

SCORED EVENTS AND AWARDS

TOP PLACE AWARDS

Top competition finishers are determined by the best combined scores from all the scored events.

First Place \$7,000

Second Place \$6,000

Third Place \$5,000

Fourth Place \$4,000

Fifth Place \$3,000

Sixth Place \$2,000

SCORED EVENTS

REPORT #1

YEAR TWO FALL TECHNICAL REPORT

40 points

Event Captain: Forrest Jehlik – Argonne National Laboratory

Challenge X Teams submitted a 10-page SAE-format report documenting the final changes to the design and vehicle technical specifications from the first challenge year's analysis. Teams were required to document and describe the powertrain architecture integrated into the vehicle for the June 2006 competition. Utilizing completed modeling and component testing, Teams updated their vehicle technical specifications. From this analysis, Teams provided insight into how their Vehicle Technical Specification (VTS) was developed, the changes that occurred to the original VTS, and presented the information to substantiate their selections.

REPORT #2

YEAR TWO SPRING TECHNICAL REPORT

70 points

Event Captain: Forrest Jehlik – Argonne National Laboratory

Considered the final written technical document for the competition's second year, Challenge X Teams submitted a final 15-page SAE-format report. The purpose of the spring technical report was to document how the components and control system were able to meet the energy efficiency, emissions, and performance/utility capabilities of the vehicle as determined in the first year's modeling analysis. Teams presented test data from their vehicle to support claims of energy efficiency, emissions, and performance. The broad range of topics covered in the report consisted of their selected powertrain and hybrid control strategy, powertrain control and operation capabilities of vehicle compared to the production vehicle, validation of results that substantiate the VTS design, and specifics of the vehicle unique and important not covered in any of the previous topics.

Best Written Technical Reports (\$1,000) is awarded to the team with the highest total score for both reports.

PRE-COMPETITION TECHNICAL INSPECTION

40 points

Event Captain: Steve Gurski – Argonne National Laboratory

Prior to the competition, Challenge X mentors and organizers visited teams for a pre-event inspection of the completed competition vehicles. At this pre-competition event, a critical review of a vehicle's compliance to the safety and technical guidelines was held. Teams were evaluated with an all-encompassing safety and technical checklist and provided feedback by mentors and organizers with regards to a team's design. As part of this inspection, teams were awarded points for displaying complete integration of their powertrain, as well as demonstrating vehicle operation.

QUALIFYING: BRAKING AND HANDLING

30 points

Co-Event Captains: Jace Petersen and Jim Trout – General Motors

The braking and handling events are the first of the dynamic qualifying events of the Challenge X competition. To ensure the vehicles maintain the appropriate amount of stopping performance, teams are required to undergo a braking test. Teams will receive a pass or fail based on their demonstrated performance. After passing the braking event, teams will then demonstrate their vehicle's ability to navigate a serpentine cone-lined course and test the vehicle's handling capabilities. Teams will be given multiple attempts to drive their vehicle through the handling course in the shortest time possible.

The team that is able to achieve the lowest time possible through the handling event will receive the trophy and a check for \$500.

QUALIFYING: ACCELERATION

35 points

Co-Event Captains: Dave Gerber, Dan Molnar, and Debbie Yee – General Motors

The Acceleration Event evaluates the ability of the vehicle to accelerate in two different metrics. Initial vehicle movement to 60 mph and 50 to 70 mph. Teams will be challenged to demonstrate the best acceleration possible given their vehicle architecture design.

The team demonstrating the highest score based on their acceleration times will receive the award for the Best Acceleration and a check for \$500.

QUALIFYING: LIMITED TRACTION CONTROL

55 points

Co-Event Captains: Jeff Hengesh and Jim Hamilton – General Motors

This event will demonstrate the "All Weather" capability that customers expect of SUVs. This event will evaluate the capabilities of the Challenge X vehicles to maintain launch traction during acceleration on low coefficient-of-friction surfaces. Subjective and measured data will be used to rate the performance of the vehicles.

QUALIFYING: HIGHWAY STABILITY

Pass/Fail

Event Captain: Shan Smith – General Motors

The purpose of the highway stability event is to evaluate the ability to control the competition vehicles at highway speeds. The event will utilize tests that are currently used in real-world vehicle design programs to ensure that vehicles are safe to operate at highway speeds.

AVL DRIVE QUALITY

65 points

Co-Event Captains: Randy Yost, Steve Baldus, and Dave Evans – General Motors

The balance between fuel economy and drivability is one of the most difficult and important tasks in the Vehicle Development Process. The objective of this event is to assess the vehicle's drivability through objective on-road evaluation. AVL DRIVE is the enabling technology that will be used to objectively evaluate the drive quality of each of the competition vehicles. The event will evaluate a set of driving "modes," such as acceleration, cruising, and braking, and develop a score that will be used for the final comparison and award for the event.

The team with the highest drive quality score will receive the trophy for the Best AVL DRIVE Quality and a check for \$1,500.

TRAILER TOW

55 points

Event Captain: Frank Witt – General Motors

The goal of this event is to demonstrate towing ability at a reasonable speed over a given grade. This drive schedule will be indicative of real-world conditions that the production vehicle may experience. The event will be performed over the road and, where applicable, demand zero net on-board energy storage change (i.e., charge sustainability) over the towing drive cycle. Distance traveled and the time taken to complete the event will be the metrics used to judge the event.

The team that is able to travel the fixed distance of the towing cycle the quickest without exceeding the maximum speed will receive an award for Best Trailer Performance and a check for \$500.

ON-ROAD EMISSIONS TESTING

65 points

Co-Event Captains: Rachel Gerver and Jim Tulpa – General Motors

Chassis dynamometer testing has traditionally been used for measuring tailpipe emissions from automobiles and light trucks. This approach provides a controlled environment and the ability to use large and accurate emissions sampling systems. However, recent developments in emissions measurement technology have given way to the opportunity of measuring tailpipe emissions from a vehicle as it is driven on-road, with the Semtech emissions sampling systems from Sensors, Inc., located aboard the vehicle. In Challenge X, competing vehicles will be driven over a pre-defined drive schedule that is similar in nature to laboratory-based emissions testing. Teams are required to demonstrate simultaneous control of key criteria emissions and will be scored based on an emissions bin structure.

The team that achieves the highest score based on the Challenge X emission bin structure will receive a check for \$2,000 and a trophy for Lowest Regulated Tailpipe Emissions.

SCORED EVENTS AND AWARDS

WELL-TO-WHEELS GREENHOUSE GAS EMISSIONS

65 points

Event Captain: Steve Gurski – Argonne National Laboratory

The objective of the well-to-wheels greenhouse gas event is to reduce greenhouse gas (GHG) emissions relative to a production vehicle based upon emissions measurements. The GHG emissions of each vehicle will be attributed to two components: (1) upstream fuel-cycle emissions and (2) tailpipe emissions measurements. The maximum points for this event will be awarded to the vehicle with the lowest GHG score. Each vehicle will be assigned upstream GHG emissions based on the type and amount of fuel used during the on-road emissions event, according to a peer-reviewed analysis of GHG emissions contained in the Greenhouse Gas, Regulated Emissions and Energy Use in Transportation (GREET) model.

The team with the lowest GHG score will receive a check for \$2,000 and a trophy for the Lowest Well-to-Wheels Greenhouse Gas Emissions.

ON-ROAD ENERGY USE AND CONTROL STRATEGY PRESENTATION

65 points

Co-Event Captains: Cheryl Clark and Jim Contes – General Motors

The purpose of the on-road energy use event is to determine the energy use and fuel economy of participant vehicles. Vehicles will be driven over a closed-loop road circuit with varying speeds, accelerations, and start/stops. The type of driving over the closed loop is designed to simulate normal real-world driving conditions.

The team that achieves the highest gasoline equivalent fuel economy will receive a check for \$2,000 and a trophy for the Best On-Road Energy Use.

WELL-TO-WHEELS PETROLEUM ENERGY USE

65 points

Event Captain: Steve Gurski – Argonne National Laboratory

The well-to-wheels petroleum energy use event will determine a team's impact on the petroleum energy use of the vehicle. The reduction of petroleum energy usage on a well-to-wheels basis is a focus of the competition and is evaluated by this event. Petroleum energy use will be determined from the fuel use demonstration during the on-road energy use event. Each competition vehicle consumes petroleum energy, either during vehicle operation (tank-to-wheels) or during the production of the fuel (well-to-tank).

The team that uses the lowest amount of petroleum energy during the event will receive a trophy for the Lowest Well-to-Wheels Petroleum Energy Usage and a check for \$2,000.



TECHNICAL PRESENTATION

65 points

Event Captain: Connie Bezanson – U.S. Department of Energy

The vehicle overview presentation event is designed to evaluate the effectiveness with which the team executed the second-year deliverables of Challenge X. In a technical presentation format, teams articulate their technical accomplishments and lessons learned from year two, along with future challenges for the final year of Challenge X. Particular emphasis is placed on understanding how teams have realized their overall design strategy, vehicle technical specifications, and vehicle architecture. Each team will make a technical presentation addressing key categories and then answer questions from a panel of industry and government experts. Scoring is based on presentation style and technical content.

The Best Technical Presentation Award (\$1,500) is presented to the team with the highest score in the Technical Presentation event.

VEHICLE DEVELOPMENT REVIEW

65 points

Event Captain: Bob Larsen – Argonne National Laboratory

The Vehicle Development Review (VDR) is a combination vehicle inspection and team presentation designed to evaluate the level of engineering design and execution of that design commensurate with a prototype vehicle in the second year of the Challenge X development process. Following the general outline of the GM Vehicle Development Process, the VDR seeks to determine the degree to which the team's vehicles exhibit the level of component integration and functionality expected as the result of their stated design goals and VSTs.

The Best Vehicle Development Review Presentation (\$1,500) is awarded to the team with the highest scores in the Vehicle Development Review event.

CONTROL STRATEGY PRESENTATION

75 points

Event Captains: Chuck Folkerts and Kent Helfrich – General Motors

After developing a vehicle control strategy to utilize advanced vehicle technologies, each team gives a presentation, then answers questions from a panel of government and industry experts. The control strategy presentation is a focused technical presentation detailing the hybrid powertrain control strategy demonstrated for the competition in each team's vehicle. The presentation includes information on the controls hardware architectures and software strategies chosen, as well as details on the overall strategy employed to provide the required control of the hybrid powertrain system, such that the safety, fuel economy, and performance targets are met.

The Best Control Strategy Presentation Award (\$1,500) is presented to the team with the highest score in the Control Strategy Presentation event.

SPECIAL AND SPONSORED AWARDS

SPECIAL AWARDS

DR. DONALD STREIT SPORTSMANSHIP AWARD

This award is presented to the team that offers the highest level of assistance and support to other teams and organizers despite their own circumstances. This award is presented in honor of Dr. Donald Streit, who served as a dedicated faculty advisor to the Pennsylvania State University FutureTruck team and embodied the true meaning of sportsmanship. Although Dr. Streit's life ended prematurely, his memory and his example are carried on by the students who have and will continue to participate in advanced vehicle technology competitions for decades to come.

The winning team will win a trophy and check for \$500.

BEST ENGINEERING & FABRICATION WORKMANSHIP

This award is presented to the team with the best combined interior and exterior vehicle presentation, based on the scores and input from the judges in the Vehicle Development Review event.

A trophy and check for \$500 will be awarded to the winning team.

SPIRIT OF THE CHALLENGE AWARD

This award, presented by the competition organizers, is given to a team that exhibits the following characteristics: displaying exceptional perseverance in the face of adversity, maintaining a positive attitude throughout the competition despite significant challenges and obstacles, and pursuing exceptionally high technical standards for their team that best represent the spirit of the Challenge X competition.

The winning team will win a trophy and check for \$500.

MOST IMPROVED TEAM AWARD

This award is presented to the team that demonstrates the most improved overall performance over last year's Challenge X competition. Improvement may be determined by performance in individual events or the overall competition.

The winning team will win a trophy and check for \$500.

OUTSTANDING RADAR AWARD

The Challenge X Outstanding Radar Award was developed this year to recognize the significant contributions of the Team Radars—an important but sometimes overlooked role in the competition. The Radar program, instituted for the 1998 Ethanol Vehicle Challenge, was modeled after Radar O'Reilly of M.A.S.H. 4077. The main purpose of a Radar is to coordinate the team logistics and communications, both within the team, as well as with the organizers.

The winner of the Outstanding Radar Award will receive special recognition from the organizers.

SPONSORED AWARDS



NATIONAL SCIENCE FOUNDATION OUTSTANDING FACULTY ADVISOR AWARDS

Event Captain: Don Senich – National Science Foundation

It takes an enormous amount of time and energy for a faculty advisor to pull together a team of students to participate in an engineering competition, and professors may be reluctant to undertake such a time-consuming project such as Challenge X. Yet, most participating students claim that Challenge X is one of the highlights of their university experience. Since 1997, the National Science Foundation-sponsored faculty award has provided recognition to the faculty advisors who, through their leadership and research, are advancing the frontiers of science and engineering while passing on a legacy to their students that extends throughout the automotive industry.

Two awards will be presented to the faculty advisors who best incorporate the Challenge X goals, objectives, and activities into the undergraduate engineering curriculum and who have had the most significant impact on the engineering education of their students or have used advanced vehicle technology competitions (AVTCs) to enhance the engineering education experience. These funds are placed into a university account to be used to enhance the integration of the AVTC experience into the undergraduate curriculum for the benefit of the students.

National Science Foundation Outstanding Incoming Faculty Advisor Award – \$15,000

National Science Foundation Outstanding Long-Term Faculty Advisor Award – \$15,000



GMability OUTSTANDING OUTREACH AWARDS

Event Captain: Lynda Palombo – Natural Resources Canada

Sponsored by GM's K-12 Education Program, the Challenge X Outreach Program encourages teams to use various outreach strategies to raise awareness about critical energy and transportation-related issues throughout North America. The Outreach Program specifically challenges teams to focus their outreach efforts on the following audiences: K-12 students, local communities (community groups, professional organizations, etc.), and local media. This year, particular emphasis was placed on securing media coverage in the team's local markets. Teams will submit a written summary of their outreach activities to be eligible for up to 20 competition points. Teams may also compete for several sponsored outreach awards by giving an oral presentation to a panel of government and industry judges.

Outstanding Outreach, First Place (\$1,500); Outstanding Outreach, Second Place (\$1,000); and Outstanding Outreach, Third Place (\$500) are awarded to teams based on additional outreach activities. Most Improved Outreach Program (\$500), K-12 Educational Outreach (\$500), Best Community Outreach (\$500), Best Media Relations Award (\$500), and Best Web Site Award (\$500) are awarded to the teams that go above and beyond the minimum point requirements in these categories.

CHALLENGE X SPONSORED AWARDS



CHALLENGE X OUTSTANDING WOMEN IN ENGINEERING AWARD

Event Captain: Lyn St. James



The Lyn St. James Foundation is sponsoring an award to honor women engineering students who are demonstrating outstanding technical excellence and accomplishments through the Challenge X automotive engineering program. The award is intended to encourage more women to study engineering and pursue a career in automotive engineering after graduation.

The Lyn St. James Foundation is a 501 (c) 3 non-profit educational organization that provides leadership, vision, resources, and financial support in order to create an open environment for women's growth in automotive fields.

The winner will receive \$1,000 for her university's Challenge X program.

The MathWorks THE MATHWORKS: CROSSOVER TO MODEL-BASED DESIGN AWARD

Event Captain: Paul Smith – The MathWorks

This award recognizes Challenge X teams that exhibit the most creative application of The MathWorks software products, including MATLAB and Simulink, to help achieve the overall competition objectives for the second year. Teams will be evaluated on how well they applied model-based design with The MathWorks' toolset to help achieve the overall competition objectives in the areas of plant modeling, controls design and tuning, data analysis and visualization, hardware implementation, the overall development process they followed, the quality of their presentation, and lessons learned.

First Place – \$1,000, Second Place – \$750, Third Place – \$500

NATIONAL INSTRUMENTS™ NATIONAL INSTRUMENTS: MOST INNOVATIVE USE OF VIRTUAL INSTRUMENTATION AWARD

Event Captain: Jeff Meisel – National Instruments

Virtual instrumentation is the combination of industry-standard computer technology with powerful application software and cost-effective hardware to perform the functions of traditional control or measurement devices. In Year 1, the National Instruments Award was given for the most innovative use of virtual instrumentation for control design and simulation. For Year 2, the National Instruments award will be given for the actual implementation of that strategy in the vehicle.

This award encourages Challenge X teams to use PC-based technology in creating sophisticated measurement, control, simulation, prototyping, and testing applications. Teams will be scored on design philosophy and control strategy,

implementation of virtual instrumentation solution(s), how they overcame the challenges encountered during implementation, their schematic diagrams of the NI products in the vehicle and the systems/subsystems that they are measuring/controlling, and screen captures of major VI block diagrams and VI hierarchy.

First Place – \$1,000, Second Place – \$750, Third Place – \$500



FREESCALE SEMICONDUCTOR: SILICON ON THE MOVE AWARD

Event Captain: Ron Stence – Freescale Semiconductor

This award recognizes the Challenge X teams that exhibit the best design and use of microprocessor hardware and software. The intent of this award is to identify the teams that have designed and developed their own hybrid electronics control system and can clearly explain the features and functions of the control systems necessary to develop a Hybrid Electric Vehicle. The teams that can demonstrate innovative uses of embedded processors and other silicon devices and have the ability to clearly identify and explain the student-developed control strategy elements (S/W and H/W) are encouraged to compete.

First Place – \$1,000, Second Place – \$750, Third Place – \$500

Award Ceremony Guest Speaker, Paul Grimme



Paul Grimme is senior vice president and general manager of the Transportation & Standard Products Group at Freescale Semiconductor, the world's No. 1 supplier of semiconductors to global auto manufacturers and the No. 2 supplier of microcontrollers.

Since joining Motorola's semiconductor business in 1981, Paul has held positions in the areas of product engineering, marketing, and operations management. Prior to his current position, he served as corporate vice president and general manager of the 8/16-bit Products Division. In 1999, Paul was promoted to vice president and general manager of the Advanced Vehicle Systems Division. In this role, he led the division's 32-bit microcontroller thrust into the automotive powertrain and chassis markets—one of the most commercially successful architecture adoptions in the automotive segment.

Paul earned a bachelor's degree in electrical engineering from the University of Nebraska. In 1992, he received his master of business administration degree from the University of Texas.