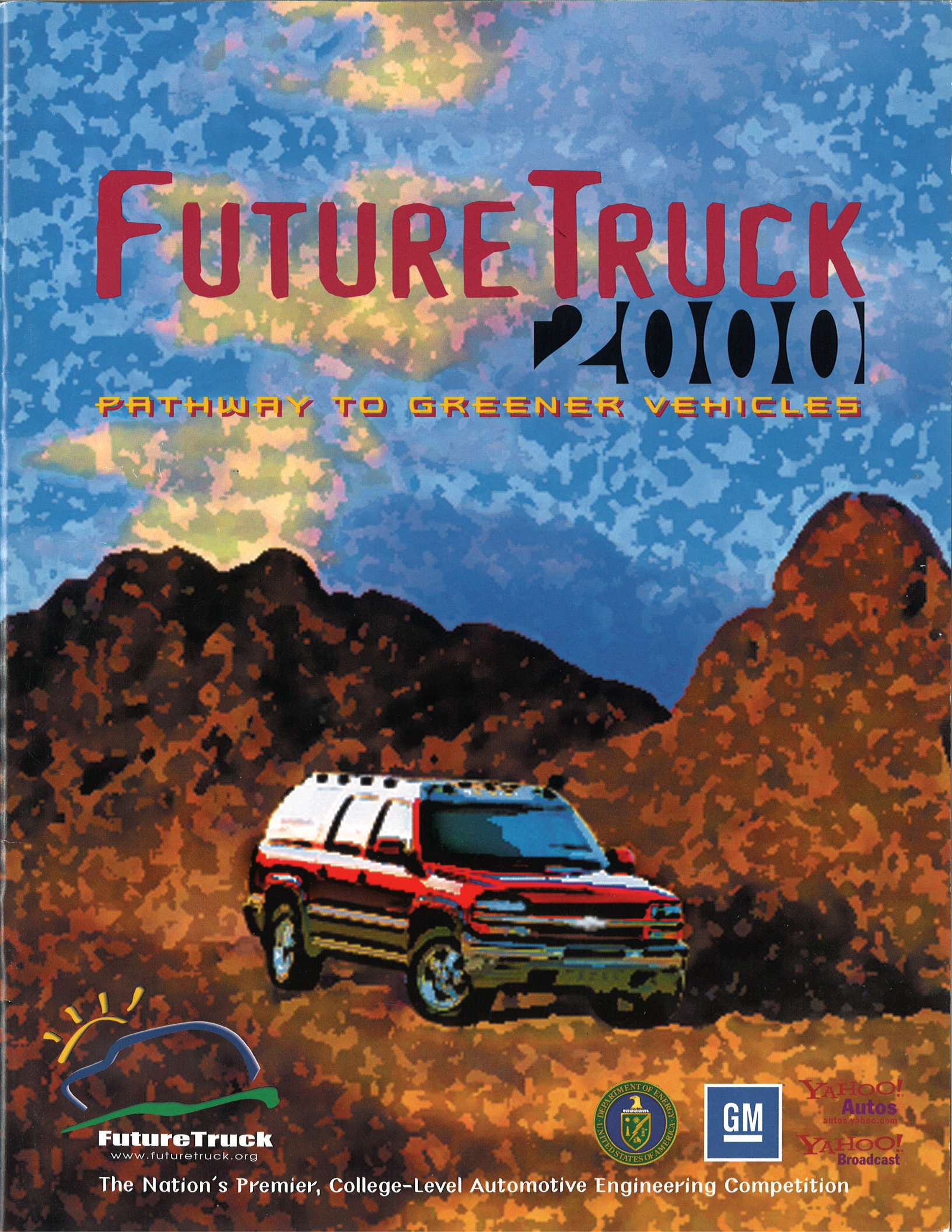
FUTURETRUCK 2010

PATHWAY TO GREENER VEHICLES



FutureTruck
www.futuretruck.org

The Nation's Premier, College-Level Automotive Engineering Competition

Dear FutureTruck Team Members,

On behalf of General Motors and especially the staff at the Desert Proving Ground, welcome to FutureTruck 2000. We are proud to co-sponsor this event, which represents the culmination of a year of effort, teamwork, and dedication. We are also pleased to see your Chevrolet Suburban full-size sport utility vehicles (SUVs), one of GM's most exciting new products, employed to explore how to improve energy efficiency and reduce emissions while maintaining customer utility.

Participating as a team member in FutureTruck provides each student with the opportunity to learn how to balance time and energy between competition activities and the rigors of strong engineering curriculums. This is not unlike the balance that cross-functional teams at GM must strike between safety, performance, function, styling, cost, and regulatory requirements when developing products like the Suburban.

General Motors is also particularly pleased to explore new advanced vehicle technologies with partners from 15 top universities, the United States Department of Energy, Yahoo!, and 10 other government and industry sponsors. General Motors remains committed to developing technologies to address the environmental challenges we face as a society, while ensuring our products remain affordable, reliable, and desirable. Hybrid vehicle technologies have the potential to provide consumers the opportunity to choose SUVs that have improved fuel economy and reduced emissions, while maintaining desired performance capabilities. Programs like the FutureTruck competition will help General Motors understand the extent to which these technologies will meet light-duty truck customer needs.

We at General Motors, along with the other sponsors of the competition, look forward to learning about the unique and innovative design approaches you have developed in converting your team's Suburban to a hybrid electric vehicle. We are confident that you have learned a great deal from this ambitious project and hope that the challenges particular to light-duty truck engineering have enhanced your competition experience. But truly, our greatest gain is in the opportunity to meet some of the brightest students in North America – students who want to be innovative members of tomorrow's engineering teams. We applaud the dedication that brought you as students and faculty to this exciting event in Arizona.

On behalf of the entire GM team, we would like to extend our best wishes to each one of you as you participate in this most exciting challenge.

Thomas G. Stephens
Vice President and Group Director
Truck Engineering

Dennis R. Minano
Vice President
Environment and Energy
Chief Environmental Officer

Al F. DeMeese
Director
Desert Proving Ground

WHAT IS FUTURETRUCK?

FutureTruck is a four-year competition that challenges student engineers to re-engineer full-size sport utility vehicles (SUVs) to meet the needs of the future – producing green, efficient transportation that has the performance, utility, and affordability that customers expect.

To tackle this challenge, the U.S. Department of Energy, General Motors Corporation, Yahoo! Inc., and 10 other sponsors have teamed up with more than 200 of the best and brightest engineering students from 15 U.S. and Canadian universities. In the first 2 years of the competition, teams will modify model-year 2000 Chevrolet Suburbans, using cutting edge technologies, such as fuel cells and other advanced propulsion systems, space-age materials, and alternative fuels like biodiesel (B20) and ethanol (E85).

The 2000 competition will be hosted by the General Motors Desert Proving Ground in Mesa, Arizona, on June 8-15, 2000. Vehicles will undergo extensive testing in more than 10 technical events. The competition also includes several high-profile publicity events, from the vehicle delivery press conferences in December 1999 to postcompetition promotional events at industry conferences, auto shows, and state fairs in the summer of 2000.

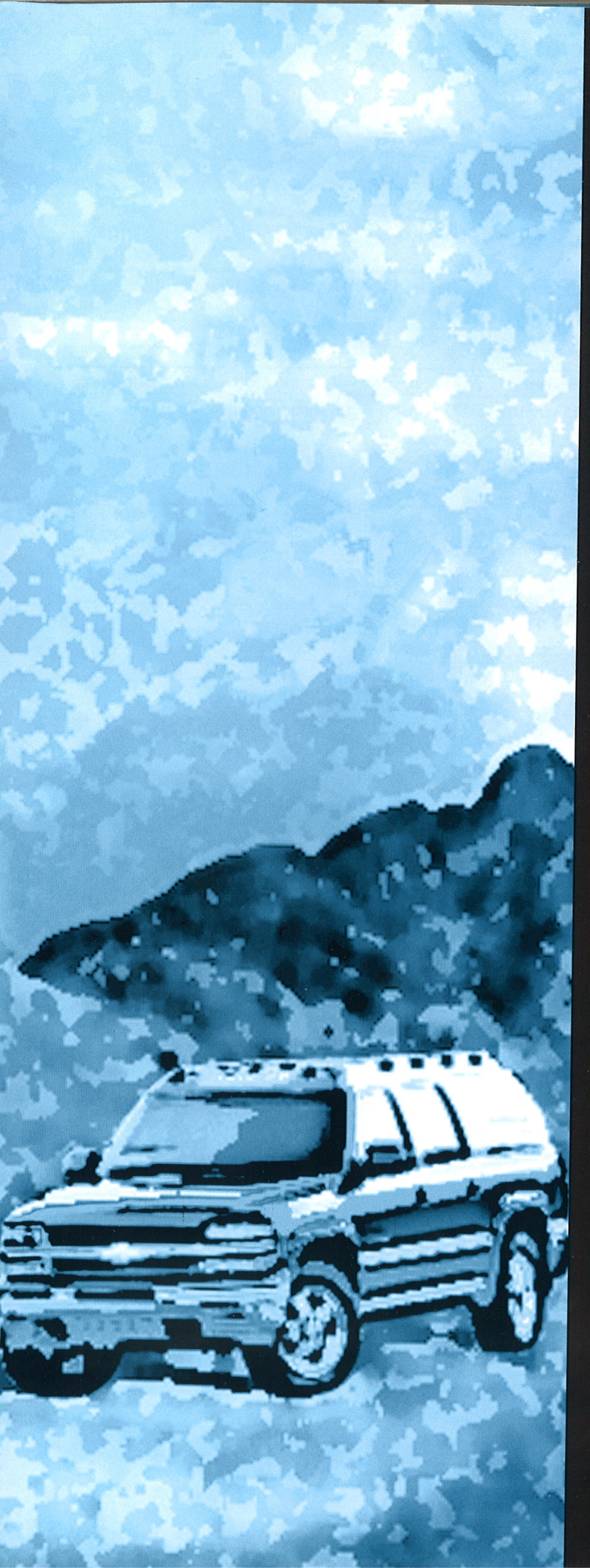
The growing customer demand for light-duty trucks, including pickups, sport utility vehicles, and vans, poses new rewards and challenges. In response to this demand, vehicle manufacturers are providing light-duty trucks that offer high levels of comfort and refinement, along with improved functionality. As a result, light-duty trucks now comprise over 50% of vehicle sales. This sales shift has changed the nature of the market and the industry.

The success of these and other vehicles in providing mobility and utility to the customer has created some serious challenges from a societal perspective. Customers, industry, and government are concerned about greenhouse gases, depletion of nonrenewable oil resources, and an increasing dependence on imported oil. The challenge that we all face is to develop alternative propulsion systems and fuels that demonstrate increased energy efficiency and reduced greenhouse gas emissions while producing near-zero tail pipe emissions and continuing to meet ever-increasing customer expectations.

FutureTruck is also redefining the ways in which private industry, academia, and government can work together to overcome obstacles to innovation. Sponsors include the U.S. Department of Energy, General Motors Corporation, Yahoo! Inc., the National Science Foundation, the National Highway Transportation Safety Administration, the Aluminum Association, Automotive Testing Laboratories, Inc., Delphi Automotive Systems, Natural Resources Canada, Governors' Ethanol Coalition, Renewable Fuels Association, National Biodiesel Board, and Newark Electronics. The competition is managed by Argonne National Laboratory.

FUTURETRUCK 2000 SPONSORS

- U.S. Department of Energy
- General Motors Corporation
- Yahoo! Inc.
- National Science Foundation
- National Highway Traffic Safety Administration
- The Aluminum Association
- Automotive Testing Laboratories, Inc.
- Delphi Automotive Systems
- Natural Resources Canada
- Governors' Ethanol Coalition
- Renewable Fuels Association
- National Biodiesel Board
- Newark Electronics



FutureTruck

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COMPETITION SCHEDULE

WEDNESDAY, JUNE 7 (OPTIONAL DAY)	Registration	9:00 a.m. - 12:00 p.m. 2:00 p.m. - 7:00 p.m.	Arizona Golf Resort, North Room
	Final Vehicle Preparation	11:00 a.m. - 10:00 p.m.	Pit Area
THURSDAY, JUNE 8	Registration	7:00 a.m. - 7:00 p.m.	Arizona Golf Resort, North Room
	Safety/Tech Inspections	7:00 a.m. - 7:00 p.m.	Vehicle Handling Facility
	Trailer Tow Driver Practice	7:00 a.m. - 7:00 p.m.	
	Fuel Drain/Refueling	7:00 a.m. - 7:00 p.m.	Fuel Station
	Lunch	12:00 p.m. - 1:00 p.m.	Food Tent
	Siesta!	1:00 p.m. - 2:00 p.m.	
	Qualifying	4:00 p.m. - 9:00 p.m.	Vehicle Dynamics Test Area
	Team Leader Meeting	7:00 p.m. - 8:00 p.m.	Food Tent
FRIDAY, JUNE 9	Opening Ceremony	7:30 a.m. - 8:00 a.m.	Pit Area
	Safety/Tech Inspections	8:00 a.m. - 7:00 p.m.	Vehicle Handling Facility
	Qualifying	8:00 a.m. - 12:00 p.m. 4:00 p.m. - 9:00 p.m.	Vehicle Dynamics Test Area
	Coastdown Testing	8:00 a.m. - 9:00 p.m.	Vehicle Emissions Lab
	Trailer Tow Driver Practice	8:00 a.m. - 7:00 p.m.	
	Fuel Drain/Refueling	8:00 a.m. - 7:00 p.m.	Fuel Station
	Lunch	1:00 p.m. - 2:00 p.m.	Food Tent
	Team Leader Meeting	7:00 p.m. - 8:00 p.m.	Food Tent
	FutureTrucks into Soak for Emissions Testing	9:00 p.m. - 10:00 p.m.	Automotive Testing Laboratory
SATURDAY, JUNE 10	Safety/Tech Inspections	7:00 a.m. - 7:00 p.m.	Vehicle Handling Facility
	Qualifying	7:00 a.m. - 12:00 p.m. 4:00 p.m. - 8:00 p.m.	Vehicle Dynamics Test Area
	Coastdown Testing	7:00 a.m. - 9:00 p.m.	Vehicle Emissions Lab
	Fuel Drain/Refueling	7:00 a.m. - 7:00 p.m.	Fuel Station
	Emissions Testing	7:00 a.m. - 9:00 p.m.	Automotive Testing Laboratory
	Lunch	12:00 p.m. - 1:00 p.m.	Food Tent
	Siesta!	1:00 p.m. - 2:00 p.m.	
	Team Leader Meeting	7:00 p.m. - 8:00 p.m.	Food Tent
	FutureTrucks into Soak for Emissions Testing	9:00 p.m. - 10:00 p.m.	Automotive Testing Laboratory
SUNDAY, JUNE 11	Safety/Tech Inspections	7:00 a.m. - 5:00 p.m.	Vehicle Handling Facility
	Qualifying	7:00 a.m. - 5:00 p.m.	Vehicle Dynamics Test Area
	Coastdown Testing	7:00 a.m. - 5:00 p.m.	Vehicle Emissions Lab
	Fuel Drain/Refueling	7:00 a.m. - 5:00 p.m.	Fuel Station
	Emissions Testing	7:00 a.m. - 5:00 p.m.	Automotive Testing Laboratory
	Tour of DPG for Sponsors/Judges	12:00 p.m. - 3:00 p.m.	
	Lunch	12:00 p.m. - 1:00 p.m.	Food Tent
	Siesta!	1:00 p.m. - 2:00 p.m.	
	FutureTrucks into Soak for Emissions Testing	5:00 p.m. - 6:00 p.m.	Automotive Testing Laboratory
	Sponsor Social	5:00 p.m. - 6:30 p.m.	Arizona Golf Resort, Courtyard Patio
	Skit Night/Team Meeting	6:30 p.m. - 10:00 p.m.	Arizona Golf Resort, Ballroom

MONDAY, JUNE 12

Emissions Testing	7:00 a.m. - 9:00 p.m.	Automotive Testing Laboratory
Trailer Tow Qualify and Test	7:00 a.m. - 9:00 p.m.	
Oral Presentations	8:00 a.m. - 5:00 p.m.	Building 33
Lunch	12:00 p.m. - 1:00 p.m.	Food Tent
Siesta!	1:00 p.m. - 2:00 p.m.	
Team Leader Meeting	6:00 p.m. - 7:00 p.m.	Food Tent
FutureTrucks into Soak for Emissions Testing	9:00 p.m. - 10:00 p.m.	Automotive Testing Laboratory

TUESDAY, JUNE 13

Emissions Testing	7:00 a.m. - 12:00 p.m.	Automotive Testing Laboratory
Trailer Tow Qualify and Test	7:00 a.m. - 12:00 p.m.	
Precise Refueling	3:00 p.m. - 4:00 p.m.	Fuel Station
On-Road Fuel Economy Testing	4:00 p.m. - 8:00 p.m.	DPG Test Tracks
Dinner	5:30 p.m. - 6:30 p.m.	Food Tent
Precise Refueling	8:00 p.m. - 9:00 p.m.	Fuel Station
Team Leader Meeting	8:00 p.m. - 9:00 p.m.	Food Tent

WEDNESDAY, JUNE 14 (MEDIA DAY)

Design Review, Static, Consumer Acceptability, Aluminum, Appearance, and Safety Judging	7:00 a.m. - 4:30 p.m.	Building 33
Tours of DPG for Local High School Students	7:00 a.m. - 4:30 p.m.	
Dynamic Consumer Acceptability	7:00 a.m. - 4:30 p.m.	Ride and Structure Road
Lunch	12:30 p.m. - 1:30 p.m.	Food Tent
Dinner	4:30 p.m. - 5:30 p.m.	Food Tent
Acceleration	5:30 p.m. - 7:00 p.m.	1.1 Mile Straightaway
Panoramic Photo	7:00 p.m. - 8:00 p.m.	Vehicle Dynamics Test Area
Team Leader Meeting	8:00 p.m. - 9:00 p.m.	Food Tent

THURSDAY, JUNE 15

Off-Road	7:00 a.m. - 11:00 a.m.	Ride and Structure Road
Wash Vehicles/Pack up Pits	11:00 a.m. - 1:00 p.m.	Pit Area
Refueling	11:00 a.m. - 12:00 p.m.	Fuel Station
Load Vehicles for Transport to Arizona Science Center	12:00 p.m. - 2:00 p.m.	
Lunch	12:00 p.m. - 1:00 p.m.	Food Tent
Vehicles Staged for Display	3:00 p.m. - 3:30 p.m.	Heritage Square (near ASC)
Middle School Student Session	3:00 p.m. - 5:00 p.m.	Arizona Science Center
FutureTruck Teams Arrive at ASC	3:30 p.m.	
Vehicle Display	3:30 p.m. - 5:30 p.m.	Heritage Square
Dinner and Exhibits	5:30 p.m. - 7:00 p.m.	Arizona Science Center
Awards Ceremony	7:00 p.m. - 9:00 p.m.	Arizona Science Center

All events will be held at the Desert Proving Ground unless otherwise specified.
All times subject to change. For current schedule, see a Competition Organizer.

COMPETITION EVENTS

SAFETY/TECHNICAL INSPECTIONS — PASS/FAIL

Event Captain: Ted Bohn

Occupant and vehicle safety are paramount to the FutureTruck competition. Vehicle Safety/Technical Inspections have been designed to evaluate vehicle safety and to verify compliance with all vehicle requirements and safety specifications. The inspections must be successfully completed before vehicles will be allowed to compete in dynamic events.

QUALIFYING AND HANDLING EVENTS — 40 POINTS

Event Captain: Brian Gargiulo

Again, occupant and vehicle safety are a major concern of the FutureTruck competition. Qualifying and Handling Events have been designed to test vehicle safety and to verify compliance with the vehicle requirements. Teams must pass all of these events with their vehicles in "normal mode" in order to compete in any dynamic events. These events include: 1) braking, 2) handling, and 3) center of gravity test.

REGULATED TAIL PIPE EMISSIONS EVENT — 100

Event Captain: Mike Duoba

Emissions reduction from on-road consumer vehicles is very important to future air quality. Manufacturers must design future light-duty trucks with increasing constraints on emissions levels. This effort must be reflected in the development of FutureTruck vehicles. Vehicles must minimally meet Federal Tier 0 emissions standards in order to earn points in this event.

GREENHOUSE GAS IMPACT — 150

Event Captain: Mike Duoba

The objective of the Greenhouse Gas Impact Event is a 2/3 reduction in greenhouse gas (GHG) emissions compared to the stock model-year 2000 Suburban. The GHG emissions of each vehicle will be attributed to 2 components: 1) upstream fuel-cycle emissions and 2) dynamometer emissions measurements.

ON-ROAD FUEL ECONOMY — 50

Event Captains: Kevin MacFadden, Justin Jans

The objective of the On-Road Fuel Economy Event is to demonstrate the robustness of the vehicle and its on-road fuel economy. The total distance traveled throughout the duration of the event (within prescribed speed limits) divided by the amount of energy (fuel and electricity) used will determine the fuel efficiency, and thus the score. The event will include stop-and-go, urban, and highway driving segments.

ACCELERATION — 75

Event Captains: Cheryl Clark, Frank Witt

The purpose of the Acceleration Event is to evaluate the ability of the vehicle to accelerate from a standing start over a 1/4-mile distance. The vehicle must be operated in "normal mode." Each team will be given the opportunity to make at least 2 runs.

TRAILER TOWING — 75

Event Captain: Dave Noriega

The Trailer Towing Event consists of pulling a 7000-lb flat-bed trailer with a 42-square-foot windscreen on a prescribed route. The purpose of this test is to evaluate the impact of the chassis and powertrain. The event will be scored based on the time required to complete the event and the change in state-of-charge (SOC) of the vehicle.

OFF-ROAD — 50

Event Captain: Kevin Horton

The Off-Road Event evaluates the trucks' maneuverability and handling qualities on an off-road course. The off-road course will combine the performance features of acceleration, braking, and handling in one event. This event will be made up of four sections: 1) 4WD Durability Loop, 2) Catch Basin Obstacle Course, 3) Sand Wash, and 4) 50% Hill. The event's 50 points will be divided among the first 3 sections. Teams that complete the 50% Hill section will receive 5 bonus points.

Written Design Report — 100

Event Captain: Cindy Svestka

Prior to the start of the competition, each team is required to submit a (maximum) 18-page written report describing its vehicle's design. Key aspects of the report include powertrain configuration, component selection, control strategy, fuel and electrical power considerations, emissions control strategies, vehicle structure modifications, suspension modifications, materials usage, manufacturability, project timeline/team management, expected vehicle operation and market usage, and performance projections accompanied by appropriate test results. Reports are to be formatted according to current Society of Automotive Engineers standards and are judged on content and quality.

Vehicle Design Inspection — 100

Event Captain: Bob Larsen

This review, lasting at most 25 minutes, is conducted by a panel of judges and involves a presentation of the actual vehicle. Up to 3 members of each team make a 15-minute presentation around the vehicle, and the remaining 10 minutes are for judges' questions. The purpose of this event is to assess the engineering concept, design elements, systems integration, and execution of the vehicle and its components. Judging for the Best Workmanship award will be completed during this event.

Appearance — Award

Event Captain: Cathy Cole

A panel of judges will evaluate the vehicles' appearance. Appearance judges will be looking for innovative styling, quality of design implementation, and overall effectiveness of the vehicles' appearance.

Oral Design Presentation — 100

Event Captain: Shelley Launey

Up to 2 members of each team will make a 15-20-minute oral presentation to a group of industry experts, then answer questions for 5-10 minutes. Team presentations will highlight how their vehicle obtains improved fuel economy and lower emissions, what advanced modifications were made to the major components, stand-alone experimental components or systems designed to enhance the vehicle, and developmental testing and results that show the potential of the vehicle system design. Judges will evaluate the teams based on the above information and the overall presentation quality.

Consumer Acceptability — 100

Event Captains (Static): Kristen De La Rosa, Debbie Heavner
Event Captain (Dynamic): Thad Stump

This event evaluates the vehicle from a prospective buyer's point-of-view, focusing on the quality of the finish, aesthetics, utility, and general driveability. The event includes static and dynamic reviews of the vehicle. The static portion of the event evaluates the comfort/roominess, usable interior storage, instrument panel and cluster, controls, audio system, alarms, dome light, cargo space, and customer maintenance labels. The dynamic portion of the evaluation includes handling, directional stability, maneuvering/parking, brake feel/effectiveness, road noise, driver control position, performance feel/responsiveness, transaxle operation, powertrain noise, ease of starting, idle noise/roughness, absence of hesitation/sag, shutdown characteristics, and response to full steering turn. The vehicle's HVAC system will also be evaluated during the dynamic portion of this event.

Safety Event — 60

Event Captain: Barbara Hennessey

The purpose of this event is to evaluate 1) the impact of teams' changes to the vehicle on the existing vehicle safety systems (i.e., compliance to the Federal Motor Vehicle Safety Standards – FMVSS), 2) safety incorporated into the design of the new powertrain and associated systems, and 3) improvements in the areas of crash avoidance, crashworthiness, and vehicle aggressivity.

COMPETITION AWARDS

The top overall finishers will receive cash awards and trophies.

AWARDS	AMOUNT	DESCRIPTION
1st Place	6,000	Based on the final combined scores from all of the events
2nd Place	5,000	Based on the final combined scores from all of the events
3rd Place	4,000	Based on the final combined scores from all of the events
4th Place	3,000	Based on the final combined scores from all of the events
5th Place	2,000	Based on the final combined scores from all of the events
6th Place	1,000	Based on the final combined scores from all of the events
Lowest Greenhouse Gas (GHG) Emissions	3,000	Lowest score determined from the Greenhouse Gas Impact Event using EPA combined city and highway cycle fuel economy method and GREET model upstream fuel-cycle analysis.
Lowest Regulated Tail Pipe Emissions	2,000	Top scoring performer in the Regulated Tail Pipe Emissions Event.
Best On-Road Fuel Efficiency	1,000	Based on the energy efficiency over both days of the endurance event. Teams must complete ALL of the designated laps to be eligible.
Best Technical Report	1,500	Awarded for the top scoring Technical Report.
Best Vehicle Design Inspection	1,500	Awarded for the highest score in the Vehicle Design Inspection.
Best Oral Design Presentation	1,500	Awarded for the highest score in the Oral Design Presentation Event.
Best Consumer Acceptability	1,000	Based on the top combined static and dynamic scores.
Lowest Vehicle Driving Losses	1,000	Based on the lowest total amount of energy lost during the city and highway cycles due to vehicle losses (rolling friction and aerodynamic). Losses calculated based on each vehicle's coast-down testing data.
Best Use of Advanced Technologies	1,000	Determined during the Vehicle Design Inspection Event, this award is given to the school that incorporates the best mix of advanced technologies. Equal weight is given to their number, application, level of development, and degree of integration in the overall vehicle design.
Safety Award	1,000	Determined during the Safety Event, this award is based on the overall safety of the design, including enhanced safety features and crashworthiness considerations.
Best Trailer Towing Performance	1,000	Combination of time and change in state-of-charge.
Best Acceleration	1,000	Fastest acceleration time.
Best Dynamic Handling	500	Awarded to the team with the highest combined handling and braking scores.
Best Appearing Vehicle	1,000	Determined during the Vehicle Design Inspection Event, this award is based on the overall appearance and visual impact of the vehicle.
Innovations in Aluminum	1,000	Determined during the Innovations in Aluminum Event, this award is based on the applications of aluminum that may lead to increased energy efficiency, lower production costs, and safer vehicles.
Excellence in Renewable Fuels	1,000	Open to ethanol (E85) fueled vehicles – it is based on the Greenhouse Gas Impact score (60%) and the score of a separate paper prepared for this award (40%), judged by a separate panel of judges.
Best Biodiesel Fuel Application	500	Open to biodiesel (B20) fueled vehicles – it is based on the Greenhouse Gas Impact score (60%) and the score of a separate paper prepared for this award (40%), judged by a separate panel of judges.
Best Workmanship	Trophy	Best combined interior and exterior vehicle presentation based on the scores and input from the judges in the Vehicle Design Inspection Event.
Best Teamwork	Trophy	Awarded by the organizers. Based on exceptional level of team performance throughout the competition to get the vehicle ready for the events.
Sportsmanship Award	Trophy	Awarded by the organizers to the team putting forth the highest level of assistance to other teams and organizers despite their own circumstance.
Spirit of the Challenge Award	Trophy	Awarded by the organizers to the team showing perseverance in the face of adversity and maintaining a positive attitude throughout the competition.
Best Skit	Trophy	The team that receives the most votes for the best skit.
Best Off-Road Performance	Trophy	Awarded to the team with the best overall score in the Off-Road Event.

COMPETITION TEAMS

Concordia University

Vehicle Information

HYBRID TYPE:	Parallel
FUEL:	Diesel
ENGINE:	Cummins, 3.9-L, 4-cylinder
MOTOR:	Advanced DC, 21-hp continuous
BATTERIES:	Optima, Lead-Acid, 52 Ah

Team Information

FACULTY ADVISOR:	Prof. Henry Hong
TEAM LEADER:	Sam Graceffa

Truck Name: SHOCKER THE MOOSE

Team makeup: Our team has 20 members, one of whom is a graduate student studying mechanical engineering. Of the undergraduates, 7 are studying mechanical engineering, 6 electrical engineering, 2 computer science, and 1 commerce. The rest of the team members are volunteers. Students involved in this project do not receive university credit for their participation.

Approach to hybrid design: The approach taken for our hybrid design is a simple, classical approach with innovative features.

Goals in participating in FutureTruck: This project helps students become goal-oriented, as well as improving their communication, teamwork, and interpersonal skills. Also, it gives students the opportunity to see the end results of their designs.

Cornell University

Vehicle Information

HYBRID TYPE:	Parallel
FUEL:	Ethanol (E85)
ENGINE:	Mazda Miata (turbocharged), 1.8-L
MOTOR:	AC Propulsion, 150 kW
BATTERIES:	Hawker, Sealed Lead-Acid, 26 Ah

Team Information

FACULTY ADVISORS:	Prof. Robert Thomas and Prof. John Lumley
TEAM LEADERS:	Vijay Iyer, Joe Caprario, Matt Anderson, Andy Peronto, Jeff Pernoud

Truck Name: RED FIVE

Team makeup: Our team has 25 undergraduate and 2 graduate students. Of those, 15 are studying mechanical engineering, 8 electrical engineering, 1 computer science, 1 operations research, 1 engineering management, and 1 electrical engineering and computer science (double major).

Approach to hybrid design: Our vehicle will make use of internal combustion engine load-leveling with an electric motor, so that it will perform at its most efficient points on its particular torque curve. This will allow for energy storage when the engine is at a low load, and a power boost to assist the engine when it is more heavily loaded. The use of the electric motor also allows for regenerative braking and a substantial total available power.

Goals in participating in FutureTruck: Students will always benefit from learning new things, but the engineer's mind is one that operates off of doing: taking something apart, designing something new, exploring possibilities. Much of an engineering undergraduate's life is textbooks and equations. This project represents a real-world problem in which students create something useful. Likewise, schools such as Cornell will always benefit by offering such an opportunity as the FutureTruck project. It attracts potential engineering students and helps current engineering students expand their career opportunities.

George Washington University

Vehicle Information

HYBRID TYPE:	Series
FUEL:	Diesel
ENGINE:	Volkswagen TDI, 1.9-L, 4-cylinder
MOTOR:	New Generation Motors, 90 kW
BATTERIES:	Electrosource 12H85, 12 V

Team Information

FACULTY ADVISOR:	Prof. Vahid Motevalli
TEAM LEADER:	Zeki Gokce

Truck Name: FOREST

Team makeup: Our team has 16 undergraduate students, 4 graduate students, and 1 volunteer.

Approach to hybrid design: This year we are focusing on our motor/generator design.

Goals in participating in FutureTruck: Our primary goal is for our team members to gain valuable hands-on experience by participating in this project.

Georgia Institute of Technology

Vehicle Information

HYBRID TYPE:	Parallel
FUEL:	Reformulated Gasoline (RFG)
ENGINE:	General Motors LM7, 5.3-L, V-8
MOTOR:	AC-Propulsion AC-150 Motor, 336 V
BATTERIES:	Panasonic LC-X1128P, Sealed Lead-Acid, 12 V

Team Information

FACULTY ADVISOR:	Prof. Jerome Meisel
TEAM LEADER:	Jerry Reeves

Team Name: FUTUREWRECK

Team makeup: Our 55-member team is made up solely of undergraduate students. Team members are studying mechanical engineering, industrial engineering, electrical engineering, computer engineering, and civil engineering. Some team members receive credit for this program, while others are volunteers.

Approach to hybrid design: Motor is in parallel with the drive shaft. Engine will use a new type of injection system as well as reformulated gasoline. Complex control strategy is used to ensure the most efficient operation.

Goals in participating in FutureTruck: The FutureTruck program will benefit the students by providing a real-life engineering experience where the theories of the classroom will be interwoven with the practical applications of the real world. FutureTruck will benefit Georgia Tech by providing national exposure to its students and engineering programs.

Michigan Technological University

Vehicle Information

HYBRID TYPE:	Power-Split
FUEL:	Reformulated Gasoline (RFG)
ENGINE:	GM Powertrain LX5, 3.5-L, V-6
MOTOR:	Unique Mobility, SR-218
BATTERIES:	Hawker, Sealed Lead-Acid, 16 Ah

Team Information

FACULTY ADVISOR:	Dr. John Beard
TEAM LEADER:	Aaron Thul

Truck Name: NORTHWIND

Team makeup: The Michigan Tech team consists of approximately 20 undergraduate engineering students from a variety of disciplines, primarily electrical and mechanical. The team also has a single graduate electrical engineering student who is developing the control structure for the hybrid powertrain.

Approach to hybrid design: Our design strategy involves a power-split configuration, a type of dual hybrid, that demonstrates characteristics of both a series and parallel configuration. A power-split hybrid divides power produced by the engine into mechanical and electrical pathways to the final output shaft. This allows control over engine operating states without the disadvantage of excessive energy conversion. Under normal operation, the power-split can be viewed as an electric continuously variable transmission (ECVT).

Goals in participating in FutureTruck: Our team's main goal for our FutureTruck is to provide a seamless transition between stock and the hybrid system, while maintaining features the consumer wants.

Ohio State University

Vehicle Information

HYBRID TYPE:	Parallel
FUEL:	Diesel
ENGINE:	Fiat, 2.4-L, 5-cylinder
MOTOR:	ECOSTAR, 68 kW
BATTERIES:	Hawker, Sealed Lead-Acid, 26 Ah

Team Information

FACULTY ADVISORS:	Dr. Yann Guezennec, Dr. Giorgio Rizzoni, Dr. Gregory Washington
TEAM LEADER:	Michael Hopka

Team makeup: Our team has 15 undergraduate and 11 graduate students. Of those, 19 are studying mechanical engineering, 3 electrical engineering, 3 industrial systems engineering, and 1 business. Four of our team members are receiving class credit for this project.

Approach to hybrid design: Our approach consists of using innovative components and maintaining vehicle utility.

Goals in participating in FutureTruck: Our goals are to have the ability to perform student-driven HEV design in a real-world research vehicle as a design laboratory and allow Ohio State to continue to be recognized as a prominent automotive engineering school.

Pennsylvania State University

Vehicle Information

HYBRID TYPE:	Series
FUEL:	Diesel
ENGINE:	Perkins, 4-L TDI, 4-cylinder
MOTOR:	(3) Solectria, 70 kW
BATTERIES:	East Penn, Sealed Lead-Acid, 12 V

Team Information

FACULTY ADVISOR:	Dr. Donald Streit
TEAM LEADER:	Joel R. Anstrom
Team Name:	THE POWERLION TEAM
Truck Name:	POWERLION

Team makeup: Our team has approximately 45 undergraduate and 15 graduate students. Team members are studying mechanical engineering, electrical engineering, engineering science and mechanics, aerospace engineering, communications, public relations, marketing, German, and business. Most of the student time is volunteered; however, there were labs in the fall and spring associated with this project, as well as several projects on specific PowerLion components.

Approach to hybrid design: One thing that makes our vehicle stand out is that it is "fuel cell ready." Since Penn State is home to the Graduate Automotive Technology Education (GATE) Advanced Energy Storage Technology Center sponsored by the U.S. Department of Energy, we have access to many different energy storage technologies, including fuel cells, advanced batteries, and flywheel energy storage. When a fuel cell is ready for vehicle application, we'll be able to integrate it into the PowerLion with only minimal changes required.

Goals in participating in FutureTruck: Our team is run just like a small company, and our goal is for our "company" to succeed. This requires our leadership to develop team-building skills, high-level communication skills, and business skills. These students learn how to motivate, organize, and manage others, as well as gaining insight into what technical management is all about (problems and rewards) in a small- to medium-sized company. The students who work on the component teams learn to work together on a real-world application. They also learn how to communicate effectively, gain experience in giving presentations and technical report writing, and discover just how important the details can become in a project of this size.

Texas Tech University

Vehicle Information

HYBRID TYPE:	Parallel
FUEL:	Reformulated Gasoline (RFG)
ENGINE:	GM, 3.1-L, V-6
MOTORS:	(2) Solectria, 78 kW
BATTERIES:	Bluestar, Lead-Acid Glass mat, 40 Ah

Team Information

FACULTY ADVISORS:	Dr. Timothy Maxwell, Dr. Daryl Vines, Dr. Michael Parten
TEAM LEADERS:	Tony Bruton (Fall 1999) Jim Muldoon (Spring 2000)
Truck Name:	SUPURBAN

Team makeup: Our team has 12 undergraduate and 3 graduate students. Of these, 6 are studying mechanical engineering, 8 electrical engineering, and 2 computer science. Three of our team members are receiving class credit for this project.

Approach to hybrid design: Our system control theory is basically an electric vehicle with internal combustion engine cruise assist. Our team motto is, "Keep It Simple Students! Only modify for necessity; make it work at competition!"

Goals in participating in FutureTruck: For competition, our goal is to do well in all categories. Overall, participating in FutureTruck provides our students with practical experience working with advanced technologies, which allows Texas Tech to produce graduates who are able to provide employers with immediate input and involvement. This is a win, win, WIN situation!

University of California, Davis

Vehicle Information

HYBRID TYPE:	Parallel
FUEL:	Reformulated Gasoline (RFG)
ENGINE:	Saturn, 1.9-L, 4-Cylinder
MOTOR:	(2) Unique Mobility, 75 kW peak
BATTERIES:	Ovonic, NiMH, 29 kWh

Team Information

FACULTY ADVISORS:	Dr. Mark Duvall, Dr. Andrew Frank
Team Name:	TEAM FATE
Truck Name:	SEQUOIA

Team makeup: Our team consists of 35 undergraduate and 3 graduate students.

Approach to hybrid design: Our vehicle strategy is to develop a charge-depleting parallel hybrid.

Goals in participating in FutureTruck: Our team members participate in FutureTruck to gain practical experience and industry contacts.

University of Idaho

Vehicle Information

HYBRID TYPE:	Series
FUEL:	Biodiesel (B20)
ENGINE:	Volkswagen TDI, 1.9-L
MOTOR:	AC Propulsion, 150 kW
BATTERIES:	Hawker Odyssey, 23 Ah

Team Information

FACULTY ADVISORS:	Dr. Steve Beyerlein, Dr. Don Blackketter, Dr. Dean Edwards
TEAM LEADERS:	John Becker, Dan Cordon, Heather Jones, Keith Wallace
Team Name:	AVCT [ADVANCED VEHICLE CONCEPTS TEAM]
Truck Name:	S.H.A.F.T. [SERIES HYBRID ALT-FUELED TRUCK]

Team makeup: Our team consists of 35 undergraduate students. Team members are studying mechanical engineering, electrical engineering, and business.

Approach to hybrid design: Our hybrid is designed to meet consumer needs without reducing the space or utility of the stock Suburban. The design optimizes emissions and fuel economy.

Goals in participating in FutureTruck: In the FutureTruck competition, we are designing and building the truck of tomorrow for competition today. Through this competition, we give students a hands-on learning opportunity and provide them with design team experience modeled after industry. In addition, FutureTruck allows us to educate the public about alternative transportation for the future and be a part of developing technology for a new generation of vehicles.

University of Maryland

Vehicle Information

HYBRID TYPE:	Parallel
FUEL:	Ethanol (E85)
ENGINE:	General Motors, 3.8-L, V6
MOTOR:	Satcon, 75 kW
BATTERIES:	PowerSonic, Lead-Acid, 18 Ah, 12 V

Team Information

FACULTY ADVISOR:	Dr. David Holloway
TEAM LEADERS:	Kevin Denton, Blaine Woehr

Team Name: UNIVERSITY OF MARYLAND FUTURETRUCK TEAM

Truck Name: PROTEUS

Team makeup: The University of Maryland FutureTruck Team consists of 35 students from the fields of mechanical engineering, electrical engineering, and computer science. One student is in the BS/MS Graduate Automotive Technology Education (GATE) program at Maryland, while all other participants are undergraduates that take FutureTruck as a senior-year, technical design elective.

Approach to hybrid design: Our vehicle is an ethanol-fueled parallel hybrid, in which the electric motor is connected through the back of the transfer case.

Goals in participating in FutureTruck: FutureTruck provides students with a hands-on engineering problem. It encourages innovation, creativity, and it allows students to view a project from the outside in – meaning they are responsible for and aware of all facets of engineering, including obtaining sponsorship, soliciting funding, writing proposals, design descriptions, procurement, design, modeling, testing, and implementation. In addition, FutureTruck creates media and recruiting opportunities for the University of Maryland engineering school.

University of Tennessee

Vehicle Information

HYBRID TYPE:	Parallel
FUEL:	Biodiesel (B20)
ENGINE:	Alfa Romeo JTD, 2.4-L, 5-cylinder
MOTOR:	Lynx Motion Technologies, 90 kW
BATTERIES:	Odyssey, Lead Acid 16 Ah

Team Information

FACULTY ADVISORS:	Dr. Jeff Hodgson, Dr. William Hamel
TEAM LEADERS:	Jason Shrieves, Craig Rutherford

Truck Name: LUCI

Team makeup: Our team consists of 16 undergraduate and 10 graduate students. The project is offered for capstone design credit to mechanical engineering seniors, as a controls class for electrical and mechanical engineering graduate students, and as elective credit to other majors.

Approach to hybrid design: Our FutureTruck uses a parallel traction assist hybrid design, which incorporates a high-efficiency direct injected diesel engine coupled to an in-line axial air gap electric motor. In addition, we are replacing some of the vehicle heat exchangers with carbon foam composite radiators, and the team is currently studying a microwave regenerated particulate trap and NO_x absorbers for added emissions control.

Goals in participating in FutureTruck: The goals of the University of Tennessee team are to provide a unique learning environment for students while developing technologies to improve the lives of all people (while winning!). Our university has been involved in competitions of this type almost since their beginning. The competitions have provided the university with a real-world practical design experience for students, as well as national recognition as a school with a strong background of automotive engineering. There is no doubt that vehicle challenge competitions enrich the academic experiences of all participants.

University of Wisconsin - Madison

Vehicle Information

HYBRID TYPE:	Parallel
FUEL:	Diesel
ENGINE:	Ford, 2.4-L, 4-cylinder
MOTOR:	Solectria, 78 kW
BATTERIES:	Moltech Power Systems, Nickel Metal Hydride, 16.8 Ah

Team Information

FACULTY ADVISOR:	Dr. Glenn Bower
TEAM LEADER:	Jenny Topinka
Team Name:	UW FUTURETRUCK TEAM
Truck Name:	MOOLLENNIUM

Team makeup: Our team has 37 undergraduate and 3 graduate students. All of our graduate students and over 60% of our undergraduates are studying mechanical engineering. Other team members are studying electrical and computer engineering (25%), industrial engineering (5%), material science (2.5%). We also have 15-20 undergraduate students taking FutureTruck for technical design elective credit.

Approach to hybrid design: We plan to use lightweight components to reduce the load on our parallel electric assist drivetrain. This will improve fuel economy and emissions without sacrificing utility, safety, or consumer acceptability.

Goals in participating in FutureTruck: Our team members gain valuable real-world engineering experience by working on the FutureTruck project. We develop mutually beneficial relationships with industry suppliers and employers.

Virginia Tech

Vehicle Information

HYBRID TYPE:	Series
FUEL:	Compressed Hydrogen
ENGINE:	Fuel cell system, approx. 100 kW
MOTOR:	(2) PEI EV 2000, 100 kW
BATTERIES:	Hawker Genesis, Sealed Lead-Acid, 42 Ah

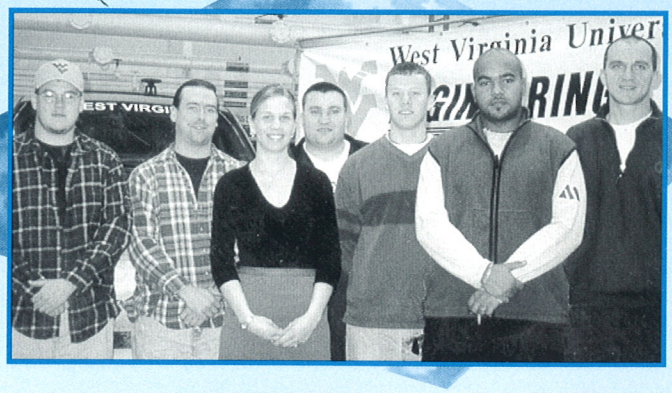
Team Information

FACULTY ADVISOR:	Dr. Doug Nelson
TEAM LEADERS:	Mike Ogburn, Stephen Gurski, Paul Bryan
Team Name:	HYBRID ELECTRIC VEHICLE TEAM [HEVT]
Truck Name:	ZEBURBAN

Team makeup: Our team has over 60 active members majoring in mechanical engineering, electrical and computer engineering, computer science, industrial design, engineering science and mechanics, and others. Thirty-eight members of the team are undergraduate mechanical engineering majors, who are working on the vehicle as part of their senior capstone design project. There are also 10 electrical engineers on the team, some of whom are working on the team for undergraduate research credit. There are also several other undergraduate engineers who work on the team on a volunteer basis. The graduate students who are on the team have worked on the team as undergraduates and are helping out while they are in graduate school.

Approach to hybrid design: The HEVT has been working at the cutting edge of technology, and this year is no exception. For this year's competition, a hydrogen fuel cell system is being designed for use in a series hybrid configuration. This design will yield the least tail pipe emissions, and since the focus this year includes greenhouse gas emissions, the team decided this would be the best approach to lowering the overall fuel cycle emissions. Hydrogen fuel cells are in use on a limited basis today. Major automotive manufacturers are using fuel cells in vehicles with hydrogen as the fuel of the future.

Goals in participating in FutureTruck: We are excited to participate in this national engineering research challenge, with tough technical goals – and tough competition! FutureTruck gives our team educational opportunities that are hard to come by in the classroom, like leadership, teamwork, and testing and refining a design until it works. Participation in FutureTruck exposes our team and the university to environmental issues and solutions for personal transportation.



West Virginia University

Vehicle Information

HYBRID TYPE:	Parallel
FUEL:	Diesel
ENGINE:	VM Motori 4.2-L, In-line 6, 180 hp
MOTOR:	Unique Mobility 75 kW
BATTERIES:	Panasonic, Sealed Lead-Acid, 17 Ah, 12 V

Team Information

FACULTY ADVISOR:	Dr. Chris Atkinson
TEAM LEADER:	Jason Conley

Team makeup: Our team has 15 undergraduate and 4 graduate students. All of our graduate students and 13 of our undergraduates are studying mechanical engineering. The other 2 team members are studying computer engineering.

Approach to hybrid design: The key to our hybrid strategy this year is a transfer case housing the 4-wheel-drive components as well as the electric motor. This type of case would be useful in integrating a hybrid system into a production vehicle.

Goals in participating in FutureTruck: This competition prepares our students for industry and makes them extremely marketable. All of the students working on FutureTruck are exposed to advanced vehicle technology that they may never have experienced otherwise. In addition, West Virginia University benefits by using the FutureTruck competition as a recruiting tool to attract new students to the university.

FutureTruck

COMPETITION ORGANIZERS

Laurie Ambrose	Argonne National Laboratory
Gary Baker	Natural Resources Canada
Matt Bardy	GM Vehicle Development Test Operations
Jerry Barnes	General Motors
Ted Bohn	Argonne National Laboratory
Doug Cesiel*	GM Truck Group
Gary Chin	GM Truck Group
Cheryl Clark	GM Truck Group
Cathy Cole	GM Truck Group
Kristen De La Rosa	Argonne National Laboratory
Mike Duoba	Argonne National Laboratory
Daryl Ehrlich*	GM Truck Group
Brian Ernst	General Motors
Brian Gargiulo	GM Vehicle Development Test Operations
Mary Giglio	Renewable Fuels Association
Ernie Granillo	GM Vehicle Development Test Operations
Jack Groh	Groh Associates
George Hazelrigg	National Science Foundation
Lola Helming	National Biodiesel Board
Barbara Hennessey	National Highway Transportation Safety Administration
Kevin Horton	GM Truck Group
Ed Hyman*	GM Truck Group
Justin Jans	GM Vehicle Development Test Operations
P.T. Jones*	GM Truck Group
Justin Kern	Argonne National Laboratory
Dick Klimisch	Aluminum Association
Don Knight	GM Vehicle Development Test Operations
Robert Krouse*	GM Truck Group
Bill Langhorst	GM Powertrain
Bob Larsen	Argonne National Laboratory
A.J. Lasley	Delphi Automotive Systems
Shelley Launey	U.S. Department of Energy
Pam Mabery*	GM Truck Group
Kevin MacFadden	GM Truck Group
Patrick Maguire	Ford Motor Company
Mark Maher	GM Truck Group
Aram Manoogian	GM Truck Group
Sam McCahon	National Biodiesel Board
Dennis McClemment	Automotive Testing Laboratories
Christine McGhee	Argonne National Laboratory
Renée Nault	Argonne National Laboratory
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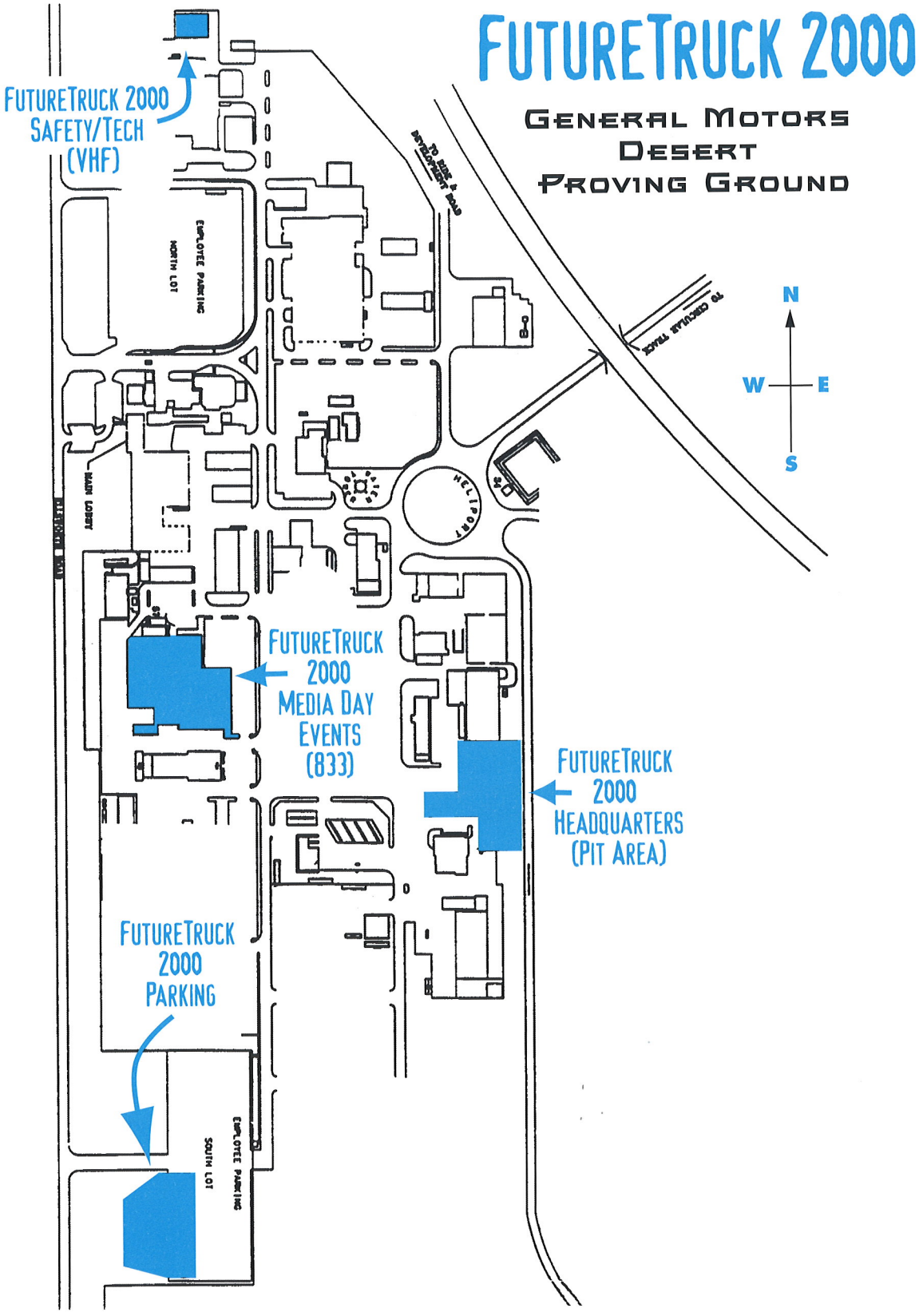
Jace Petersen	GM Vehicle Development Test Operations
Corey Rogers	GM Vehicle Development Test Operations
Dave Rosa*	GM Truck Group
Jim Schell	GM Truck Group
Becky Snedeker	Aluminum Association
Thad Stump	GM Truck Group
Cindy Svestka	Argonne National Laboratory
Conrad Tarnacki	GM Truck Group
Nada Usina	Yahoo! Inc.
Paula Verost	GM Vehicle Development Test Operations
Betty Waterman	Argonne National Laboratory
Eric Wentworth	GM Vehicle Development Test Operations
Nicole Wildern	GM ATV
Frank Witt	GM Truck Group
Randy Yost*	GM Truck Group
Pam Younggren*	GM Truck Group
Paul Zangari	Groh Associates

*Special thanks goes to these outstanding individuals who served as Team Mentors. Each was assigned 1-2 teams to work with and visit periodically throughout the year. The Mentors proved themselves invaluable as resources to the teams and organizers alike!

HOST SITE


FUTURETRUCK 2000
GENERAL MOTORS
DESERT
PROVING GROUND
FUTURETRUCK 2000
SAFETY/TECH
(VHF)
EMPLOYEE PARKING
NORTH LOT
TO DIRT & DEVELOPMENT ROAD
TO CIRCULAR TRACK
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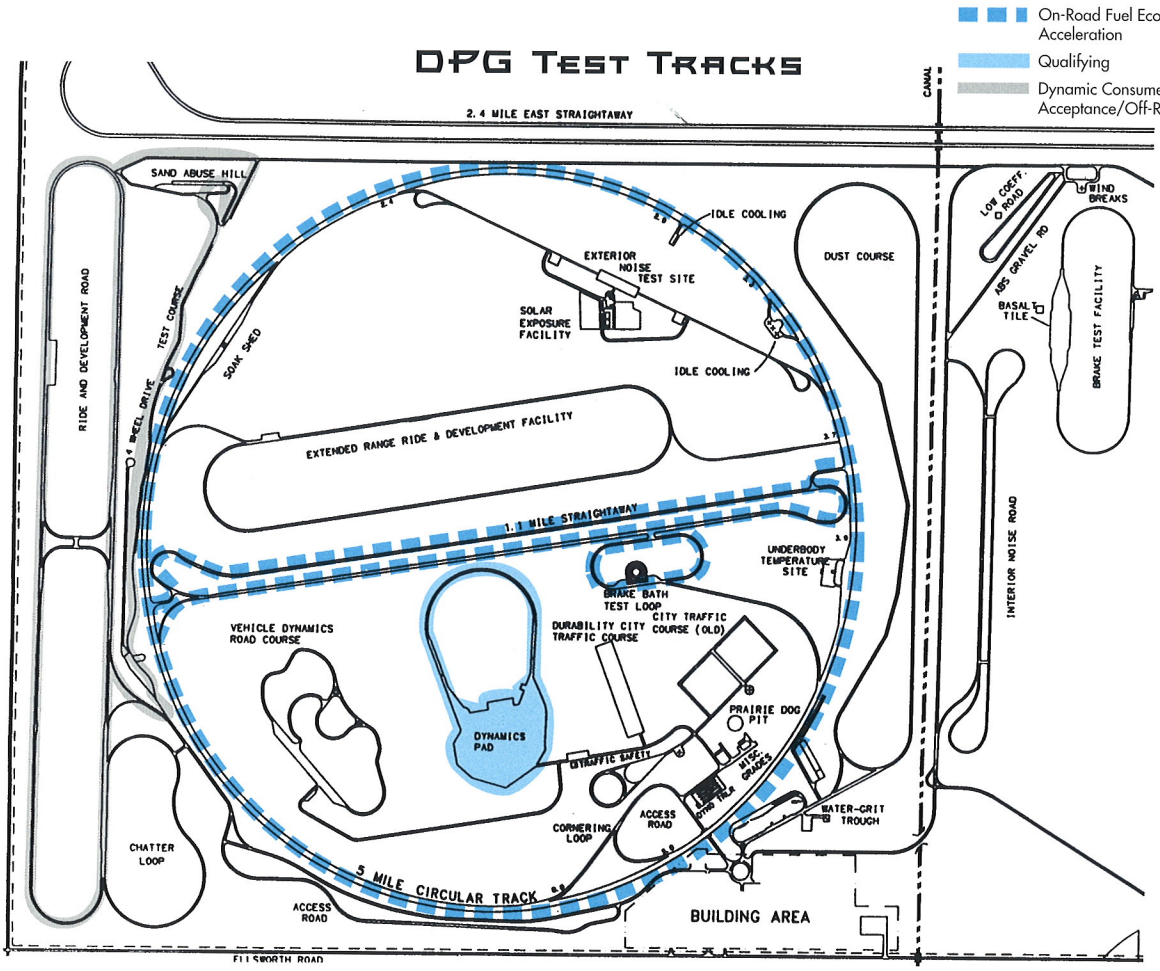
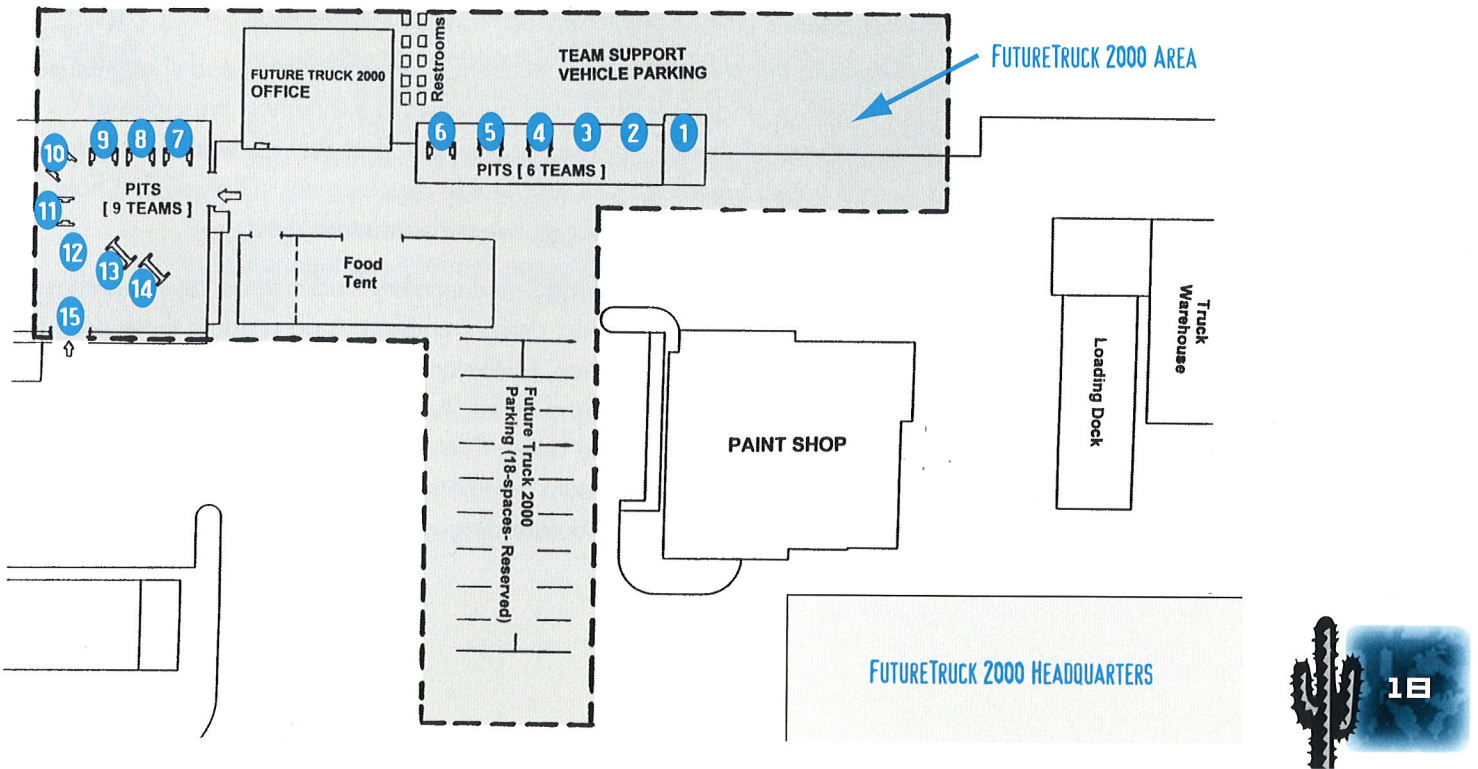
PARKING
EMPLOYEE PARKING
SOUTH LOT

DPG Test Tracks



Pit Area Map



COMPETITION SPONSORS

Headline Sponsors

U.S. Department of Energy

The U.S. Department of Energy (DOE) launched its student vehicle competition program in 1989. By combining the next generation of technical innovators with today's emerging advanced transportation technologies, FutureTruck 2000 will help ensure a sustainable, environmentally responsible transportation future. DOE has an aggressive research and development program in advanced vehicle technologies. DOE and its network of national laboratories support work in fuel cells, energy storage, hybrid systems, advanced materials, alternative fuels, and heat engines. DOE's primary transportation mission is to turn the corner on oil imports by improving vehicle efficiency. At the same time, we also work to improve vehicle emissions.

Student vehicle competitions have been an effective way to demonstrate and test the technologies developed in the laboratory. Close to 20,000 students have received hands-on engineering experience in these competitions, and many of them move on to take jobs in the automotive industry, bringing with them an understanding of and enthusiasm for advanced vehicle technologies.

General Motors Corporation

General Motors Corporation, founded in 1908, is the world's largest full-line vehicle manufacturer. GM manufactures and markets cars, trucks, automotive systems, heavy-duty automatic transmissions, and locomotives worldwide. Our vision is to be the world leader in transportation products and related services. We will earn our customers' enthusiasm through continuous improvements driven by integrity, teamwork, and innovation of GM people.

GM and its people understand the need to balance economic, environmental, and social issues. We understand that, as a global leader, we must hold ourselves to the highest principles of responsibility for our environmental, health, and safety activities, and that the world will judge us by our actions. Our shared beliefs have led us to sustainable development initiatives that hold great potential for benefiting both GM and the world in which we work.

The GM Truck Group develops a variety of light- and medium-duty trucks, vans, and cab-chassis for markets around the world. Truck team members design, engineer, and validate these products and the related manufacturing processes in Pontiac, Michigan. Further testing takes place at the GM Proving Grounds in Milford, Michigan, and Mesa, Arizona. More than 48,000 team members, whether salaried or represented by the UAW, CAW, IUE, or other unions, build our truck products in 14 plants in North America. These team members use the most advanced processes, tools, and technologies to develop and produce outstanding vehicles.

YAHOO! INC.

Yahoo! Inc. is a global Internet communications, commerce, and media company that offers a comprehensive branded network of services to more than 145 million individuals each month worldwide. As the first online navigational guide to the Web, www.yahoo.com is the leading guide in terms of traffic, advertising, household, and business user reach, and is one of the most recognized brands associated with the Internet. The company also provides online business services designed to enhance the Web presence of Yahoo!'s clients, including audio and video streaming, store hosting and management, and Web site tools and services. The company's global Web network includes 22 local world properties outside the United States.

Yahoo! Broadcast (http://broadcast.yahoo.com) is an important component of Yahoo!'s comprehensive suite of business services designed to enable companies to conduct business efficiently online. Yahoo! Broadcast is a leading provider of turnkey Internet broadcasting solutions and tools to help businesses communicate with their customers, employees, and shareholders in real-time.

Yahoo! Autos (http://autos.yahoo.com) provides users with a free comprehensive road map for researching, buying, selling, and maintaining new and used cars in one central place on the Web.

MAJOR SPONSORS

NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) is an independent agency of the U.S. federal government responsible for investing over $3.3 billion annually in almost 20,000 research and education projects covering nearly all fields of science and engineering. The Foundation encourages high quality in education at all levels and heavily supports graduate education in the sciences and engineering. It is well known for its promotion of science, the numerous advances it has funded, and the recognition that its grantees have achieved, including several Nobel prizes and other highly prestigious awards. NSF funds an outstanding faculty award honoring academic leaders who have shown exceptional leadership during the FutureTruck program.

National Highway Traffic Safety Administration

NHTSA
People Saving People
http://www.nhtsa.dot.gov

The National Highway Traffic Safety Administration (NHTSA) is responsible for reducing deaths, injuries, and economic losses resulting from motor vehicle crashes. This is accomplished by setting and enforcing safety performance standards for motor vehicles and motor vehicle equipment, conducting research on driver behavior and other traffic safety issues, and developing effective means of bringing about safety improvements through advanced technology research, traffic safety campaigns, and consumer information programs.

Many advances have been made over recent years in vehicle occupant safety. The ongoing development of advanced air bag and restraint systems, smart cruise control, antilock brakes, automatic crash notification systems, crashworthiness of alternative fuel propulsion systems, to name just a few, offer new and exciting career opportunities. Through its participation in the FutureTruck Challenge, NHTSA can share its mission with the next generation of automotive engineers, many of whom will be working on safety issues in this competition and specializing in the design of vehicle safety systems in the future.

The Aluminum Association

The Aluminum Association, based in Washington, D.C., with offices in Detroit, Michigan, is the trade association for U.S. producers of primary aluminum, recyclers, and semi-fabricated aluminum products. Its Automotive and Light Truck Group works to accelerate the use of aluminum in automotive structures and components by demonstrating and promoting that it is the material of choice for high-value, safe, environmentally friendly, and superior-performing vehicles. Member companies operate nearly 200 plants in 37 states.

Automotive Testing Laboratories, Inc.

Automotive Testing Laboratories, Inc. (ATL), was established in 1971 with the objective of supplying high quality, independent vehicle testing services to industry and government. ATL performs exhaust and fuel economy testing in accordance with EPA and California Air Resource Board (CARB) protocols. Available facilities include chassis and engine dynamometers (including a full time, 4-wheel dynamometer), vehicle enclosures for evaporative emissions, automated analytical benches for regulated pollutants, chemical laboratory support, and fuel mixing and analysis capabilities. Laboratories are operated in East Liberty, Ohio, and Mesa, Arizona. Nearby test tracks are used for related outdoor testing procedures at both sites.

ATL's past and present clients include the U.S. Environmental Protection Agency (EPA), the California Air Resources Board (CARB), the Coordinating Research Council (CRC), the Department of Energy (DOE) and DOE's National Renewable Energy Laboratory (NREL), the American Petroleum Institute (API), and nearly every automobile manufacturer selling vehicles in the United States. ATL provided EPA with significant support in its development of current testing protocols of both new and in-use light-duty vehicles, particularly the development of the running loss test for evaporative emissions and the IM240 test for transient exhaust testing of in-use vehicles. Many OEM and aftermarket vehicle component suppliers, oil and oil additive manufacturers, and tire manufacturers have utilized our extensive capabilities.

ATL's Mesa lab will be performing chassis dynamometer tests to measure emissions and fuel economy for the FutureTruck competition.

Delphi Automotive Systems

Delphi Automotive Systems, headquartered in Troy, Michigan, is a world leader in transportation and mobile electronics components and systems technology. Delphi's three business sectors – Dynamics and Propulsion; Safety, Thermal and Electrical Architecture; and Electronics and Mobile Communication – provide comprehensive product solutions to complex customer needs. Delphi Automotive Systems is committed to reducing the environmental impact of the automobile, now and in the future. Delphi has a history of innovative solutions that improve fuel economy, reduce emissions, decrease vehicle mass, and increase the recyclability of our products. These objectives are synergistic with and benefit from the goals of the FutureTruck program. Additional information on Delphi products can be found on the Internet at www.delphiauto.com.

Competition Supporters

Natural Resources Canada

Natural Resources Canada (NRCan), through its research and technology development arm, CANMET Energy Technology Centre, is a proud sponsor of FutureTruck 2000. NRCan, in partnership with the U.S. Department of Energy, has been a sponsor of these student vehicle competitions since they first began in 1989. By combining the next generation of technical innovators with some of North America's emerging alternative transportation technologies, the FutureTruck competition is helping to ensure a sustainable, environmentally responsible transportation future.

Governors' Ethanol Coalition

The Governors' Ethanol Coalition is a bipartisan organization representing 22 governors interested in expanding the market for ethanol. The Coalition also includes representatives from Brazil, Canada, Mexico, and Sweden. The goals of the Coalition are to increase the use of ethanol-based fuels, decrease the nation's dependence on imported energy resources, improve the environment, and stimulate the national economy. These goals are accomplished by educating the public about the benefits of ethanol use, encouraging ethanol fuel production and use through research and market development efforts, and investing in infrastructure that supports expansion of the ethanol market. The Coalition supports the production of ethanol from corn or other domestic, renewable resources using sustainable agricultural methods and encourages its use in environmentally acceptable applications.

Renewable Fuels Association

The Renewable Fuels Association (RFA) is the national trade association for the U.S. fuel ethanol industry. The RFA works to expand production and consumer use of renewable ethanol fuels in the U.S. fuels market. Membership includes producers, marketers, and blenders; equipment manufacturers; energy and engineering companies; and environmental, consumer, and agri-business organizations.

RFA is supporting the FutureTruck competition because it provides the ethanol industry with the opportunity to introduce the next generation of automotive engineers to ethanol, which has an important and growing role in our nation's fuel supply. Students have demonstrated that vehicles optimized for E85 can achieve improved fuel economy and emissions reductions when compared with gasoline.

National Biodiesel Board

The National Biodiesel Board (NBB) is a national nonprofit trade association, which serves as the coordinating entity for the research, development, and commercialization of biodiesel in North America. NBB's member organizations include all major state and national soybean commodity boards, as well as biodiesel fuel producers and marketers, and other national industry associations from the U.S. and Canada.

Recently, the biodiesel industry has seen the achievement of 3 long-term objectives. First, in March 1998, biodiesel became the only alternative fuel in the country to have successfully completed the EPA-required Tier I Health Effects testing under the Clean Air Act. Second, effective November 1998, Congress approved B20, a blend of 20% biodiesel and 80% petroleum diesel, as the first fuel use option under the Energy Policy Act (EPAct). The legislation allowed EPAct fleets to meet their alternative fuel vehicle purchase requirements simply by buying 450 gallons of pure biodiesel and burning it in new or existing diesel vehicles in at least a 20% blend with diesel fuel. Finally, in December 1998, the American Society of Testing and Materials (ASTM) issued a provisional specification (PS 121) for biodiesel. As a result of the completion of these 3 objectives, over 40 major fleets have begun using biodiesel over the last 14 months.

The NBB is pleased to be a sponsor of FutureTruck 2000. World Energy Alternatives, an NBB member fuel supplier, donated biodiesel that will be used in the vehicles of 3 of this year's competing universities: the University of Idaho, the George Washington University, and the University of Tennessee.

Newark Electronics

Newark Electronics is the market leading distributor of electronic components in North America. Newark Electronics is a part of the global business to business distributor Premier Farnell plc. At Newark Electronics, we understand your needs. Over the years we have paid close attention to the needs of our customers across North America. Traditional values, professionalism, financial stability, and a long-term growth perspective are but a few of the key words that describe Newark Electronics. The history of Newark is the history of electronics distribution. Log on to www.newark.com/edusave or www.newark.com, or call 1-800-4-NEWARK today to find out more information.


SUBURBAN

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- Concordia University
- Cornell University
- George Washington University
- Georgia Institute of Technology
- Michigan Technological University
- Ohio State University
- Pennsylvania State University
- Texas Tech University
- University of California, Davis
- University of Idaho
- University of Maryland
- University of Tennessee
- University of Wisconsin - Madison
- Virginia Tech
- West Virginia University

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- U.S. Department of Energy
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- National Highway Traffic Safety Administration
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- Delphi Automotive Systems
- Natural Resources Canada
- Governors' Ethanol Coalition
- Renewable Fuels Association
- National Biodiesel Board
- Newark Electronics

A collegiate engineering competition managed by Argonne National Laboratory

For more information visit www.futuretruck.org