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UTSVT *Solorean*

WHAT STARTS HERE, CHANGES THE WORLD.



New Solar Car Construction Begins

The University of Texas at Austin Solar Vehicles Team is diligently developing and building a new generation solar car named *Solorean* to compete in the 2008 North American Solar Car competition.

Team members under the direction of Prof. Gary Hallock are working hard to complete the many aspects involved with building a solar car to meet competition requirements. At the start of the fall semester, the team split into groups to concentrate on areas such as electrical, mechanical, and aerodynamic systems. Among the electrical team's responsibilities are the battery system, solar array, and software. The mechanical team is accountable for the suspension, chassis, body work,

and steering and braking system of the car.

The team meets every Monday and Wednesday to collaborate, to make group decisions, and to keep the team updated on current progress. Some of the programming is developed in the Solar Vehicles' lab located in the ENS; however, a majority of the construction of the actual vehicle is completed at the Pickle Research Center. Every Sunday at the Pickle Research Center, the team has been devoted to preparing and planning the materials and procedures to begin the actual manufacturing of the solar

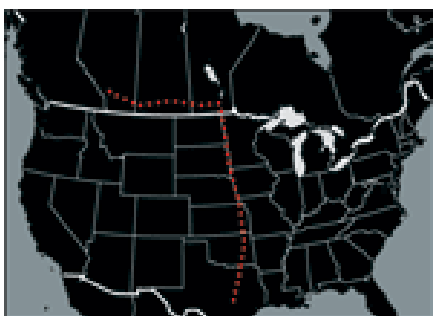


University of Texas Solar Vehicles Team 2005 solar car, Solar Steer.



2008 North American Solar Car Race

The NASC is a national solar car competition that occurs every two years. Students from US and Canadian universities design, build, and race a solar powered race car. The 2008 race will begin in Dallas, Texas and travel 2300 miles to Calgary, Alberta. Every team hopes to win the competition to be crowned as the fastest solar-powered car. There are many regulations and requirements in order to compete in this exclusive competition. The time and finances required to be in such a race is an accomplishment in itself.



Getting in gear with the Mechanical team!

The mechanical team starts off the semester by building a PVC mockup of the new chassis.

Chassis

The chassis team has the responsibility of building the “skeleton” like framework that will shape and support the *Solorean*. Currently, the team is working very hard to build a PVC mockup of the chassis in order to better help the electrical team. The electrical team and the chassis team will need to work together in order to integrate hardware such as the seat, electronics, and other features.

The present goal of the chassis team is to purchase the Chromoly steel that they will need and to cut it into the precise lengths that they have already planned in their design. The team would like to accomplish this task before mid-November so that they can get a professional to help weld it together before the end of the semester.



and now has the *Solorean*'s body design planned. The team is currently in a test phase as they are trying to determine which molding/epoxying methods will work best for their designed applications.

The team hopes to get the body fully molded by the end of the semester

The team is testing different materials to be used as an intermediary layer between the mold foam and the carbon fiber so that the epoxy will not bond to the foam.

epoxy will not bond to the foam.

The team wishes to have a large functioning autoclave/vacuum bagging structure and the foam molds completed by the middle of November. After having completed that task, the team plans to have the body fully molded by the end of the semester.

Trailer

The trailer team has the responsibility of modifying our trailer to hold the *Solorean* as we bring it to competition and to community events. The trailer sports the logos of our sponsors. Some of the ideas and plans of the team are as follows:

- 110 VAC system with CFLs for lights
- 110 VAC system powered by the generator
- Redesign and rewire the trailer
- Designing lightweight storage and considering whether or not to use aluminum and fiberglass
- Check the bearings on the wheels and assess the tire situation
- Price conduit and outlet boxes for electrical system



#1 Design Tip

“KISS”

KEEP IT SIMPLE
STUPID

Meeting Times

General	Wed 5PM ENS 109
Class	Mon 5PM ENS 109
Battery	Thurs 7PM ENS 416
Microcontroller	Thurs 7PM ENS 416
Mechanical	Sun 1:30PM Pickle

Off-Campus Work
Sunday 1:30-6PM
@ Pickle Research Center

Suspension

The suspension team has the crucial responsibility of designing and assembling a system of springs, shock absorbers, and linkages that will connect *Solorean* to its wheels.

The suspension is important because it will play a big role in the safety, handling, and braking of the *Solorean*. Another objective of the suspension, is to help isolate any noise from the road, bumps, and other vibrations.



Brakes and Steering

The brakes and steering team is currently working with the suspension team in order to meet the correct design specifications. The team is considering using the braking system from the previous solar car. The team has decided that they should design the brakes before planning out the steering system.

Body

The body team immediately started on their project

Shocking Updates!!!

by the Electrical Team

The University of Texas student engineers put their years' of electrical skills and knowledge to the challenge!

Electrical System

The electrical system is one of the most important aspects of the car's systems as it controls all the power that comes into and is used by the car. This year the electrical team has acquired a powerful tool in the Compact Rio. The Compact Rio, provided by National Instruments, functions as the "heart" of the solar vehicle. It will monitor and regulate the car's electric system, act as a motor controller, data acquisition system, and execute programs as a microcontroller.

The electrical team utilizes National Instruments' versatile software LabVIEW to accomplish all their programming. Currently the team plans to complete seven major programs by the end of the 2007 semester:

1. Telemetry
2. Vehicle Turn On/Turn Off
3. Cruise Control
4. Turn Signal/Brake Lights
5. Error Reporting
6. Touch Panel
7. Chase Vehicle

The Compact Rio, provided by National Instruments, functions as the "heart" of the solar vehicle.

The team has made excellent progress, with many programs running on the Compact Rio as well as the communication with the touch screen.

Many of the smaller electrical projects are also underway. The team has ordered parts, such as a speedometer, camera and display, LEDs, and DC contactors. For this year's vehicle the *Solorean*, an actual speedometer will be used to analyze and display the vehicle's speed. Previous years the team has used a global positioning system to aid in relaying speed measurements. Also the *Solorean* will have a rear-mounted camera and display in the cockpit to act as the rearview mirror and aid in reversing the vehicle. Many of the turn signals and other lighting will use LEDs because of their bright lighting and low power consumption.

Batteries

Although there are many different types of batteries in use by solar vehicles, the team will use lithium-ion batteries, similar to those used in laptops. Although the batteries are expensive,



the lithium-ion batteries have one of the best weight to power ratios on the market. The battery team has begun

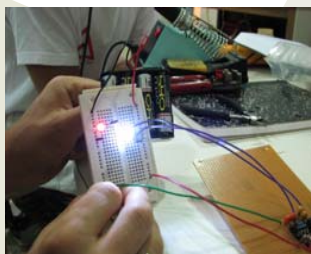


LG Type 18650 Battery Cell.
(197WH/kg, 3.6V)

to design the battery enclosure for the *Solorean*, which will hold 624 LG Type 18650 battery cells, currently the highest density cell on the market (estimated \$5000). The team is developing a method to test the cell capacity and to gather thermal data. It is important to provide adequate cooling for the battery system as well as monitor the thermal temperature to avoid overheating.

Solar Array

The solar array consists of hundreds of photovoltaic solar cells which convert sunlight into electricity. The solar team has chosen to use the A300 cells made of monocrystalline silicon from Sunpower (estimated \$12,000). The cells are wired into strings and the strings wired together to form a panel. The solar array acts similar to many small batteries connected in series. The team plans to have 3 sub-arrays on the car. Each sub-array will be designed to have its own boost power tracker from AERL, which increases the voltage coming from the sub-array to the bus voltage. Therefore, the goal



Electrical team member testing LEDs.

of the array team is to find the most optimal placing for the cells to fit as many as possible onto the *Solorean*.

COMPACT RIO

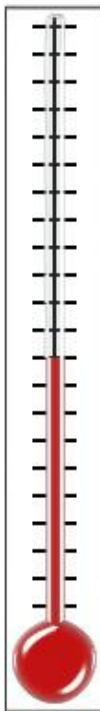


- The University of Texas Solar Vehicles Team would like to thank National Instruments for their generosity and sponsorship. NI donated the Compact Rio and other supporting equipment.



- Small, rugged embedded control and data acquisition system
- Powered by National Instruments LabVIEW graphical programming tools for rapid development
- Features embedded real-time processor for reliable stand-alone or distributed operation
- Integrates an embedded FPGA chip that provides the flexibility, performance, and reliability of custom hardware
- Includes hot-swappable industrial I/O modules with built-in signal conditioning for direct connection to a variety of sensors and actuators
- Information provided by: www.ni.com/compactrio/whatis.htm





\$100,000

Fundraising

The fundraising team is responsible for raising money to build *Solarean* and to participate in the race. In addition to the need for tools and equipment, the money helps pay for registration fees as well as travel expenses.

As many of the parts still need to be ordered for *Solarean* for the 2008 race, the team still is in need of funds to be competitive in the race. The team will need resources as they make their trip from Dallas to Calgary. The only possible way to increase resources is to garner the public's interest and reach out to the

community for as much support as possible.

There are many upcoming public events, which are great opportunities for UTSVT to increase public awareness. These events are also great for our current sponsors as we thank them for their continued support. We would like to give a special thanks to The University of Texas Electrical & Computer Engineering Department and National Instruments. Below is a list of our sponsors for the 2008 race.

BE A UTSVT SPONSOR!

- Join the team as we reach our goal to compete and finish in the 2008 race.
- Many benefits, such as your logo on the solar car/trailer, media material (brochures, newsletters, slideshows), and much more!!!
- Receive updates and news about the team's progress.
- **TO RECEIVE A CORPORATE PACKET AND MORE INFORMATION PLEASE CONTACT tdeconin@hotmail.com**

PLATINUM SPONSORS (\$10,000+)



THE UNIVERSITY OF TEXAS AT AUSTIN



ELECTRICAL & COMPUTER ENGINEERING

We would not be where we are today without the generous support from our sponsors.

BRONZE SPONSORS (\$1,000+)

Austin Body Works
Baer Engineering
IBM
Lower Colorado River Authority (LCRA)
Powerfoam Insulation
Schlumberger
School of Biological Sciences



GOLD SPONSORS (\$5,000+)



British Petroleum



The University Co-Op



National Instruments

The UT Solar Vehicles Team thanks National Instruments for all their support. Information provided by: www.ni.com/company/

National Instruments was founded in 1976 by Dr. James Truchard, Bill Nowlin, and Jeff Kodosky. "National Instruments has been a technology pioneer and leader in virtual instrumentation - revolutionary concept that has changed the way engineers and scientists in industry, and government, and academia approach measurement and automation."

Among their major software products include LabVIEW, a graphical development environment, and LabWindows/CVI, which provides VI tools for C. Their hardware products include VXI, VMEbus, and PXI frames and modules, and other industrial automation standards. National Instruments has direct operations in 40 different countries.



The University of Texas at Austin Electrical & Computer Engineering

The UT Solar Vehicles Team thanks the Electrical & Computer Engineering Department for all of their continued support.

"The mission of the Department of Electrical and Computer Engineering is to produce graduates who will help make Texas the foremost electrical/electronics/computer industrial center in the world to create significant individual and industrial growth opportunities, and to be recognized as one of the premier electrical and computer engineering departments in the US."

The School of Engineering opened in 1903 under the supervision of Prof. Arthur C. Scott. In the 1940's the electrical department started to teach electronics, communication by radio and television, and microwave propagation. The Electrical Engineering Research Laboratory (EERL) was established with the donation of research money from the Government. "The EERL produced radio telescopes and is something that the Associated Press views as one of the three most significant American accomplishments of the 20th century."

Quick Facts:

Stock Symbol: NATI (NASDAQ)
Founded: 1976
Headquarters: Austin, Texas
Employees: 4,000

Awards:

- 8 Straight Years as Fortune's 100 Best Companies to Work For. (2000-2007)
- Record annual revenue of \$660 million in 2006, up 15.5% from the previous year, marking the 29th year of revenue growth
- EE Times: ACE Awards Finalist for Small Company of the Year

Visit National Instruments' Website: www.ni.com

The University of Texas at Austin Tower lighted to honor the Electrical and Computer Engineering's centennial, 100 year's of excellence. The school is currently in its 104th year (Started in 1903).

Quick Facts:

- Ranked one of the top Electrical & Computer Engineering departments in the country for over a decade.
- Second largest undergraduate program at UT.
- 2007 U.S. News and World Report ranks UT-ECE's
 - Undergraduate computer engineering program # 8
 - Undergraduate electrical engineering program # 9
 - Grad computer engineering # 6
 - Grad electrical engineering # 10



Visit ECE's website: www.ece.utexas.edu

From the Desk of Professor Gary Hallock



- How many solar cars have you helped develop for the UTSVT?

I have been involved with several UT solar cars. These include *Texas Native Sun II*, *Solstice*, *Solar Steer*, and now *Solorean*.

- What interesting changes in technology have you noticed from when you began up to *Solorean*?

Over the years battery technology has changed greatly. *Texas Native Sun II* used heavy lead-acid batteries, where *Solorean* will use light and powerful Li-Ion batteries. Solar cell efficiency has also greatly improved. Solar cars have become lighter, stronger, and faster.

- What are some notable accomplishments of the past UT Solar Vehicles Teams?

Texas Native Sun I came in second out of thirty teams in the 1991 California Clean Air Race. *Texas Native Sun II* came in fourth in its class in the 1996 Tour de Sol.

- What motivates you to help lead the UTSVT over the years?

It is a fantastic project-complex, multidisciplinary, teamwork, competition, etc. It is a lot of fun, and I really believe that the team members (almost all undergraduates) become much better engineers.

Community Outreach

The UT Solar Vehicles Team is committed to promoting solar power awareness and strives to aid the younger generation to develop an interest in engineering.

In the community

Every year, the solar car team receives many invitations by companies, schools, and city and campus-wide events. We strive to accommodate as many events as we can fit into our students' schedule, usually once a month. Currently, the schedule for the Fall 2007 semester has been set; however, events are still being accepted for the Spring and Summer of 2008.

Event Goals

UTSVT members are passionate about renewable energy, especially solar power. During each event the UTSVT team strives to provide a unique educa-

tional experience by providing lectures and facilitating experiments. We enlighten the community about solar power, its differences and advantages from other types of energy and its uses today. Also we explain the purpose and progress of the solar vehicle and how we are developing our new car, *Solorean*. We use presentations, brochures, information sheets, poster boards, and actual hands-on labs to garner interest and exhibit our material. During most events we use the previous vehicle Solar Steer to showcase our work.

Other activities we have depending on our audience include measurement and analysis we can perform in real time on the solar vehicle. Also we have an activity where students can visualize how a solar vehicle operates by using solar cells to power individual mini-cars.

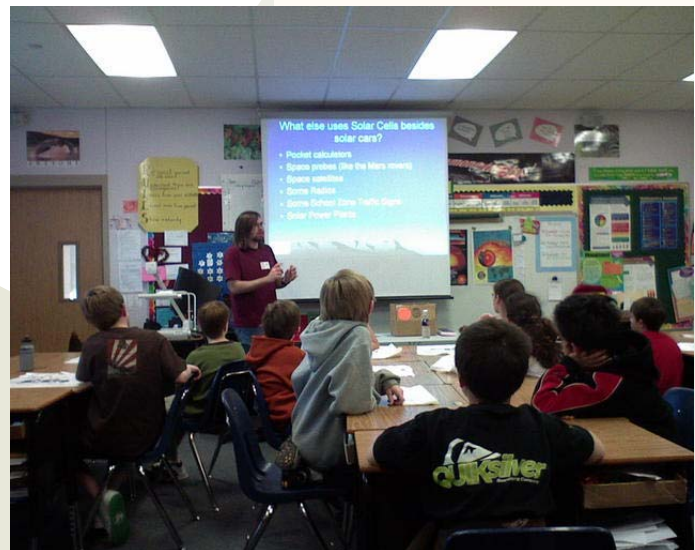
Upcoming Events

- Parents Weekend
10/20 10:00 AM
- Allan Elementary
11/02 3:00 PM
- Edison Lecture Series
1/9/08 11:00 AM
- Bridge Point Elementary
1/18/08 8:30 AM



Top: Edison Lecture Series at the University of Texas at Austin campus January 10, 2007

Right: Bridgepoint Elementary February 25, 2007



If you are interested in having the UTSVT team come out to your event, or would like more information about our community outreach please contact

Professor Hallock

hallock@ece.utexas.edu



Left: Women in Engineering Program (WEP): Introduce a Girl to Engineering day February 27, 2007

Below: Travis High School Students participating in the Mini-Solar car activity



Whether you would like the car on display or would like the team to lead experiments and demonstrations that integrate with your curriculum, we would be happy to help you show your audience a world of possibilities!

Facts and Questions



Commonly asked questions about the UT Solar Car Team

What is the UTSVT?

The University of Texas Solar Vehicles Team is a student organization sponsored by the Cockrell School of Engineering at the University of Texas at Austin. The team consists of a diverse range of students from the College of Engineering and other majors. Under the guidance of Professor Gary Hallock, students raise funds, design, build, test, and race vehicles powered only by the sun.

What is the purpose of the UTSVT?

The UT Solar Vehicles Team is dedicated to raising awareness and working as a team to design an effective means of solar-electric transportation, while representing the University of Texas in competitions.

Who is the team comprised of?

The team is a student-run, mostly undergraduate, volunteer organization. Students are responsible for every part of the process of building the car, from body design to power maintenance to actually assembling the car.

What experience does the team have?

The organization has been a presence on campus, under two names, since 1988. This will be the fifth car built at the University of Texas, preceded by *Native Sun I*, *Native sun II*, *Solstice*, and the *Solar Steer*.

What is the team preparing for?

The team's goal is the 2008 North American Solar Challenge, a race that begins in Dallas, Texas, and will end in Calgary in Alberta, Canada.

What rules must the team follow in designing the car?

All power for the car must come directly from the sun, which means the car will get less than two horsepower, and must be extremely efficient. The car must be legal for highway driving, which means it must pass stringent inspections, and must travel at highway speeds.



 SOLAR VEHICLES TEAM
COLLEGE OF ENGINEERING

Team Members

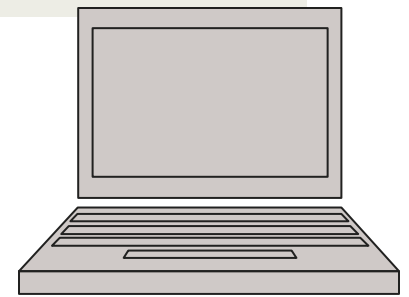
The University of Texas Solar Vehicles Team consists of students from many different areas of engineering.

Djordje Adnadjevic, ECE
Dinesh Antony, ECE
Cyrus Bavarian, ECE
Erik Bilansky, ME
Jason Bowman, ME
Johnathan Bush, ECE
Naveen Challapalli, ME
Jason Chang, ECE
Thomas Deconinck, ASE
Abe Dillon, ECE
Brian Ditta, ASE
Fred Engelkemeir, ECE
Hunter Estes, ChE/EE
Aaron Forsander, ECE
Kris Gleason, ECE
Benton Greene, ASE
Geoff Grimes, ME

Trevor Hird, ECE
Nok Ho, ECE
Duke Hwang, ECE
John Kerzaya, LA
Asa Kirby, ECE
Hyun Kum, ECE
Charles Lee, ECE
Andrew Miu, ECE
Brad Nathan, ECE
Minh Nguyen, ECE
Shyam Palaiyanur, ECE
Matt Perricone, ECE
Jason Pham, ECE
Jerome Powell, ECE
Dev Saha, Biochem
Geoff Scheid, ME
Amir Shiva, ECE

Chris Such, ECE
Kyle Sung, ECE
Benoit van Swieten, ECE
Justin Tang, ECE
Erica Thorson, ECE
Chen-Yi Tsai, ECE
Bharath Vasudevan, ECE
Steven Yang, ECE
Chak Man Yeung, ECE
Ben Zamanian, ChE
Li Zhang, ECE
Frank Zhu, ECE

*Check us
out on the
web*



www.utsvt.com

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