

Racing into a Brigher Future

The Reinvention of Penn Solar Racing
by Barry Scharfman

Imagine cruising in your car on a sunny summer day without ever having to stop at a gas station. You sip a cold, refreshing beverage while scanning the surrounding landscape through your sunglasses. The sun's intense rays don't bother you, because you are aware that they are the source of your vehicle's energy. Think this vision is only a sweltering mirage? Well, it might not be as far off as you believe.

Here Comes the Sun

Penn Solar Racing (PSR)'s *Keystone* is the latest invention rolling out of the solar car lab in B11 Towne. Weighing in at 500 pounds, the team's seventh solar-electric automobile resembles an alien spacecraft. This sleek, white, streamlined car is adorned with dark blue solar cells and sports the logos of Penn and team sponsors. A small dome peeks out from the center, allowing the crouched driver to view the racetrack as he coasts at about 55 miles per hour.

Although the car was disqualified at the 2005 North American Solar Challenge (NASC) last summer due to malfunctions experienced during the qualifying rounds, the team considers *Keystone* to be an important achievement and a springboard for success in future races. Penn Solar Racing is currently preparing for the 2006 Formula Sun Grand Prix and the 2007 NASC.

The solar car team was established in 1989 when a group of Penn students designed and constructed a solar-powered vehicle for the first GM Sunrayce. Since then, PSR has competed in all of the Sunrayces, the 1994 American Tour de Sol, and the 2001 and



2003 American Solar Challenges. PSR's previous car, the *Spirit of '76*, raced for 11 days and more than 1,000 miles from Chicago to Los Angeles in the 2003 ASC. After successfully completing the difficult qualifying round, in which 11 teams (including 2001 ASC winner the University of Michigan) failed to meet the strict qualification standards, the *Spirit of '76* finished the race in seventeenth place. Although the races are the most visible part of PSR, the team spends most of its time preparing for these exciting events.

Zoom, Zoom!

Zach Kirkhorn, co-leader of the team, has outlined PSR's plans for this year, "Our strategy for the 2005-2006 school year is quite simple. It consists of testing, testing, and, well, more testing! We have isolated the electrical and mechanical weaknesses of the car and are addressing them one by one. We also have an impressive group of new members who have demonstrated their commitment to the team and are eager to take on projects. The team cannot wait to demonstrate *Keystone* this summer." The mechanical, electrical,

and business teams have all been putting forth their best efforts to improve PSR's performance. Many enhancements are also being made to the solar car team's website (www.seas.upenn.edu/~solarwww) to reflect this progress. Upperclassmen have been training freshmen to become fully involved in every aspect of the team.

Great progress is being made in the mechanical department. Mechanical Team Leader Zach Friess has outlined his goals for *Keystone's* renovation: "Many of the crucial components of the car that the team plans to perfect this semester include the steering linkages, suspension alignment, brake rotors, and battery boxes." To improve steering, the mechanical team plans to replace the current system, which uses left- and right-handed levers, with a more traditional steering wheel. One challenge, however, is the lack of space around the driver. The team is analyzing where exactly to place the steering wheel and is considering installing a removable one to permit easier entrance and exit from the car. Old shock absorbers have also been replaced on *Keystone*. Freshmen have been acquiring experience in the

machine shop by working on small projects such as creating components for a ramp that can be used to move the car in and out of the solar car lab. In coordination with the electrical team's rewiring of the car's circuitry, the mechanical team plans to rebuild the battery boxes so that they function more effectively than in previous races.

In regard to the electrical aspects of the car, Electrical Team Leader Nadya Sosonkin is excited about the influx of new, devoted members: "This year the electrical team has gotten off to an impressive start. We have almost twenty new members on the electrical team alone who have shown

a remarkable desire to learn about the car's systems. Unlike previous years, we have also acquired members from a wide array of disciplines ranging from cognitive science to materials science." At the beginning of the fall semester, upperclassmen taught new members how to incorporate capacitors, LEDs, transistors, and resistors into a circuit. While building their own circuits, electrical team members learned how to solder. They later tested and repaired the car's blinker system, which will be used in the upcoming race. Some of the current electrical projects are a battery protection system and a new set of driver displays that inform the driver of battery voltages and of the current and temperature of the battery stack. A group of team members has also been discussing how to protect *Keystone's* circuitry from unwanted noise.

The business team has also come up with some ideas for PSR. One of the new biannual newsletters has already been produced to notify affiliates, sponsors, and others of the team's progress (it can be viewed on the solar car team's website). Another goal is to begin hosting social events for members from each of PSR's three teams. According to business team co-leader Alan Hsieh, "This allows for the disparate forces driving Penn Solar Racing to come together in a more social setting, building strong bonds and friendships

that will last through school and into the future." Additionally, the business team is working to improve and expand its relations with major corporate sponsors like GM, Boeing, Lockheed Martin, Brenner Aerostructures, Mitsubishi Electric, and Northrop Grumman.

Knowledge is Power

PSR is not only focused on racing. Since the team's inception more than a

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decade ago, an important goal has been to promote the use of alternative energy sources including, but not limited to, solar power. None of the members believe that the automotive industry should rely on solar energy to power its cars, as co-team leader Noël Camacho states, "I am not saying we will all be driving modified *Keystones* in the future, but if we can power a car to race across two countries, we can surely find many more applications that will reduce the ever-present energy consumption crisis in America." Penn Solar Racing's educational initiative is a key venue for spreading awareness of "green energies." The *Keystone* has been displayed at the Green Festival in Washington DC, NBC 10's TechFest, and, this past September, at the Delaware Transportation Festival. Locally, the team helped the Society of Women Engineers Girls in Technology day and has taken the car to West Philadelphia schools to instill in students an interest in studying science, math, or engineering. In the summer of 2004, one such local outreach program, PSR's Illumination Education Tour, shed light on the benefits of utilizing solar power. Elementary, middle, and high school students across Pennsylvania were excited to learn about such energy-saving technology. "When a student realizes that you can use math and science to do amazing things like build a car powered by the sun, that's exciting,"

remarked Camacho. The team is preparing another Illumination Tour for the summer of 2006.

Enter the Winner's Circle

From team members' perspective, the advantages of being part of PSR are immeasurable. In Sosonkin's opinion, "It has given me an opportunity to apply what I have learned in my classes to real-world engineering situations.

Also, it's a lot of fun to work with a group of really smart and creative people on something as cool as a solar-powered car. How many college kids get to do that?" Members also learn important interpersonal skills that will

certainly prepare them for their future endeavors. Kirkhorn believes that "[b]esides learning how to market the team campus wide or how to engineer the suspension, this experience is irreplaceable for two reasons: leadership skills and teamwork."

Joining the team is simple. Anyone who is interested may attend the weekly meetings on Monday from 7 to 8 PM in Towne B11 and contribute to the efforts of the mechanical, electrical, or business teams. No prior experience is necessary. Team leaders and upperclassmen are willing to teach new members everything they need to know. Dedication and enthusiasm are the only prerequisites to membership.



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