Passenger Side

No Decals
No transfers, window stickers, paint, or anything.

Team

Silver & Bronze
Put decals on the body between the C & D Pillars and below the rear window. No specific placement or sponsor requirements other than to balance the number of sponsorships on each side of the vehicle. Silver & Bronze Sponsors only appear once on each side of vehicle.

Platinum
Put decals on the body between the A & D Pillars and below the door window. No specific placement requirements. Platinum Sponsors appear on both sides of vehicle.

Headline
Put decals on the body between the A & D Pillars and below the door window. The OCE and GM logos will appear on each side of the vehicle.

Gold
Put decals on the front fender. No specific sponsor layout requirements. Gold Sponsors only appear on both sides of vehicle.

Team Name & Vehicle #
Must appear in the location depicted above.

Driver Side Sponsor Decal Layout for Years 2, 3 and 4

No Decals

Team

Gold Sponsors

Platinum Sponsors

Silver Sponsors

Team Name
Front and Rear of Vehicle Decal Layout for Years 2, 3 and 4