FUTURETRUCK 2002

Driving technology toward a greener tomorrow

FutureTruck

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

Ford

NO BOUNDARIES
FORD OUTFITTERS

Efficiency = $e \cdot 1 - r^{\frac{1}{k-1}}$

$= 1 - \frac{1}{(6)^{0.4}} = 0.512$

FutureTruck
June 11-21, 2002

Ford's Arizona Proving Ground
Yucca, Arizona • June 11-16, 2002

- Safety/Tech Inspection Event
- Opening Ceremony
- Acceleration Event
- Off-Road Event
- Trailer Towing Event
- On-Road Fuel Economy Event

University of California, Riverside, Center for Environmental Research and Technology
California Air Resources Board
El Monte, California
June 17-19, 2002

- Emissions Testing
- Greenhouse Gas Impact Event

Marriott
Ontario, California • June 18, 2002

- Oral Presentations Event

California Motor Speedway
Fontana, California
June 19-20, 2002

- Vehicle Design Inspection Event
- Consumer Acceptability Events
- Vehicle Appearance Event
- Sponsored Awards for:
  - Cisco Systems Telematics Award
  - ArvinMeritor Integrated Airflow and Emissions Award
  - National Instruments LabVIEW™ Real-Time Award
  - Most Innovative Use of Aluminum Award

Los Angeles, California
June 21, 2002

- Vehicle Display and Press Conference
  Third Street Promenade, Santa Monica
- Awards Ceremony
  The Regent Beverly Wilshire, Beverly Hills

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Driving technology
FUTURETRUCK 2002
YUCCA, ARIZONA - LOS ANGELES, CALIFORNIA JUNE 11-JUNE 21
toward a greener tomorrow

Ford

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FORD OUTFITTERS

DEPARTMENT OF ENERGY · UNITED STATES OF AMERICA

"FutureTruck brings government, industry, and academia together to explore new innovative approaches to developing fuel-efficient, low-emissions sport utility vehicles. The advanced automotive engineering technologies explored in FutureTruck are important tools to reduce the U.S. and Canada's dependence on foreign oil."

—Spencer Abraham
Secretary of Energy

FutureTruck
www.futuretruck.org

June 11, 2002

Dear FutureTruck Team Members,

Welcome to FutureTruck 2002! Ford Motor Company is pleased to co-sponsor this challenging event. We are excited to be involved with this effort to develop advanced technology.

As we move into the future, it is becoming increasingly more important that popular products like the Explorer continue to offer high customer satisfaction in the areas of safety, performance, function, style, and cost while becoming increasingly more energy efficient and producing fewer emissions. The FutureTruck competition is unique in that it allows us to explore not only the environmental benefits of innovative new technologies, but also how consumers interact with these technologies.

Over the course of the last year, you have experienced many of the challenges of engineering cutting-edge technologies into a vehicle that is still capable of meeting the diverse demands of the marketplace. No doubt you have learned many valuable lessons, and we are hopeful that you will further develop this knowledge as you join the problem-solving teams of tomorrow.

Upon entering the FutureTruck program, you identified the complex goals you wanted to achieve. You are to be commended for meeting these goals and attending this demanding event at the Arizona Proving Ground. We at Ford Motor Company, as well as our co-sponsor—United States Department of Energy—and FutureTruck's many other industry and government sponsors, are looking forward to studying the ground-breaking solutions you have implemented on your Explorers and talking with you about lessons learned along the way.

The kind of cooperation that is taking place between industry, the U.S. and Canadian governments, and the 15 participating universities is an equally important outcome of this event. Fostering positive relationships and communication among various facets of society as we face these environmental challenges together is a vital objective; FutureTruck serves as an important step toward accomplishing this goal.

Ford Motor Company welcomes you to Arizona and wishes you all the very best of luck!

Bob Himes
Director of Outfitters Engineering

Merle R. Ward
Arizona Proving Ground Manager

FUTURETRUCK

What Is FutureTruck?

FutureTruck is a unique four-year program that brings together the resources of industry, government, and academia in a cooperative effort to address important environmental and energy-related issues posed by the growing demand for sport utility vehicles (SUVs).

FutureTruck 2002 challenges teams of students from 15 top North American universities to reengineer a conventional, mid-size Ford Explorer into a lower-emissions vehicle with at least 25% higher fuel economy—without sacrificing the performance, utility, safety, and affordability consumers want. To meet these challenges, students employ cutting-edge automotive technologies; including fuel cells and other advanced propulsion systems; space-age materials; and alternative fuels, such as ethanol, biodiesel, and hydrogen. All of the teams in FutureTruck 2002 are implementing hybrid electric design strategies.

Where Is FutureTruck?

After months of preparation, team members will participate in eleven days of intense testing, scheduled for June 11-21, 2002. Vehicles will undergo more than a week of comprehensive safety evaluation and dynamic testing at Ford's Arizona Proving Ground in Yucca, Arizona. The teams will then travel to California, where their vehicles' emissions will be tested at the California Air Resources Board in El Monte and the University of California's Center for Environmental Research and Testing in Riverside. Immediately following the emissions testing, teams will participate in two days of dynamic and static design events at the California Motor Speedway in Fontana. The teams will then travel to Los Angeles for a vehicle display and awards ceremony.

Who Is Involved?

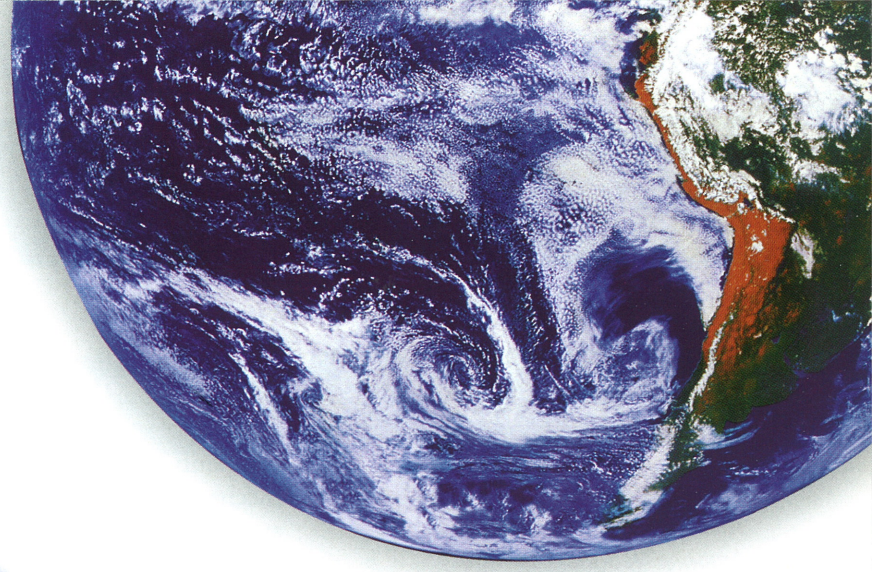
The U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (DOE) is partnering with Ford Motor Company as the headline sponsors of FutureTruck 2002 and 2003. Ford is providing the Explorer SUVs that the teams are modifying, almost $200,000 in seed and prize money, engineering consulting for each team, competition facilities, and operational support. Ford Motor Company has replaced General Motors Corporation, who served as the competition's headline sponsor with DOE in 2000 and 2001.

Argonne National Laboratory, a DOE research facility, provides competition management, team evaluation, and technical and logistical support. Fifteen private and public organizations are joining DOE and Ford to support this innovative engineering program. More than 300 participants from mechanical and electrical engineering, computer science, and other disciplines will participate.

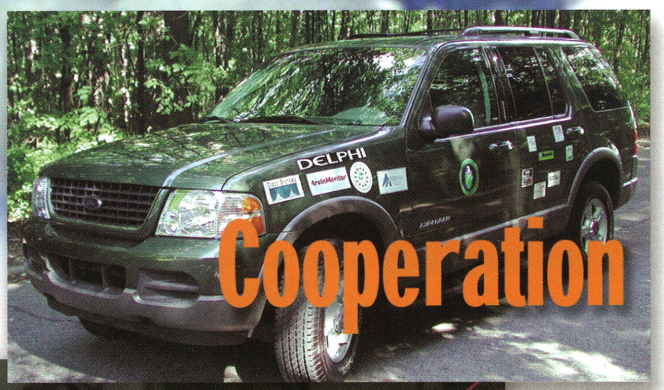
Why Is FutureTruck Important?

Today more than 50% of all new vehicle sales are SUVs and light-duty trucks, contributing to increased greenhouse gas (GHG) emissions and further dependence on foreign oil because SUVs historically have been less energy-efficient than cars. FutureTruck shows that the cooperation of industry, government, and academia is the best approach to developing more energy-efficient and "greener" automotive technologies, to improving our economy and our environment, and to keeping North American technology competitive on a global basis. The competition also helps develop hundreds of highly skilled engineers with a greater awareness of these technologies—preparing them to lead the automotive industry in the 21st century.

2002



Innovation



Cooperation

Dedication

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FutureTruck 2002 Event & Award Descriptions

Pre-Competition Reports and Pre-Inspections (75 Points)

Event Co-Captains: ***Nicole LeBlanc, Justin Kern*** *and* ***Ted Bohn,*** *Argonne National Laboratory*

FutureTruck teams are required to submit three design description reports throughout the competition year to update FutureTruck organizers about the fuels and technologies that they will be implementing. In addition, teams are required to submit two project updates that detail the team's organization and include timelines, organizational charts, and schedules for the project. Each pre-competition report is worth five points, for a total of 25 points.

Competition vehicles are inspected before the competition to ensure that the vehicles are operational and that all the main systems are functional. A total of 50 points is available in the following areas: installation and operation of data acquisition system, installation of fuel tank, leak check test of the exhaust, and general state of readiness of the vehicle.

Safety/Technical Inspections (Pass-Fail)

Event Captain: ***Justin Kern,*** *Argonne National Laboratory*

To qualify for the FutureTruck competition, teams must pass through three qualifying events: Safety/Technical Inspections, Braking, and Handling.

The Safety/Technical Inspection event evaluates vehicles for safety and verifies compliance with all competition rules for chassis, mechanical, electrical, and fuel systems. The inspections must be successfully completed before a vehicle is allowed to compete in dynamic events, and the organizers reserve the right to disqualify unsafe or incomplete vehicles from design events if they have not passed inspections. In addition, passing these safety and technical inspections does not remove a school from responsibility or liability for the safety of its vehicle.

Braking and Handling (30 Points)

Event Co-Captains: ***Jim Mitchell*** *and* ***Claudia Borges,*** *Ford Motor Company (Arizona Proving Ground)*

After Safety/Technical Inspections, teams must pass the Braking and Handling events to qualify for participation in the FutureTruck competition. The Braking and Handling events are designed to test dynamic vehicle safety and verify compliance with competition requirements.

The Best Dynamic Handling Award ($500) is presented to the team with the highest combined Handling and Braking scores.

Greenhouse Gas Impact (100 Points)

Event Captain: ***Justin Kern,*** *Argonne National Laboratory*

The objective of the Greenhouse Gas Impact event is a reduction in GHG emissions compared to the stock model year 2002 Explorer. The GHG emissions of each vehicle will consist of two measured components:

(1) upstream fuel-cycle emissions, and

(2) dynamometer emissions measurements

The GHGs measured and used in scoring this event are CO_2 (carbon dioxide), CH_4 (methane), and N_2O (nitrous oxide).

Upstream fuel-cycle emissions are those GHG emissions from a fuel's production and distribution cycle. These include GHG emissions from the primary energy recovery, transportation, and storage; the fuel production process; and the fuel transportation, storage, and distribution. Each vehicle will be assigned upstream GHG emissions based on the type of fuel used, according to a peer-reviewed analysis of GHG emissions contained in the Greenhouse gas, Regulated Emissions and Energy use in Transportation (GREET) model version 1.6.

The amount of energy consumed in the combined city and highway dynamometer tests will be used to calculate the amount of upstream GHG emissions attributable to each vehicle's operation. The dynamometer emissions are determined by using tailpipe emissions produced from the

combined city and highway dynamometer tests. The upstream fuel-cycle emissions and the dynamometer emissions for each vehicle are then combined to obtain the GHG impact number.

The Lowest Greenhouse Gas Emissions Award ($2,000) is presented to the team with the lowest GHG impact number or best score determined from this event.

On-Road Fuel Economy (100 Points)

Event Co-Captains: ***Bruce Potter*** *and* ***John Konarski,*** *Ford Motor Company (Arizona Proving Ground) Fueling Event Co-Captains:* ***Dennis Yuricek,*** *Ford Motor Company (Arizona Proving Ground) and* ***Dave Slimcoski,*** *Argonne National Laboratory*

This event demonstrates the robustness and on-road fuel economy of each vehicle. The total distance traveled (within prescribed speed limits) divided by the amount of energy (fuel and electricity) used determines the fuel economy, and thus the score. The event includes stop-and-go, urban, and highway driving segments.

The Best On-Road Fuel Efficiency Award ($2,000) is presented to the team with the highest fuel efficiency in the On-Road Fuel Economy event. Teams completing all laps with a fuel economy 25% above that of the stock Explorer are eligible for 100% of the event points.

Regulated Tailpipe Emissions (100 Points)

Event Co-Captains: ***Mike Duoba*** *and* ***Justin Kern,*** *Argonne National Laboratory*

Reducing emissions from on-road consumer vehicles is very important to future air quality. Manufacturers must design new SUVs to comply with more stringent regulatory limits on emissions levels. To earn points in this event, FutureTruck vehicles are required to meet real-world requirements by simultaneously controlling pollutants and meeting minimum federal Tier 0 emissions standards. The goal of the event is to meet California's Super Ultra Low Emissions Vehicle (SULEV) standards to receive full points.

The Lowest Regulated Tailpipe Emissions Award ($2,000) is presented to the team with the highest bracket in the Regulated Tailpipe Emissions event.

Acceleration (85 Points)

Event Co-Captains: ***Nolan Scarbrough*** *and* ***Pat Cook,*** *Ford Motor Company (Arizona Proving Ground)*

Passing and freeway merging performance remain key customer satisfaction criteria. To evaluate acceleration, the vehicles are staged single-file and run 1/8-mile on a straight course. Elapsed times are measured using photocell-based timing equipment, and trap speeds at the end of the run are recorded by radar for reference. Scores are calculated by using the lowest elapsed time of all runs. Teams must beat a time of 15.0 seconds to earn participation points. To be eligible for full points, teams must meet or beat a time of 11.5 seconds.

The Best Acceleration Award ($1,000) is presented to the team with the fastest acceleration time.

Off-Road (50 Points)

Event Co-Captains: ***Linus Chappell*** *and* ***Bob Howard,*** *Ford Motor Company (Arizona Proving Ground)*

To remain true to the heritage of SUVs, FutureTruck vehicles must demonstrate a high degree of off-road mobility, defined as a vehicle's ability to successfully negotiate off-road obstacles and routes. Four-wheel-drive capability is crucial to successfully negotiate all obstacles without damage or loss of function. The team's score is based on the sum of points for each measurement and obstacle a team passes. The measurement and inspection sections are worth up to 12 points, the obstacle section is worth up to 26 points, and the challenge section is worth up to 12 points.

The Best Off-Road Performance Award ($1,000) is presented to the team with the best score in the Off-Road event.

FutureTruck 2002 Event & Award Descriptions

Trailer Towing (50 Points)

Event Co-Captains: ***Jay Chan*** *and* ***James Garman,*** *Ford Motor Company (Arizona Proving Ground)*

The goal of this event is to demonstrate that the vehicle can tow a trailer up a hill at a reasonable speed; this is the highest load condition that will be placed on the vehicle. A tow dynamometer is attached to the vehicles to simulate pulling a 2000-pound trailer up a 5% grade at set speeds. The towing dynamometers measure draw-bar force and are regulated to keep the load at this point constant. To complete each stage, the vehicle must complete one lap at a set speed. This event consists of three consecutive stages for teams to complete to earn full points.

Best Technical Report (100 Points)

Event Co-Captains: ***Nicole LeBlanc,*** *and* ***Christine McGhee,*** *Argonne National Laboratory*

To demonstrate written communication skills, each team submits a written design report documenting its approach for meeting the FutureTruck goals. The report includes information on the concept, design elements, engineering analysis, and development of the vehicle. These reports are judged by a group of industry experts on content and mechanics.

The Best Technical Report Award ($1,500) is presented to the team with the highest score for the technical report.

Vehicle Design Inspection (100 Points)

Event Captain (Dynamic): ***Mike Ogburn,*** *Ford Motor Company*
Event Captain (Static): ***Duane Hartsell,*** *Ford Motor Company*

The Vehicle Design Inspection event consists of both a *static* and *dynamic* evaluation. In the *static* evaluation, which is worth 75 points, teams give brief presentations and answer questions from a team of industry and government judges. Judges will evaluate the vehicles in the following areas:

- engineering concept
- component selection and assembly
- weight reduction
- cost minimization
- material selection
- serviceability
- systems integration
- overall execution of the vehicle and its components

During the *dynamic* evaluation, which is worth 25 points, judges will evaluate the basic operation of the vehicle and review vehicle performance data from prior dynamic events to determine how successfully the team demonstrated the intent of its design. Specifically, the judges will evaluate the team's passive control strategy, hybrid operation, and powertrain operation.

This is not an evaluation of one technology over another, but an evaluation of the implementation of the design strategy.

The Best Vehicle Design Inspection Award ($1,500) is presented to the team with the highest combined score in the Vehicle Design Inspection event.

Best Use of Advanced Technologies

The Best Use of Advanced Technologies Award *($1,000)*, determined during the Vehicle Design Inspection static evaluation, is presented to the school that incorporates the best mix of advanced technologies. Equal weight is given to the number, application, level of development, and degree of integration in the overall vehicle design.

Best Workmanship Award

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 Design Inspection event.

Oral Presentation (100 Points)

*Event Co-Captains: **Shelley Launey**, and **TG Powell**, U.S. Department of Energy*

Up to two members of each team make a 15- to 20-minute oral presentation, then answer questions from a panel of government and industry experts for 5-10 minutes. The presentation should address how the team attempted to meet the competition goals, such as increased fuel economy and decreased emissions, without sacrificing the safety, performance, or utility of the stock vehicle. Teams should also validate or justify any modeling or performance prediction methods they used. Judges evaluate the teams based on presentation style (worth 30 points) and technical content (worth 60 points); and an additional 10 points can be awarded at the judges' discretion.

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

Consumer Acceptability (110 Points)

*Event Captain (Inspection): **Pax Maguire**, Ford Motor Company*
*Event Co-Captains (Dynamic): **Pat Cook** and **Nolan Scarbrough**, Ford Motor Company (Arizona Proving Ground)*

The Consumer Acceptability event consists of a vehicle inspection and a dynamic evaluation, both focusing on the prospective buyer's point of view. In the *vehicle inspection*, which is worth 60 points, judges evaluate the vehicle in three distinct sections: the driver area, general vehicle interior, and exterior of the vehicle. From the driver area, the judges evaluate seat comfort, adjustability, ease of entry and exit from the driver's seat, driver's visibility of the road, the gauges on the dash, and driver ergonomics. The interior of the vehicle is evaluated on the standard convenience features (i.e., visor, radio, functioning windows, interior lights, power windows, etc), interior fit and finish, and telematics features as they relate to driver interface, ease of use and useful features. The exterior of the vehicle is evaluated on functionality (i.e., opening/closing doors, lift gate, windows, hood release, and fueling ports), and fit and finish of the vehicle (i.e., panel spacing, trim, clean edges, etc).

The dynamic portion of the evaluation, which is worth 50 points, 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, no 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.

The Best Consumer Acceptability Award ($1,000) is presented to the team with the highest combined scores from the vehicle inspection and dynamic evaluation of the Consumer Acceptability event.

Best Appearing Vehicle

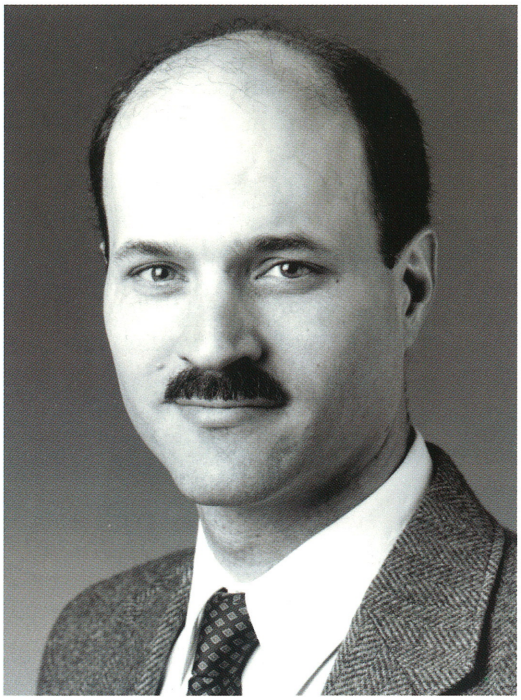
*Event Captain: **Lynda Palombo**, Natural Resources Canada*

Each vehicle must provide a visual impression that displays quality, value, and the professional pride of the team. The interior and exterior appearance of the competition vehicles will be judged for overall harmony of appearance, visual impact, graphics organization, color aerodynamic enhancements, fit and finish, and visual appeal.

The Best Appearing Vehicle Award ($1,000) is presented to the team with the highest score in the Vehicle Appearance event.

FutureTruck 2002 Event & Award Descriptions

Dr. Donald Streit Sportsmanship Award



This award is presented to the team that puts forth the highest level of assistance and support to other teams and organizers despite their own circumstances. This award is 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 was ended prematurely, his memory and his example are carried on by the students who have and will continue to participate in FutureTruck.

Spirit of the Challenge Award

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

Most Improved Team

This award is presented to the team that demonstrates the most improved overall performance over previous FutureTruck competitions. Improvement may be determined by performance in individual events or the overall competition.

Top Place Awards

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

First Place	**$6,000**
Second Place	**$5,000**
Third Place	**$4,000**
Fourth Place	**$3,000**
Fifth Place	**$2,000**
Sixth Place	**$1,000**

FutureTruck 2002 Sponsored Awards

National Science Foundation Outstanding Faculty Advisor Award

The National Science Foundation, well known for promoting science, has established an award to recognize and honor the critical role of the FutureTruck faculty advisor. Faculty advisors, 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. *$20,000*

Cisco Systems Telematics Award

This award recognizes teams for the best implementation of wireless Internet connectivity to their vehicle using Cisco networking gear and other standards based on off-the-shelf products. Three teams who demonstrate excellence in systems integration combined with practical Telematics applications will be selected for the award. *First Place—$1,000, Second Place—$750, Third Place—$500*

ArvinMeritor Integrated Airflow and Emissions Technology Award

This award is for the best-integrated design of the air induction and exhaust systems in the vehicles. ArvinMeritor sponsors the Integrated Airflow and Emissions Technology Award to encourage teams to explore and develop technology that leads to a reduction in tailpipe emissions and high-efficiency engine operation while maintaining customer acceptability. *$1,000*

Most Innovative Use of NI LabVIEW™ Real-Time Award

This award focuses on the teams' use of NI's LabVIEW™ Real-Time and RT Series hardware to demonstrate their ability to use a computer-based real-time measurement and automation system for their vehicle design. With the use of NI products, teams learn and apply theories of reliable, deterministic control loops with the latest embedded technologies. *First Place—$1,000, Second Place—$750, Third Place—$500*

The MathWorks Leadership and Teamwork Award

The MathWorks Leadership and Teamwork Award has been established to recognize the critical importance of leadership and teamwork within the FutureTruck teams. This award will be presented to an individual, sub-team, or entire team that best moved the FutureTruck program forward despite obstacles and challenges. Specifically, the emphasis is on the success of innovation, accelerating the pace of discovery, and working in a team setting to achieve better results. *$3,000*

Innovations in Aluminum Award

To achieve the FutureTruck 2002 Competition goals of decreasing emissions and increasing fuel economy without sacrificing safety or performance, many teams make use of aluminum in their vehicle designs. The Innovations in Aluminum Award evaluates each team's use of aluminum in its vehicle. Considerations include innovation, feasibility of using aluminum for the specific application, light-weighting potential, recyclability, execution/craftsmanship, and use of donated aluminum components. *First Place—$1,000, Second Place—$750*

Excellence in Renewable Fuels Award

FutureTruck teams have demonstrated that vehicles optimized for E-85 can achieve improved fuel economy and reduce emissions compared to gasoline. This award is given to a team that has used E-85 to accomplish these characteristics. The award is based on the team's Greenhouse Gas Impact score and the score from their technical report. *$1,000*

FutureTruck 2002 Organizers & Sponsors

Fabian Allard	Natural Resources Canada
Fawzan Al-Sharif	Ricardo, Inc.
Laurie Ambrose	Argonne National Laboratory
John Anderson	Argonne National Laboratory
Bob Bartholomew	PenTeleData
Julianne Bash	National Instruments
Jim Becker	Ford Motor Company
Ron Beeber	Delphi
Brent Boecking	National Instruments
Ted Bohn	Argonne National Laboratory
Paul Boisvert	Argonne National Laboratory
Claudia Borges	Ford Motor Company
Peter Brown	Ricardo, Inc.
Paul Bryan	Ford Motor Company
Steve Burke	Ford Motor Company
Jonathan Butcher	Ford Motor Company
Liz Callanan	The MathWorks
Jesús Cardoso	Ford Motor Company
Jay Chan	Ford Motor Company
Linus Chappell	Ford Motor Company
Pat Cook	Ford Motor Company
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Pat Ford	Ford Motor Company
Sherry Foster	Ford Motor Company
James Garman	Ford Motor Company
Shannon Gibson-Sysak	ArvinMeritor
Mary Giglio	Renewable Fuels Association
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Ryan Kennel	Ford Motor Company
Brad Kenoyer	Ford Motor Company
Justin Kern	Argonne National Laboratory
Richard Klimisch	Aluminum Association
Uta Koehler-Hardy	Argonne National Laboratory
John Konarski	Ford Motor Company
Shivkumar Kutty	Cisco Systems
Bob Larsen	Argonne National Laboratory
Shelley Launey	U.S. Department of Energy
Nicole LeBlanc	Argonne National Laboratory
Lori Long	Ford Motor Company
Dave Loos	Illinois Department of Commerce & Community Affairs
Pax Maguire	Ford Motor Company
Misty Matthews	Delphi
Melissa McEwen	Ford Motor Company
Christine McGhee	Argonne National Laboratory
Jim Mitchell	Ford Motor Company
Jeremy Moore	Ford Motor Company
Jamie Morgan	Ford Motor Company
Frank Niezabytowski	Ford Motor Company
Mike Ogburn	Ford Motor Company
Lynda Palombo	Natural Resources Canada
Guy Pinard	Natural Resources Canada
Walt Podolski	Argonne National Laboratory
Stefan Pototschnik	Ford Motor Company
Bruce Potter	Ford Motor Company
TG Powell	U.S. Department of Energy
Rob Randolph	Ford Motor Company
Valerie Rosnik	Ford Motor Company
Nolan Scarborough	Ford Motor Company
Damon Scott	Ford Motor Company
Raymond Shan	Ford Motor Company
Kathi Sherby	Kat & Dog Studio
Dave Shimcoski	Argonne National Laboratory
Tom Smyth	Natural Resources Canada
Becky Snedecker	Aluminum Association
Ed Sun	California Air Resources Board
Bill Swift	Argonne National Laboratory
Sara Tatchio	Ford Motor Company
Jon Thomas	Ford Motor Company
Roger Ueda	Ford Motor Company
Greg Urban	Ford Motor Company
Bob Usleman	ArvinMeritor
Sean West	Ford Motor Company
Dennis Yuricek	Ford Motor Company
Michael Zeller	National Instruments

FutureTruck 2002 Mentors

Ford Motor Company Mentor Program

A Ford Motor Company engineer was assigned to each team to provide technical mentoring. The mentors helped guide the teams through the vehicle design process and provided an industry perspective on their design approach. Ford mentors also helped the teams explore the benefits of their chosen technologies to help them produce the most efficient, consumer-acceptable vehicle possible.

"It is to industry's benefit to sponsor and support advanced automotive technology competitions such as FutureTruck. These events provide the opportunity to evaluate the school's engineering talent and obtain ideas for advanced technology and methodologies. The mentoring program produces ambassadors who can develop relationships that benefit both Ford Motor Company and the next generation of automotive engineering talent."

Jim Potter, Control Strategy Design—Transmission,
Ford Motor Company

"Working on FutureTruck has been a wonderful experience for me. It's been fun to help future engineers work through the types of issues we, in the auto industry, see all the time. Then to have the students come up with fresh, innovative ways of dealing with those issues is really exciting."

John Nalevanko, Windnoise,
Ford North American Truck

"I'm truly amazed at the passion, drive, commitment, and knowledge level of the students involved in this project. We (in industry) need to find a way to allow these ambitious, energetic people to apply themselves to our business without impeding them with some of the corporate drag we have in our day-to-day activities. The students show me how much work can be accomplished when only essential activities are worked on."

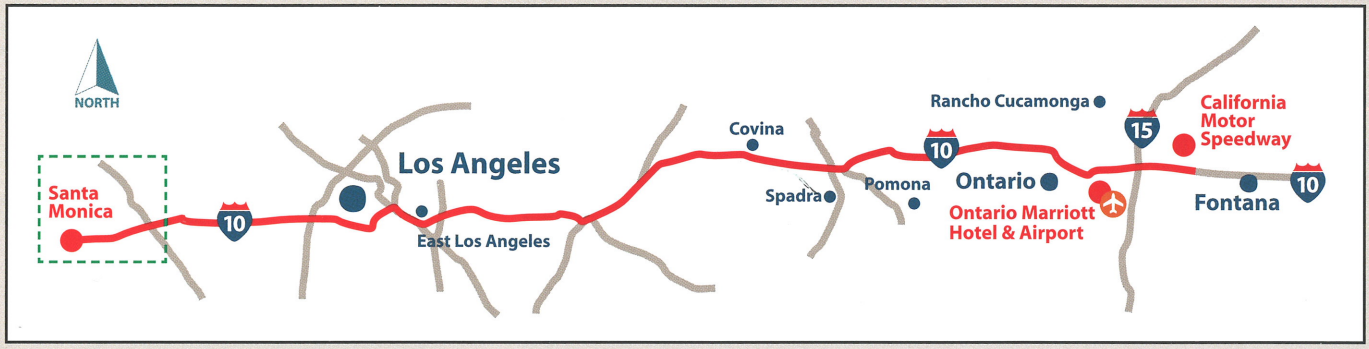
Tom Schramski, Axle/Driveline/4x4/AWD Systems
Supervisor, Global Core Engineering,
Ford Motor Company

Name	Assignment	School
Scott Bodjack	Escape/Tribute Vehicle Integration Supervisor	University of Tennessee, Knoxville
Dave Boggs	Engine Calibration Supervisor—HEV Escape	University of Wisconsin - Madison
Keith Carduner	Supervisor—OPD Planning	University of Alberta
Pat Curran	Technical Specialist—Fuel Control Development	Pennsylvania State University
Seepaul Lyman	Noise, Vibration, and Harshness (NVH) Engineer	California Polytechnic State University, San Luis Obispo
Brandon Masterson	Vehicle Development Engineer	Michigan Technological University
John Nalevanko	NVH Engineer—Wind noise	Georgia Institute of Technology
James Potter	Control Strategy Design—Transmission	Ohio State University
Deepa Ramaswamy	Hybrid Electric Vehicle Controls Supervisor	Cornell University
Tom Schramski	Axle/Driveline/4x4/AWD Systems Supervisor	University of California, Davis
Jack Szpytman	EcoStar Electric Drive Systems Manager	West Virginia University
Hoang Troung	Ranger Program Management	Texas Tech University
Bill Weidenaar	Truck Vehicle Engineering Supervisor	University of Idaho
Russ Worosz	E-Series Powertrain Program Management	University of Maryland
Min Zhu	Supervisor—Manual Transmission & Clutch	Virginia Tech

Roadtrip Map: Yucca, AZ to Ontario, CA

Ontario Area Map

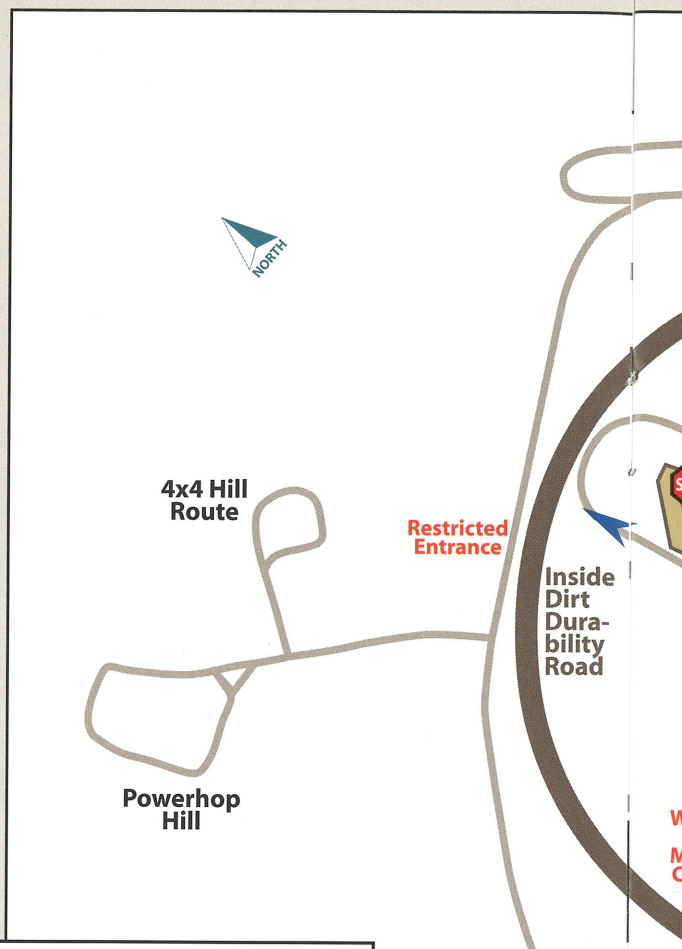
Roadtrip Map: Ontario to Santa Monica

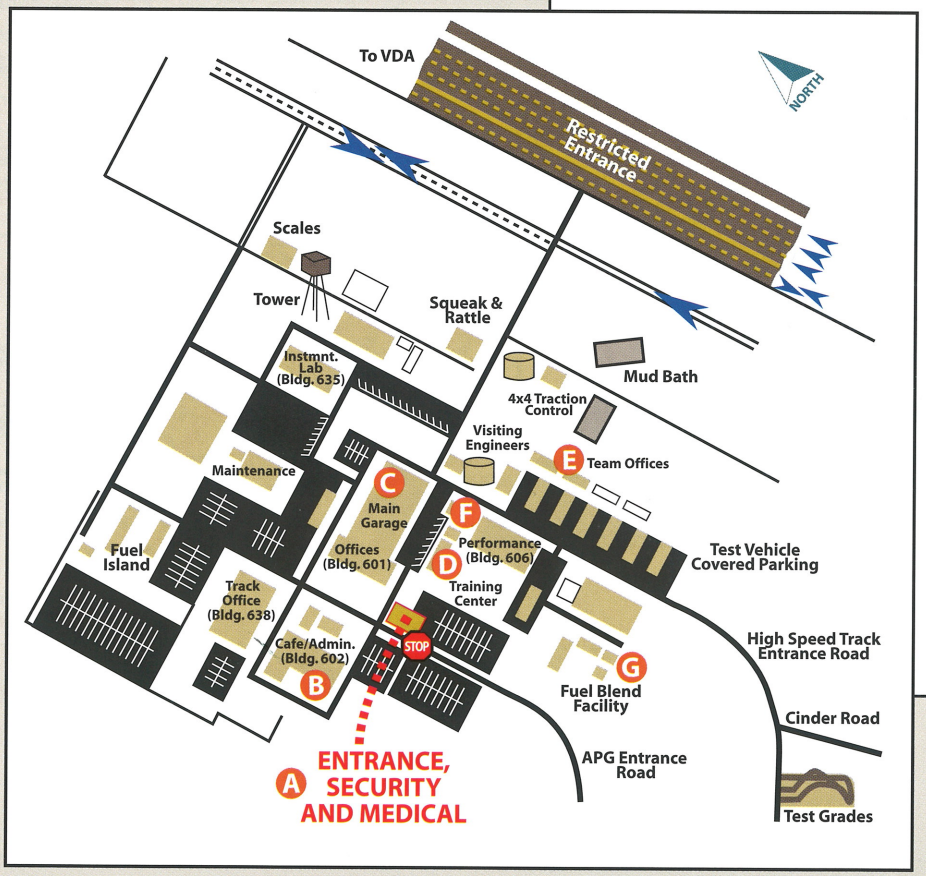


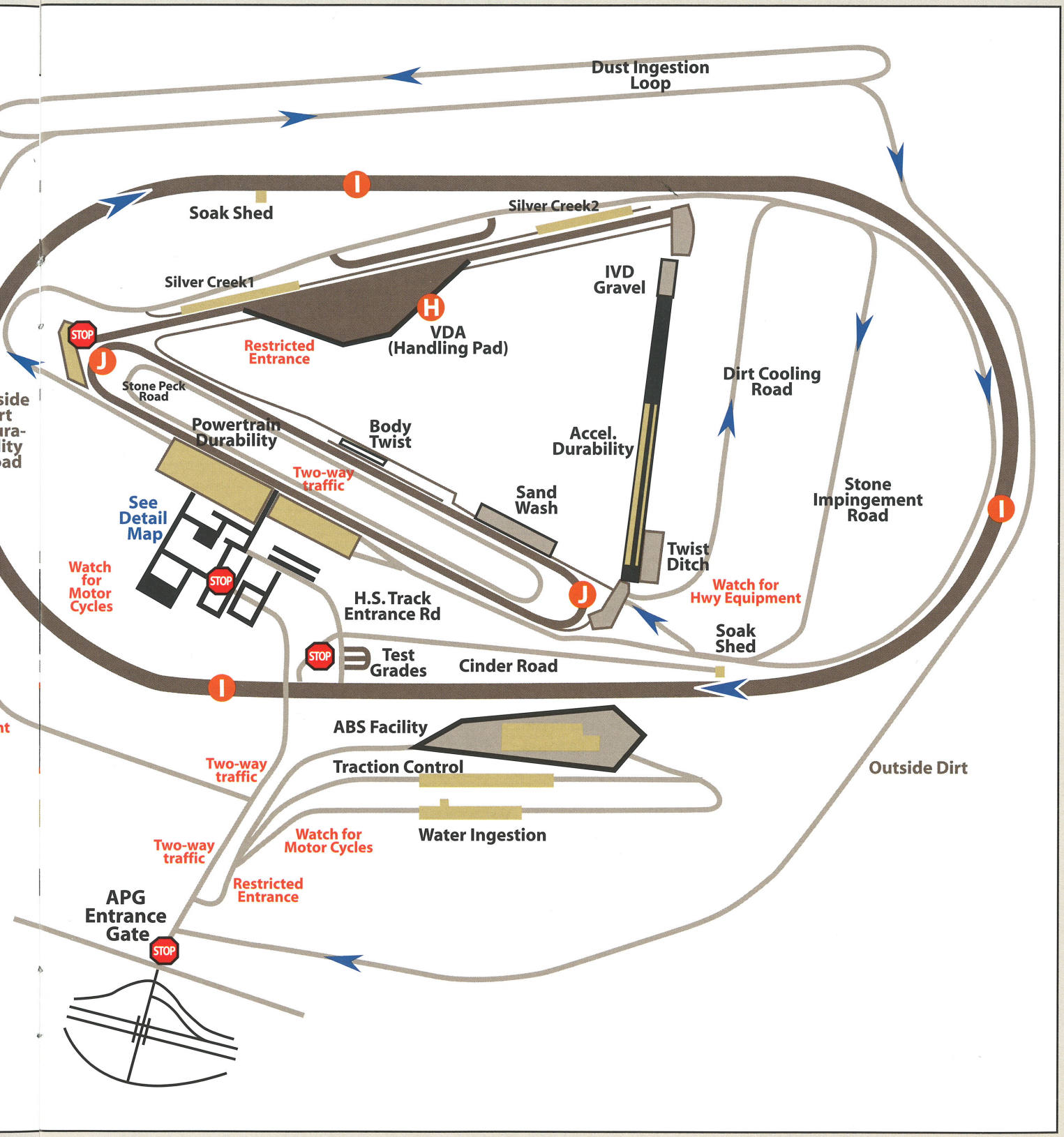
Santa Monica/Beverly Hills Area Map

Arizona Proving Ground Overview

- **A** ENTRANCE, SECURITY AND MEDICAL
- **B** CAFETERIA / ADMINISTRATION BUILDING: REGISTRATION, OPENING CEREMONY, CAFETERIA
- **C** MAIN GARAGE: PITS, SAFETY / TECH INSPECTIONS
- **D** TRAINING CENTER: COMPETITION HEADQUARTERS
- **E** TEAM OFFICES
- **F** PIT / HYDROGEN TEAMS
- **G** FUEL BLEND FACILITY (REFUELING AREAS)
- **H** VDA: QUALIFYING – BRAKING AND HANDLING, ACCELERATION, OFF-ROAD, PANORAMIC PHOTO
- **I** HIGH-SPEED TRACK: TRAILER TOW, ON-ROAD FUEL ECONOMY
- **J** POWERTRAIN DURABILITY: ON-ROAD FUEL ECONOMY






Dust Ingestion Loop
I
Soak Shed
Silver Creek2
Silver Creek1
IVD Gravel
H
VDA (Handling Pad)
STOP
J
Restricted Entrance
Stone Peck Road
Dirt Cooling Road
Powertrain Durability
Body Twist
Accel. Durability
Two-way traffic
Sand Wash
See Detail Map
Stone Impingement Road
I
Twist Ditch
Watch for Motor Cycles
STOP
H.S. Track Entrance Rd
J
Watch for Hwy Equipment
Soak Shed
STOP
Test Grades
Cinder Road
I
ABS Facility
Two-way traffic
Traction Control
Outside Dirt
Water Ingestion
Two-way traffic
Watch for Motor Cycles
Restricted Entrance
APG Entrance Gate
STOP

FUTURETRUCK 2002 Competition Schedule

Tuesday, June 11	EVENT	TIME	LOCATION	MAP KEY
	Registration	7:00 a.m. - 5:30 p.m.	F-150, APG	B
	Final Vehicle Preparation	10:00 a.m. - 5:30 p.m.	Pit Area – Garage, APG	C
	Skit Night	7:00 p.m. - 10:00 p.m.	Nautical Inn, Lake Havasu, AZ	

Wednesday, June 12	EVENT	TIME	LOCATION	MAP KEY
	Safety/Tech Inspections	6:30 a.m. - 5:30 p.m.	Pit Area – Garage, APG	C
	Fueling	6:30 a.m. - 5:30 p.m.	Fueling Area (Fuel Blend Facility), APG	G
	Lunch, NO EVENTS	11:00 a.m. - 1:00 p.m.	Cafeteria, APG	B
	Late Team Registration	7:00 a.m. - 5:00 p.m.	F-150, APG	B
	Braking and Handling	1:00 p.m. - 5:30 p.m.	VDA, APG	H
	Trailer Tow	1:00 p.m. - 5:30 p.m.	High-Speed Track, APG	I
	Team Leader Meeting	6:30 p.m. - 7:00 p.m.	Cafeteria, APG	B

Thursday, June 13	EVENT	TIME	LOCATION	MAP KEY
	Safety/Tech Inspections	6:30 a.m. - 5:30 p.m.	Pit Area – Garage, APG	C
	Braking and Handling	6:30 a.m. - 5:30 p.m.	VDA, APG	H
	Fueling	6:30 a.m. - 5:30 p.m.	Fueling Area, APG	G
	Trailer Tow	6:30 a.m. - 5:30 p.m.	High-Speed Track, APG	I
	Late Team Registration	8:00 a.m. - 5:00 p.m.	F-150 , APG	B
	Event Captain Registration	8:00 a.m. - 5:00 p.m.	F-150 , APG	B
	Opening Ceremony	11:00 a.m. - 11:30 a.m.	Pavilion outside Cafeteria, APG	B
	Lunch, NO EVENTS	11:30 a.m. - 1:00 p.m.	Cafeteria, APG	B
	Team Leader Meeting	6:30 p.m. - 7:00 p.m.	Cafeteria, APG	B

Friday, June 14	EVENT	TIME	LOCATION	MAP KEY
	Safety/Tech Inspections	6:30 a.m. - 5:30 p.m.	Pit near break area, APG Garage	C
	Braking and Handling	6:30 a.m. - 5:30 p.m.	VDA, APG	H
	Fueling	6:30 a.m. - 5:30 p.m.	Fueling Area, APG	G
	Trailer Tow	6:30 a.m. - 5:30 p.m.	High-Speed Track, APG	I
	Lunch, NO EVENTS	11:00 a.m. - 1:00 p.m.	Cafeteria, APG	B
	Team Leader Meeting	6:30 p.m. - 7:00 p.m.	Cafeteria, APG	B

Saturday, June 15	EVENT	TIME	LOCATION	MAP KEY
	Braking and Handling	7:30 a.m. - 11:00 a.m.	VDA, APG	H
	Trailer Tow	8:00 a.m. - 11:00 a.m.	High-Speed Track, APG	I
	Lunch, NO EVENTS	11:00 a.m. - 12:30 p.m.	Cafeteria, APG	B
	Friends & Family Day	12:00 p.m. - 6:30 p.m.		
	Acceleration	1:00 p.m. - 3:00 p.m.	VDA, APG	H
	Panoramic Photo	3:00 p.m. - 4:30 p.m.	VDA, APG	H
	Dinner	4:00 p.m. - 5:30 p.m.	VDA, APG	H
	Off-Road Event	4:30 p.m. - 6:30 p.m.	Off-Road Course, APG	H
	Wash Vehicles/Fueling	6:30 p.m. - 8:00 p.m.	Pit Area	C

Sunday, June 16	EVENT	TIME	LOCATION	MAP KEY
	On-Road Fuel Economy	8:00 a.m. - 12:00 p.m.	High-Speed Track & Durability Loop, APG	I, J
	Precise Refueling	12:00 p.m. - 2:00 p.m.	Fuel Blend Facility, APG	G
	Lunch, NO EVENTS	12:00 p.m. - 2:00 p.m.	Cafeteria, APG	B
	Team Leader Meeting	1:00 p.m. - 2:00 p.m.	Break area, APG Garage	C
	Support Vehicles Drive to California	2:00 p.m. - 7:00 p.m.		
	FutureTrucks by Carrier to CMS, Emissions Testing	4:00 p.m. - 10:00 p.m.	CMS, CE-CERT and ARB	

Monday, June 17	EVENT	TIME	LOCATION	MAP KEY
	Facility/Pit Setup	7:30 a.m. - 5:00 p.m.	CMS	M
	Emissions Testing	7:30 a.m. - 5:00 p.m.	CE-CERT, ARB	
	Oral Presentations Practice	2:00 p.m. - 5:00 p.m.	Lecture Hall, Ontario Marriott	
	Team Leader Meeting	6:00 p.m. - 6:30 p.m.	Room 320, Ontario Marriott	

Tuesday, June 18	EVENT	TIME	LOCATION	MAP KEY
	Emissions Testing	7:30 a.m. - 5:00 p.m.	CE-CERT, ARB	
	Oral Presentations	8:00 a.m. - 5:00 p.m.	Lecture Hall, Ontario Marriott	

Wednesday, June 19	EVENT	TIME	LOCATION	MAP KEY
	Emissions Testing	7:30 a.m. - 12:00 p.m.	CE-CERT, ARB	
	Team Leader Meeting	7:30 a.m. - 8:00 a.m.	Goodyear Garage, CMS	Q1
	Vehicle Appearance Event	9:30 a.m. - 2:30 p.m.	Between Garage 2 and 3, CMS	O
	Lunch, NO EVENTS	11:00 a.m. - 1:00 p.m.	Goodyear Garage, CMS	Q1
	Vehicle Design Inspection Event	12:30 p.m. - 5:00 p.m.	Garage 2, CMS	N
	Consumer Acceptability Event	12:30 p.m. - 5:00 p.m.	Garage 2, CMS	N
	SPONSORED AWARDS AND EVENTS			
	Innovations in Aluminum Award	12:30 p.m. - 5:00 p.m.	Garage 3, CMS	M
	National LabVIEW™ Real-Time Award	12:30 p.m. – 5:00 p.m.	G-12, Pit Lane, CMS	Q2
	ArvinMeritor Integrated Airflow and Emissions Technology Award	12:30 p.m. – 5:00 p.m.	Garage 3, CMS	M
	Cisco Systems Telematics Award	12:30 p.m. - 5:00 p.m.	Garage 2, CMS	N
	Dynamic Vehicle Design Inspection	12:30 p.m. - 5:00 p.m.	Lot B, CMS	L
	Dynamic Consumer Acceptability	12:30 p.m. - 5:00 p.m.	Lot A, CMS	K
	Sponsor Social	6:30 p.m. - 9:30 p.m.	Grand Ballroom, Ontario Marriott	

Thursday, June 20	EVENT	TIME	LOCATION	MAP KEY
	Vehicle Design Inspection Event	8:00 a.m. - 12:30 p.m.	Garage 2, CMS	N
	Consumer Acceptability Event	8:00 a.m. - 12:30 p.m.	Garage 2, CMS	N
	SPONSORED AWARDS AND EVENTS RESUME	8:00 a.m. - 12:30 p.m.		
	Dynamic Vehicle Design Inspection	8:00 a.m. - 12:30 p.m.	Lot B, CMS	L
	Dynamic Consumer Acceptability	8:00 a.m. - 12:30 p.m.	Lot A, CMS	K
	Team Lunch & Team Leader Meeting	12:30 p.m. - 1:30 p.m.	Goodyear Garage, CMS	Q1
	Open Design Review	1:30 p.m. - 2:30 p.m.	Between Garages 2 and 3, CMS	O
	Support Vehicles Drive to Santa Monica	Depart at 2:30 p.m.		
	FutureTrucks by Carrier to Santa Monica	Depart at 3:30 p.m.		
	FutureTrucks Parked at Civic Auditorium	6:00 p.m.	Civic Auditorium Parking Lot— 4th Street and Pico	8

Friday, June 21	EVENT	TIME	LOCATION	MAP KEY
	Vehicle Display/Press Conference	8:00 a.m. - 1:00 p.m.	3rd Street Promenade, Santa Monica	3
	Reception & Dinner	5:00 p.m. - 7:00 p.m.	Regent Beverly Wilshire, Beverly Hills	9
	Awards Ceremony	7:00 p.m. - 10:00 p.m.	Regent Beverly Wilshire, Beverly Hills	9

APG = Arizona Proving Ground
VDA = Vehicle Dynamic Test Area
CMS = California Motor Speedway
CE-CERT = Center for Environmental Research and Technology
ARB = California Air Resources Board

California Motor Speedway Overview

K LOT A: DYNAMIC CONSUMER ACCEPTABILITY

L LOT B: DYNAMIC VEHICLE DESIGN INSPECTION

M GARAGE 3:
ALUMINUM EVENT
ARVINMERITOR EVENT
TEAM PITS

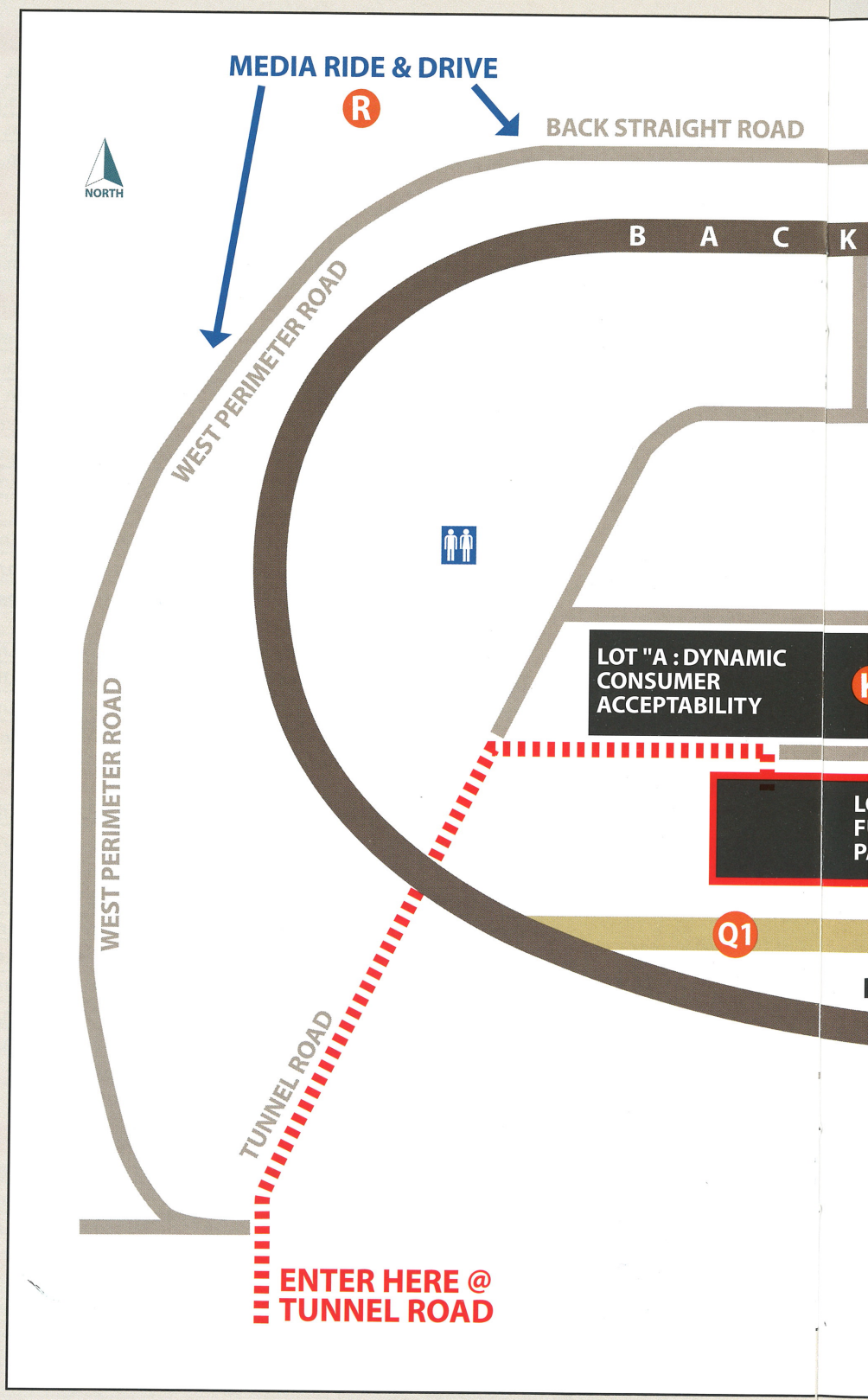
N GARAGE 2:
CONSUMER ACCEPTABILITY EVENT
VEHICLE DESIGN INSPECTION EVENT
CISCO TELEMATICS EVENT
DYNAMIC EVENTS BRIEFING ROOM
JUDGE BRIEFING IN DRIVER'S MTG. ROOM

O VEHICLE APPEARANCE EVENT

P FUELING:
F1 - LIQUID
F2 - H_2

Q PIT LANE BLDG:
Q1 TEAM LUNCH—GOODYEAR GARAGE: ROOM G31
Q2 NATIONAL INSTRUMENTS AWARD: ROOM G14
Q3 MEDIA ROOM: ROOM G11
Q4 MEDIA LOUNGE: ROOM G10
Q5 ORGANIZER HEADQUARTERS: ROOM G6-G7

R WEST PERIMETER ROAD:
MEDIA RIDE AND DRIVE



CMS Garage 3 - Team Pits, Media Ride & Drive, Aluminum and ArvinMeritor Events

CMS Garage 2 Pits - Static Events

FUTURETRUCK 2002 Technologies

Team	Configuration	Strategy	Engine	Transmission	E-Motor	Batteries	Fuel
California Polytechnic State University, San Luis Obispo	Series	Charge Sustaining	2.0L VW	GM 4L60E Automatic, 4-Speed	NetGain WarP 11", DC Series, 150kW Peak	Hawker Genesis PbA - 228V	E-85
Cornell University	Post-Transmission Parallel	Charge Sustaining	1.8L Mazda I4 (Miata) Turbocharged	Mazda M15M-D Manual, 5-Speed	AC Propulsion AC-150, AC Induction, 150kW Peak	Hawker Genesis PbA - 336V	E-85
Georgia Institute of Technology	Thru the Road Parallel - Electric on Front Axle	Charge Sustaining	3.0L Lincoln V6 (LS)	Ford 5R55N Automatic, 5-Speed	AC Propulsion AC-150, AC Induction, 150kW Peak	Panasonic PbA - 336V	RFG
Michigan Technological University	Thru the Road Parallel - Electric on Rear Axle	Charge Sustaining	2.0L Ford Zetec I-4	Ford XS4P Automatic, 4-Speed	UQM SR218, Perm. Magnet, 75kW Peak	Hawker Genesis PbA - 288V	RFG
Ohio State University	Post-Transmission Parallel	Charge Sustaining	2.5L Detroit Diesel	Ford M5OD-R4 Manual, 5-Speed	Siemens/Ecostar, AC Induction, 55kW Peak	Hawker Genesis PbA - 324V	B50
Pennsylvania State University	Post-Transmission Parallel	Charge Sustaining	2.5L Detroit Diesel	Ford M5OD-R4 Manual, 5-Speed	Solectria, AC Induction, 37kW Peak	Hawker Odyssey PbA - 180V	Low Sulphur Diesel
Texas Tech University	Series Fuel Cell	Charge Sustaining	Honeywell PEM Fuel Cell Stacks - 80kW Peak	Lenco Gear Reducer, 3:73:1	(2) Solectria, AC Induction, 75kW Peak	Panasonic NiMH -273.6V	H_2
University of Alberta	Pre-Transmission Parallel	Charge Sustaining	2.0L Ford Zetec	GM 4L60E Automatic, 4-Speed	UQM SR120, DC Brushless, 60kW Peak	Worley LiON - 200V, NESS Ultra Capacitors - 200V	E-85
University of California, Davis	Pre-Transmission Parallel	Charge Depleting	Saturn 1.9L I4	New Venture Gear Manual, 5-Speed	UQM SR218H, Perm. Magnet, 75kW Peak; Enova EDU, AC Induction, 60kW Peak	Ovonic NiMH - 317V	E-85
University of Idaho	Pre- and Post-Transmission Mild Hybrid	Charge Sustaining	4.0L Explorer V6	Ford 5R55W Automatic, 5-Speed	Advanced DC Motor, 20.9kW Peak; Zena Series 200, 2.4kW Peak	Hawker PbA - 36V	E-85
University of Maryland	Pre-Transmission Parallel	Charge Sustaining	3.0L Lincoln V6 (LS)	Ford 5R55W Automatic, 5-Speed	Honda MF2, Perm. Magnet, 10kW Peak	Panasonic NiMH -144V	E-85
University of Tennessee	Post-Transmission Parallel	Charge Sustaining	2.7L V4 (4.0L V6 w/ 2 cyl. deactivated)	Ford M5OD-R1 Manual, 5-Speed	UQM SR218H Perm. Magnet, 53kW Peak	Hawker Genesis PbA - 324V	E-85
University of Wisconsin - Madison	Post-Transmission Parallel	Charge Sustaining	2.5L TD5 Land Rover Diesel	Borg Warner Manual, 5-Speed	Custom Built, AC Induction, 45kW Peak	Panasonic Prismatic NiMH - 273.6V	B50
Virginia Tech	Series Fuel Cell	Charge Sustaining	Honeywell PEM Fuel Cell Stacks - 60kW peak	Single Speed, 3:73:1	GE EV2000, AC Induction, 85kW Peak	Hawker Genesis PbA - 336V	H_2
West Virginia University	Post-Transmission Parallel	Charge Sustaining	2.5L Detroit Diesel	New Venture Gear Manual, 5-Speed	UQM SR218, Perm. Magnet, 75kW Peak	Hawker Genesis PbA - 324V	B50

The teams in the FutureTruck competition are employing many novel ideas, approaches, and technologies that provide near-term and long-term solutions to increase the efficiency and reduce the overall environmental impact of SUVs. Various hybrid electric vehicle (hybrids) designs—many of which are either in production or are being considered by original equipment manufacturers—are demonstrated by the student-modified vehicles, including series and parallel hybrids.

Engines modified to run on bio-based fuels, such as ethanol and biodiesel, represent a near-term approach; more advanced engines, such as homogeneous-charge compression-ignition engines and hydrogen fuel cells, represent more long-term approaches. Exemplifying the long-term approach to reducing on-board energy consumption, one team has chosen a "charge-from-the-wall" philosophy to extend the short commute electric-vehicle range of its hybrid.

The teams are combining these advanced power units with emerging exhaust gas aftertreatment technologies to reduce emissions and total GHG production. Other systems, such as selective catalytic reduction to control oxides of nitrogen emissions, are being used with high-efficiency diesel engines. Advanced electric drive systems enable hybrid features such as regenerative breaking, high load assist, and transient smoothing to further improve vehicle-level efficiency.

These student-designed and modified vehicles truly represent the future of automotive powertrains.

FutureTruck 2002 Teams

California Polytechnic State University, San Luis Obispo

Faculty Advisors: Chris Pascual and Brian Higgins
Team Leader: Ryan Hoest

Approach to Hybrid Design

Our design strategy attempts to maximize the efficiency of our most inefficient components and reduce the inefficiencies associated with the conversion of energy from fuel to electricity. With this strategy in mind, we built a series hybrid with complete load isolation. A 2.0-liter E-85 engine and a modified Warp 11 electric motor allow us to increase the vehicle's power by 75% while maintaining Ultra Low Emissions Vehicle (ULEV) emission standards. We are working on our Family Smart™ adaptive controls, in which the vehicle will learn each family member's driving style and adjust itself accordingly to maximize power and efficiency.

Goals in Participating in FutureTruck

Our goal is to educate our members and the general public about the possibilities of an efficient and environmentally conscious hybrid electric SUV that maintains comfort, safety, and power. By using commercially available products, we hope to demonstrate how practical and achievable the technology is.

Cornell University

Faculty Advisor: John Callister
Team Leader: Jonathan Schoenberg

Approach to Hybrid Design

Our post-transmission parallel charge-sustaining hybrid design uses a small turbocharged engine that offers excellent power density and a powerful electric motor. The motor provides low-end torque and power assist to allow the engine to run at its most efficient operating range for steady-state needs. The development of an advanced control system distributes a driver torque demand to the motor and engine with a goal of increasing the total fuel economy and maintaining the state of charge of the batteries. We have researched and produced innovative, lightweight and aerodynamic components to enhance consumer acceptability by using aluminum and carbon fiber materials.

Goals in Participating in FutureTruck

Our goal for participating in FutureTruck is to allow our students to use the knowledge and skills from the classroom to produce a functional piece of innovative engineering that addresses real-world problems. FutureTruck gives undergraduate students a chance to learn about automotive engineering and develop new skills through hands-on research and design.

Georgia Institute of Technology

Faculty Advisors: Jerome Meisel, Caryn Riley, and Boyd Pettitt
Team Leader: Jason Parsons

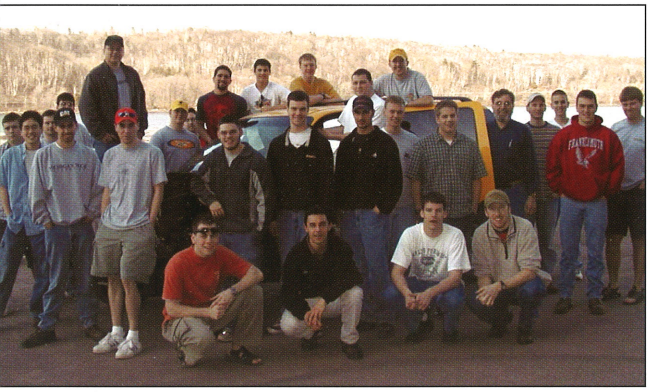
Approach to Hybrid Design

With the new vehicle platform in 2002, Georgia Tech has changed to a split-parallel hybrid configuration to meet the packaging constraints of the Ford Explorer. By selecting a strong parallel strategy, Georgia Tech plans to reach the competition goals of increased fuel efficiency and reduced emissions without sacrificing vehicle performance or consumer acceptability. Georgia Tech's hybrid uses an electric motor to drive the front wheels and provide the majority of the acceleration torque, while the engine drives the rear wheels and supplies cruising torque and electric energy generation.

Goals in Participating in FutureTruck

Georgia Tech looks forward to this year's competition. Our 2002 goals are to:

- Create a unique hands-on learning environment specializing in advanced powertrain concepts
- Build on the success of the 2001 FutureTruck Competition
- Have a strong-running vehicle in Arizona
- Enjoy a safe and fun competition



Michigan Technological University

Faculty Advisor: John Beard
Team Leader: Nick Manor

Approach to Hybrid Design

Our truck incorporates a "through-the-road" parallel design. Instead of the motor being directly coupled to the engine (as in a normal parallel hybrid), our connection between the two is through the road. The engine will drive the front wheels while the motor will be supplementing that power by driving the rear wheels. This year's concentration is on reducing weight and controlling emissions.

Goals in Participating in FutureTruck

Our team's goals this year include providing younger team members with experience in design as well as competition, producing a competitive vehicle, and producing designs that could be used in industry.

Ohio State University

Faculty Advisors: Giorgio Rizzoni, Yann Guezennec, and Frank Ohlemacher
Team Leader: Kevin Stockmeier

Approach to Hybrid Design

Our team has chosen to use a charge-sustaining, parallel hybrid strategy. The main power source is an advanced compression-ignition direct-injection (CIDI) engine with outstanding efficiency and emission characteristics coupled to a 5-speed manual transmission. The engine uses bio-diesel fuel to significantly mitigate the GHG impact of the vehicle. A 55kW AC induction motor directly coupled to the driveshaft provides additional power and regenerative braking. A user-transparent control strategy is implemented to optimize the powertrain performance, reduce fuel consumption and emissions, and manage the battery state-of-charge.

Goals in Participating in FutureTruck

We believe FutureTruck provides an invaluable experience for the students, as well as a real contribution to the advancement of automotive technologies. Through hands-on experience, students are able to apply the knowledge they have gained throughout their education and also learn lessons about engineering and teamwork that cannot be taught in any classroom. We hope to exhibit that there are reasonable alternatives to conventional vehicles that provide real environmental savings while maintaining consumer acceptable cost and performance.

Pennsylvania State University

Faculty Advisor: Daniel Haworth
Team Leader: Brian Kleback

Approach to Hybrid Design

The Penn State FutureTruck, the *Wattmuncher*, is a parallel hybrid-electric vehicle, primarily powered by a highly efficient 2.5-liter, 139-horsepower Detroit Diesel engine. A 5-speed manual transmission transfers power from the engine to the wheels for maximum efficiency. A 46-horsepower Solectria AC-21 electric motor is coupled to the driveshaft just after the transmission, giving the driver extra power during heavy acceleration and recapturing energy through regenerative braking. Thanks to regenerative braking and the ability to put the transfer case in neutral (using the diesel engine to spin up the electric motor, thereby using it as a generator), the vehicle's 180-volt lead-acid battery pack never needs to be plugged into the wall. While the driving experience is completely identical to that of a conventional SUV, the *Wattmuncher* is certain to put a smile on the owner's face at the gas pump!

Goals in Participating in FutureTruck

The main goals of the Penn State FutureTruck team are to educate the public on hybrid-electric vehicles, challenge Penn State students with a real-world engineering experience, and support university research on hybrid-electric vehicles and energy storage. While the Toyota Prius and Honda Insight have brought HEVs to the showroom floor, the auto companies have yet to introduce a hybrid-electric SUV. *Wattmuncher* proudly shows the public that an environmentally friendly 28-mpg SUV can be built and sold today. The vehicle is entirely student designed and built—a tremendous feat that provides Penn State undergraduate and graduate students with valuable real-world experience prior to hitting the job market. As a member of the DOE's Graduate Automotive Technology Education (GATE) program, Penn State is actively involved in fuel-cell, battery, and ultracapacitor research. FutureTruck not only serves as a testbed for these new technologies, but also helps researchers stay a step ahead of the needs and trends of the automotive industry.

Texas Tech

Faculty Advisor: Tim Maxwell
Team Leader: Aaron Rogahn

Approach to Hybrid Design

Texas Tech University has provided students with the unique opportunity to be a part of the leading technologies in alternative power sources. The FutureTruck program has provided a venue for the students to show their engineering skills while working on a fuel cell hybrid electric vehicle. Students show their skills by solving old problems in new and inventive ways and solving new problems associated with the new technologies. Drivetrain systems are built from scratch to adapt to the new constraints of electric power. Systems such as electric storage systems include the newest in automotive technology. Nickel-metal hydride batteries save weight and room, two of the most important considerations during the designing process. The centerpiece of our design is the fuel cell that supplies the power for the truck. The only fuels required by the fuel cell are hydrogen and air, and the only exhaust is water. Great care has gone into designing and building the 2002 Ford Explorer for FutureTruck 2002, and we are excited to show our hard work and dedication to this project at this year's competition.

Goals in Participating in FutureTruck

With the support of Texas Tech, the FutureTruck program has become an integral part of many undergraduate and graduate students' studies. Students gain experience in many technologies that extend well beyond the automotive field. The support from Texas Tech and FutureTruck make it possible for a team of students who are truly interested in advancing vehicle technologies to come together and achieve great things. Under the leadership of an exemplary faculty team, the Texas Tech FutureTruck team keeps its focus on craftsmanship and teamwork. We are all proud to be a part of the Texas Tech team and the FutureTruck program.

University of Alberta

Faculty Advisor: Bob Koch
Team Leader: Cheri Olsen

Approach to Hybrid Design

The U of A's approach to hybrid design is to couple an efficient, yet sufficiently powerful, natural combustion engine with a regenerative electric motor drive. The two drive through a common transmission and drivetrain, separated by an over-running sprag clutch. The sprag clutch allows for both the engine and the electric motor to transfer power to the transmission; it also allows the electric motor to overrun the engine when it is not in use. Thus, it is possible to drive partially on the natural combustion engine and partially on the electric motors, increasing the range of the electric system as well as reducing the net GHG emissions of the vehicle.

Goals in Participating in FutureTruck

The U of A's goals are to produce an efficient and environmentally friendly vehicle powered using electric motors and E-85 fuel. U of A's FutureTruck team members are expected to get design experience as well as practical hands-on experience. This project requires engineering students to apply and fine tune problem-solving skills learned in the classroom so as to prepare them for the workforce. And of course, a major goal of participating in the competition is to have a good time.

University of California, Davis

Faculty Advisors: Andrew Frank and Mark Duvall
Team Leader: Dahlia Garas

Approach to Hybrid Design

Through the use of lightweight components, aerodynamic improvements, custom powertrain elements, embedded electronics, and an advanced control system, our vehicle is capable of achieving double the stock fuel economy while having a minimal GHG impact on the environment.

Goals in Participating in FutureTruck

There are three primary goals that drive the UCD team. First, to obtain practical engineering insight for students, providing the much-needed integration of theoretical classroom learning and practical application. Second, to keep the public informed and aware of new vehicle technology and what impacts they will have. Finally, to develop and expand new technologies, prove that they are a viable automotive resource, and continue the bond between industry and academia to improve our world.

University of Idaho

Faculty Advisor: Frank Albrecht
Team Leader: Scott Anderson

Approach to Hybrid Design

The University of Idaho has designed a soft parallel system. During the summer of 2001, graduate students and club members spent time modeling vehicles to determine the optimum choice between parallel and series. Many factors were considered in designing our vehicle: weight, reliability, efficiency, emissions, and ease of installation. We selected a soft parallel design that implements a modified internal combustion engine, along with an electronic motor to assist the vehicle under hard acceleration. This design has benefits for keeping the vehicle light while providing assistance to the engine.

Goals in Participating in FutureTruck

Showing that our use of proven technologies in a unique way helps to create a more reliable vehicle.

University of Maryland

Faculty Advisor: David Holloway
Team Leader: Bill Kreig

Approach to Hybrid Design

For the 2002 FutureTruck Competition, the University of Maryland will be replacing the 4.0-liter six-cylinder engine of a Ford Explorer with a hybrid electric system. The system will be composed of a 2000 Lincoln LS 3.0-liter six-cylinder engine and a 2002 Honda Insight electric motor coupled between the new engine and the stock transmission. The Lincoln LS engine will run off of an ethanol mixture (E-85). Nickel metal hydride batteries will power the Honda Insight electric motor. Regenerative braking will be used to recharge the batteries. The goal of this system is to reduce the emissions and the GHG impact, while at the same time retaining the power and performance of a factory 2002 Ford Explorer.

Goals in Participating in FutureTruck

The University of Maryland is participating with several team goals. We hope to investigate approaches to developing environmentally friendly hybrid vehicles and along the way, we will learn about vehicle design and dynamics and apply this knowledge to our Ford Explorer competition vehicle. We hope to build upon our previous success at FutureTruck competitions and display an innovative and operational solution to hybrid vehicle design.

University of Tennessee

Faculty Advisor: Jeff Freeman
Team Leader: Aaron Woods

Approach to Hybrid Design

The University of Tennessee's FutureTruck team (UT) has designed a post-transmission, parallel, "heavy" hybrid powertrain for our Ford Explorer. This design has a reduced engine displacement, compared to the original vehicle, and incorporates a fairly large electric motor. The design should allow us to stop the engine when the vehicle is stopped, launch and restart using the electric motor, and operate as a zero-emission vehicle (ZEV) during some phases of driving.

Goals in Participating in FutureTruck

FutureTruck is one of the capstone design projects at UT. The team is composed of mainly seniors in Mechanical and Electrical engineering who gain experience by working in multidisciplinary groups, while redesigning the Ford Explorer to achieve better fuel economy and lower emissions.

University of Wisconsin – Madison

Faculty Advisor: Glenn Bower
Team Leader: Jason Helgren

Approach to Hybrid Design

The UW's strategy is to design an efficient hybrid drivetrain and to implement lightweight components. The drivetrain includes a common rail direct-injection diesel engine coupled to a 5-speed manual transmission. Our transfer case is a modified stock transfer case that has been 'divorced' from the transmission with a short 'jack'

shaft. The transfer case utilizes the stock chain-drive configuration and provides the front mounting flange for the in-line electric motor. The motor has been optimized for efficiency and runs at driveshaft speeds. Because weight reduction is a key factor in reducing fuel consumption and emissions, we reengineered components from advanced materials to reduce weight, improve dynamic performance, and increase safety.

Goals in Participating in FutureTruck

The UW FutureTruck team has bonded though challenges and accomplishments, while developing personal and professional skills. Routinely, our team displays our vehicle while educating kindergartners through senior citizens about advances in vehicle technology. We believe that the technologies explored through the FutureTruck program should be implemented for the good of society. We are proud to be involved in the endeavor to advance automotive technology in an effort to preserve our environment.

Virginia Tech

Faculty Advisor: Doug Nelson
Team Leader: Stephen Gurski

Approach to Hybrid Design

The Hybrid Electric Vehicle Team (HEVT) of Virginia Tech is using hydrogen fuel and a fuel-cell system to generate electricity to power *Magellan*. This strategy improves energy efficiency and fuel economy and reduces overall emissions from driving the vehicle (both tailpipe and fuel production). We chose this approach because pure hydrogen fuel results in zero emissions from the truck itself and low GHG emissions from hydrogen production. Hydrogen can be efficiently produced from low-carbon fuels like natural gas, or from renewable energy sources.

Goals in Participating in FutureTruck

HEVT is demonstrating that fuel-cell technology can meet the demanding performance requirements of an SUV, while reducing the environmental impact. FutureTruck students and many others at Virginia Tech are exposed to environmental issues and solutions for personal transportation. The team-building skills and learning experience of FutureTruck go with them to industry and the development of future consumer products.

West Virginia University

Faculty Advisor: Nigel Clark
Team Leader: Axel Radermacher

Approach to Hybrid Design

Our team selected a post-transmission parallel hybrid design powered by a Detroit Diesel 2.5-L common-rail engine. The electric motor is connected to the driveline using a chain drive behind the transfer case. The focus of our design was to use knowledge from previous years and incorporate it in this year's vehicle. Advanced hybrid vehicle controls were integrated to improve the vehicle's drivability and to increase fuel efficiency. Urea with selective catalytic reduction was used to reduce NO_x emissions.

Goals in Participating in FutureTruck

Our team's goals include providing our engineering students with opportunities to use the knowledge they have gained to work with advanced vehicle technologies in a team environment. The team members can also make industry contacts and gain valuable experience not found in the classroom.

FutureTruck 2002 Sponsors

Major Sponsors

The National Science Foundation, well known for promoting science, mathematics, and engineering, has established an award to recognize and honor the critical role of the FutureTruck faculty advisor. Faculty advisors, 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.

For more information about NSF, visit **www.nsf.gov**

Cisco Systems Inc, an industry leader in networking solutions, is sponsoring an expanded Telematics Event this year, where teams are encouraged to explore ways to provide Internet connectivity to a vehicle to enhance driver's safety, deliver mission critical services such as remote vehicle diagnostics, real time weather and traffic advisory, as well as for a myriad of back-seat-infotainment services.

In addition to supplying an assortment of networking and wireless products worth over $150,000, Cisco has provided technical assistance and training on a variety of topics pertaining to networking and telematics.

Cisco Systems is the worldwide leader in networking for the Internet.

For more information about Cisco Systems, visit **www.cisco.com**

ArvinMeritor, a global supplier of integrated automotive systems and modules, is returning to sponsor FutureTruck as well as an Integrated Airflow and Emission Technology Award. This award focuses on the integrated design of air induction and exhaust systems to reduce tailpipe emissions and produce high-efficiency engine operation while maintaining customer acceptability. ArvinMeritor Exhaust, a leading provider of exhaust systems and solutions, is offering cutting-edge lightweight titanium exhaust systems to select teams.

A $7-billion global supplier of integrated systems, modules, and components for the automotive industry, ArvinMeritor is headquartered in Troy, Michigan, and employs 36,000 people at more than 150 manufacturing facilities in 26 countries. The company serves light vehicle, commercial truck, trailer, and specialty original equipment manufacturers and related aftermarkets. The Exhaust Systems Division is a premier supplier of air and emissions management solutions.

For more information about ArvinMeritor, visit **www.arvinmeritor.com/home/index.asp**

Delphi, a leader in mobile electronics and transportation components and systems technology, is returning for its third year as a Major Sponsor of the FutureTruck competition. Delphi engineers and staff will be involved in judging and coordinating competitive events for the program.

Delphi is a world leader in mobile electronics, transportation 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 is committed to reducing the environmental impact of automobiles and has a history of innovative solutions that improve fuel economy, help reduce emissions, decrease vehicle mass, and increase recyclability.

For more information about Delphi, visit **www.delphi.com**

National Instruments (NI) leverages commercial technologies, such as industry-standard computers and the Internet, to deliver customer-defined measurement and automation solutions. Headquartered in Austin, Texas, NI has more than 2,800 employees and direct sales offices in more than 35 countries. NI increases the productivity of engineers and scientists worldwide by delivering easy-to-integrate software and modular hardware. For the past three consecutive years, *Fortune* magazine has named NI one of the 100 best companies to work for in America.

NI is proud to sponsor the competition and The Most Innovative Use of NI LabVIEW™ Real-Time Award. The award encourages teams to use NI's LabVIEW™ Real-Time and RT Series hardware to learn and apply theories of reliable, deterministic control loops with the latest embedded technologies. Teams competing for the award must demonstrate innovative vehicle design; integration of NI products into the design; reliability of the design; and overall cost effectiveness, quality, and performance.

In addition to providing an NI Application Engineer advisor to each team for product support and expertise through all phases of the competition, NI also donated more than $300,000 in software and hardware products to participating teams.

Through its support of the FutureTruck competition, NI continues its commitment to education by providing tomorrow's engineering leaders with tools to be successful today and in the future.

For more information about National Instruments, visit **www.ni.com**

Natural Resources Canada (NRCan) has been a long-time supporter of the DOE's advanced vehicle technology competition program, providing technical and program support for more than 20 competitions over 12 years. FutureTruck underscores NRCan's commitment to addressing the global issue of climate change and supporting sustainable energy policies and advanced automotive technologies.

NRCan provides knowledge, expertise, and program activities for the sustainable development and use of Canada's natural resources and to support the global competitiveness of its resource and related sectors. This includes energy activities that encompasses policy development, market development programs, and international activities in energy efficiency, renewables, transportation technologies, alternative fuels, and conventional fuels.

For more information about NRCan, visit **www.nrcan.gc.ca**

The MathWorks develops technical software, including MATLAB (for modeling systems and visualizing data) and Simulink (an interactive tool for modeling, simulating, and analyzing dynamic systems), which are used by engineers and scientists in industry and at more than 2,500 colleges and universities worldwide. The MathWorks is providing major financial support to the competition and has donated MATLAB and Simulink software as well as several toolboxes and block sets to the FutureTruck teams to enhance their vehicle modeling capabilities that support the competition program.

For more information about The Mathworks, visit **www.mathworks.com**

The Aluminum Association has been a sponsor of DOE's advanced vehicle technology competitions for more than four years, encouraging teams to explore aluminum to help boost environmental, safety, and handling performance, and for special emphasis on weight reduction for increased fuel efficiency. For the second year, they will sponsor The Most Innovative Use of Aluminum Award.

The Aluminum Association, based in Washington D.C. with offices in Detroit, Michigan, is the trade association for U.S. primary aluminum producers, recyclers, and manufacturers of semifabricated aluminum products. Member companies operate nearly 200 plants in 37 states. The association's Automotive and Light Truck Group promotes the use of aluminum in automotive structures and components by demonstrating the reasons why it is the material of choice for high-value, safe, environmentally friendly, and superior-performing vehicles. The FutureTruck competitions help teach students how to use aluminum, which has doubled in cars and light trucks during the last 10 years.

For more information about the Aluminum Association, visit **www.autoaluminum.org**

California Environmental Protection Agency
Air Resources Board

The California Air Resources Board (ARB) is well known for promoting and protecting public health, welfare, and ecological resources through the effective and efficient reduction of air pollutants while recognizing and considering the effects on the economy of the state of California. ARB will provide facilities and staff to perform emissions testing on 11 of the FutureTruck vehicles including those operating on E-85, reformulated gasoline, and hydrogen. The vehicles are expected to control pollutants and meet minimum emissions standards and will aim to meet California's ULEV standards.

For more information about ARB, visit **www.arb.ca.gov**

Competition Supporters

ILLINOIS
RIGHT HERE. RIGHT NOW.
Department of Commerce and Community Affairs

Illinois Department of Commerce and Community Affairs (DCCA) works with industrial and agricultural organizations to promote and expand the use of ethanol as a clean-burning, renewable fuel. DCCA manages numerous ethanol fuel tests and demonstration projects designed to stimulate economic growth in both industrial and rural communities and sponsors new and innovative research and development projects, such as the FutureTruck competition, which focus on energy efficiency and advanced technology.

For more information about the DCCA, visit **www.illinoisenergy.org**

WISCONSIN SOYBEAN MARKETING BOARD

The Wisconsin Soybean Marketing Board was formed in 1972 with 200 members. Today, over 1,700 Wisconsin soybean growers are members of a progressive organization devoted to bringing together all persons interested in the production, marketing, distribution, and utilization of soybeans and soybean products. Several of the FutureTruck teams are using biodiesel, which can be derived from soy. Biodiesel is a domestically produced, renewable fuel that produces fewer harmful emissions than traditional diesel fuel. Biodiesel can be used in blends such as B20 (20% biodiesel), B50 (50% biodiesel), or in pure form, B100.

For more information about the Wisconsin Soybean Marketing Board, visit **www.wisoybean.org**

RFA
Renewable Fuels Association

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

RFA supports the FutureTruck competition because it provides the ethanol industry with the opportunity to promote ethanol's important and growing role in our nation's fuel supply to the next generation of automotive engineers. Students have demonstrated that vehicles optimized for E-85 can achieve improved fuel economy and emissions reductions compared with gasoline. The RFA is co-sponsoring the Excellence in Renewable Fuels Award.

For more information about the RFA, visit **www.ethanolrfa.org**

Together with its U.S. and international subsidiaries and joint ventures, Goodyear manufactures and markets tires for a wide variety of applications at 96 facilities in 28 countries. Goodyear is providing competition support as well as low-rolling-resistance tires to the FutureTruck teams to help increase the energy efficiency of their vehicles. By reducing rolling resistance with new tread compounds and designs and using lightweight materials and construction, Goodyear tire engineers expect to drive rolling resistance down even further to help the participating teams meet the lofty goals of the competition.

For more information about the Goodyear, visit **www.goodyear.com**

Ricardo, Inc., the U.S. division of Ricardo Group plc, is a leading engineering technology and services provider, undertaking advanced engineering, design, and development services for the world's automotive manufacturers. In addition, Ricardo markets, develops, and supports a wide range of design and analysis software products, including WAVE, which are developed specifically for application during the powertrain development and vehicle integration process. In addition to providing competition support, Ricardo has donated WAVE software to each of the FutureTruck teams.

For more information about Ricardo, visit **www.ricardo.com**

BP is focused on finding, producing, and marketing the natural energy resources on which the modern world depends. In addition, the company is committed to making a positive contribution and taking a leadership role toward a cleaner environment. BP delivers cleaner-burning and lower-emissions fuels to more than 113 cities worldwide that have serious air quality problems. As vehicle technology continues to advance, fuels and lubricants must also change to keep pace with the new technology. Recently BP introduced ECD-1, an emissions control (ultra low sulfur) diesel fuel that helps sulfur-sensitive control systems operate effectively and is supplying the fuel to several of the FutureTruck teams.

For more information about BP, visit **www.bp.com**

"Ford's commitment to the FutureTruck competition fosters the training ground for developing engineers who will lead our industry into the 21st Century. What better way to attract young minds to engineering than for them to play a part in developing the next generation of low-emission, fuel-efficient, advanced-technology vehicles."

Bob Himes, Director of Engineering
Ford Motor Company

"FutureTruck is a tremendous opportunity for National Instruments (NI). From NI engineers working with students to solve real-world obstacles and design issues in a hands-on learning environment to partnering with committed industry leaders to address this key environmental need, we are honored to participate as a major competition sponsor."

Pete Zogas, Vice President of Sales
National Instruments

"In 1997, a former MTU Faculty Advisor convinced me to take this position because, "it requires minimal time and travel, the sack lunch cuisine at competition is excellent and I will be back to help next year." Numerous sleepless nights, thousands of miles of travel, countless skinned knuckles and five different powertrains later, I am still the advisor. Each year I am amazed at the energy and dedication of the teams as they solve the complex problems of building a practical hybrid vehicle. Team members learn to interact with the auto industry, its suppliers, the DOE and the program sponsors. They utilize knowledge from all engineering disciplines to complete their task. In addition to attacking the engineering problems, the students have learned life skills that will serve them well throughout their future endeavors. As I observe these positive outcomes and the camaraderie among teams, I am reminded of the honor it has been to be involved in the development of these young men and women."

John Beard, Faculty Advisor
Michigan Tech

"FutureTruck teams faced a real-world telematics challenge this year. Teams struggled with issues like how to build a system that delivers invaluable services; what technologies are most effective; and how to leverage the Internet to drive down costs. Every team approached the challenge with enthusiasm and dedication—all were quick to recruit students from a variety of engineering disciplines and form strong relationships with industry. To ramp up quickly, some students also attended industry seminars and participated in outside training.

One of the most impressive testimonies to the teams' enthusiasm was their willingness to share their challenges and experience with each other. Teams exchanged ideas through weekly chat sessions and through active participation in discussions via email and teleconference sessions.

Cisco Systems is proud to be part of a program that has helped mobilize a new specialized work force for the nascent Telematics industry."

Shivkumar Kutty,
Business Development Manager
Cisco Systems

"FutureTruck gave me the opportunity to lead a group of undergraduate engineers in designing and building a hybrid electric vehicle. This process was the most difficult and rewarding experience I had as an undergraduate, because it exposed me to the challenges of leading a complex task. For all of the students who participated in FutureTruck it has been a rewarding experience that will prepare them for advanced work on any future projects."

Jonathan Schoenberg,
Cornell ECE 2003
CUHEV Team Leader '01-'02

FutureTruck 2002 Headline Sponsors

U.S. Department of Energy

The U.S. Department of Energy (DOE), through Argonne National Laboratory, provides overall competition management, team evaluation, and technical and logistical support. FutureTruck is the premier DOE-sponsored student vehicle competition. DOE launched its student vehicle competition program in 1989 to demonstrate and test the technologies developed in laboratories. By combining the next generation of technical innovators with emerging advanced transportation technologies, the FutureTruck competition helps ensure a sustainable, environmentally responsible transportation future. DOE and its network of national laboratories maintain an aggressive research and development program in advanced vehicle technologies, including fuel cells, energy storage, hybrid systems, advanced materials, alternative fuels, and heat engines. The FutureTruck vehicles mirror much of this research and demonstration activity.

DOE's primary transportation mission is to turn the corner on oil imports by improving vehicle efficiency while also working to reduce vehicle emissions. Close to 20,000 students have received hands-on engineering experience in these competitions. Many of them have moved on to take jobs in the automotive industry, bringing with them an understanding of and enthusiasm for advanced vehicle technologies.

For more information about DOE, visit
www.eren.doe.gov

Ford Motor Company

Ford Motor Company constantly develops and refines new technologies that enhance the efficiency of the company's wide variety of automotive products across all of its global brands. Ford understands the need for society to continually reduce its impact on the environment and strives to meet this goal while still satisfying the marketplace's ever-more-challenging safety, comfort, and performance demands.

By providing vehicles as well as facilities, financial assistance, technical assistance, and staffing, Ford is committed to helping ensure the success of the FutureTruck program. FutureTruck also inspires young engineers to become involved with the new and developing technology that will yield a large increase in fuel economy while reducing emissions.

For more information about Ford, visit
www.hybridford.com

FutureTruck 2002

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Wisconsin Soybean Marketing Board

Renewable Fuels Association

The Goodyear Tire & Rubber Company

Ricardo, Inc.

BP

The Advantages of Sponsoring FutureTruck

The year-round, high-visibility program offers competition-level sponsors:

- International visibility and media coverage
- Opportunities to strengthen their association with advanced automotive technology
- Opportunities to provide a real-world engineering experience to young engineers who will lead the automotive industry in the 21st century
- A venue for recruiting some of the top engineers in the U.S. and Canada
- First-hand exposure to new technologies, through judging competition events, technical papers, etc.
- Networking opportunities with other industry and government sponsors

The U.S. Department of Energy and Ford Take the Lead

The U.S. Department of Energy, Ford Motor Company, and the other industry and government sponsors are proud to support FutureTruck 2002, in which 15 North American engineering schools explore and develop new automotive technologies. These sponsors support FutureTruck's cooperative approach in developing fuel-efficient SUVs, leading to reduced petroleum usage and a stronger economy.

FutureTruck 2002 Participating Schools

California Polytechnic State University, San Luis Obispo

Cornell University

Georgia Institute of Technology

Michigan Technological University

Ohio State University

Pennsylvania State University

Texas Tech University

University of Alberta

University of California, Davis

University of Idaho

University of Maryland

University of Tennessee

University of Wisconsin – Madison

Virginia Tech

West Virginia University

For more information, visit

www.futuretruck.org

FutureTruck

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Ford

NO BOUNDARIES
FORD OUTFITTERS

Center for Transportation Research

An advanced vehicle technology competition managed by Argonne National Laboratory's Center for Transportation Research