SOLAR EXPRESS

SUMMER PROGRESS - 1998

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Project Manager's Memo

by Jed Christensen, Project Manager

As I look back upon the progress that the Solar Car Team has made this summer, I am truly amazed. It is certainly obvious that we have had several active team members throughout the past four months. Though some areas of the car aren't as on schedule as our original (ambitious) plan, others are far ahead of schedule. We are well-suited for the next year of intense activity.

One of the most challenging tasks we have ahead of us this next year is preparing for World Solar Challenge 99. The team announced in our first Solar Express that we were considering the possibility of going to WSC 99. Since then, our vehicle, personnel, and financial situation have progressed enough so that we can emphatically make a committment to going to Australia in October of 1999.

To race in Australia takes an incredible committment of both financial resources and team member time. This next year will be even more hectic than the past year in our fund-raising and logistical efforts. Since WSC has no restrictions on solar cell technology or cost, we hope to construct an entirely new array for the race. Purchasing new solar cells for this purpose can easily cost upwards of several hundred thousand dollars. The cost of logistically taking our team and equipment to Australia and racing there is another significant hurdle. However, based on our successes of the past year, the team feels it can finally race in Australia for the first time since *Maize&Blue* in 1993.

I would like to extend a special note of thanks to Ryan Smith, Materials/Manufacturing Director and Heather Nettle, Array Team Leader. Both have held jobs on campus this summer, and they have both sacrificed a lot of time this summer to help with Solar Car Team public events. There are so many events to name, I'll just ask you to check the News section of our *MaizeBlaze* home page. On that note, please take a look at Sean Kennedy's article on his amazing improvements to the team web page. It is certainly one of the most pleasing and useful web sites I've seen recently!

Solar Car at the Stadium

by José Alvarez, Special Projects Director

In the last few years the athletic department has been sprucing up the Michigan Football Stadium by creating brick plazas at each of the main entrance gates. The latest addition was Wolverine Plaza at the northwest corner of the stadium grounds. The solar car team asked it's alumni, as well as current members, to help fund a brick for this plaza. The brick itself was of the largest size available to the general public and cost $1,000. The brick lists all of the past car's names and recognizes *Sunrunner's* and *Maize & Blue's* National Championship. The brick plaza will make its debut on September 12 when Michigan plays Syracuse. Go Blue!

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PUBLISHER:
JOSÉ ALVAREZ

EDITOR:
HEATHER NETTLE

TEAM OFFICE:

THE U OF M
SOLAR CAR TEAM
3411 EECS
1301 BEAL
ANN ARBOR, MI
48109-2116

PHONE:
(734) 764-2257

FAX:
(734) 647-4746

WEBSITE:
WWW.ENGIN.
UMICH.EDU/
SOLARCAR

POWER!Lab Cleanroom

by Ryan Smith, Materials and Manufacturing Director

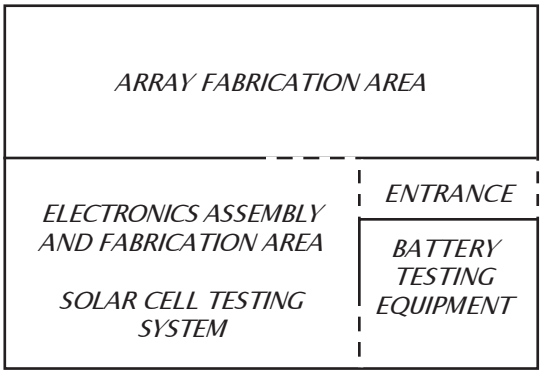
The POWER!Lab Cleanroom is largest and most extensive undertaking of the Solar Car Team in recent memory. In an exhaustive effort to increase the reliability of our vehicle electronics and solar array, members of many branches of the *MaizeBlaze* team joined to construct the 600 sq. ft. cleanroom.

Internal view of the POWER!Lab Cleanroom

Construction of the room began in May thanks to the generosity of the Alro Group of Indianapolis, Indiana, who provided the aluminum tubing and sheets for the walls and ceiling. As construction neared completion in June, the team began wiring the Cleanroom for a multitude of electronic testing systems. Electronics were moved into the Cleanroom beginning in August under the direction of Heather Nettle, Array Team Leader and recently appointed director of the facility.

An overhead lamp array will be installed in the array fabrication area with the capability to simulate sunlight at 1000 W/m^2. These lamps will be used for the full-scale testing of arrays and will be capable of producing near-ultravoilet light for the inspection of encapsulant thickness and solder flux contamination (both glow under black light) during construction.

Safety is of utmost concern when dealing with encapsulants, confined spaces and other hazards. The team has been working closely with the University of Michigan Department of Occupational Safety and Environmental Health (UM-OSEH) to ensure that all team members and guests are safe in the Cleanroom and all work areas. The array fabrication area is being equiped with a supplied air system for use during encapsulation procedures. Due to the toxicity of these compounds, this system was implemented with the further restriction of three occupants in this area with at least one supervisor outside the fabrication area. Fire evacuation and fire fighting procedures have been implemented and standard operating procedures (SOPs) are currently being developed.



POWER!Lab floorplan

The next several months will prove the most crucial in the operation of the Cleanroom and we are confident that the *MaizeBlaze* team will produce the most relaible and highest power producing solar array in the UM Solar Car Team history with the most efficient electronics possible. We'll keep you updated.

P.S. If you have any disposable shoe covers, please send them to us. Thanks.

Electrical Team Update

by Dave Jordan, Electrical Team Leader

The summer's top story in our area is the recent sponsorship of Keithley Instruments, Inc. of Cleveland, OH. Keithley is providing the team with high-speed precision measurement devices for use in *MaizeBlaze* as well as the equipment that we will use for solar cell testing in the new POWER!Lab facility. Special thanks go to Bob Erdman, Tim Kniss, and all at Keithley. We will also be choosing *MaizeBlaze*'s battery and motor configuration very soon and testing for drive system data to run our race simulations.

KEITHLEY

Aero/Body Team Update

by Jason Kramb, Aero/Body Team Leader

The Aero/Body team has been busy as usual during the past few months. We are happy to announce that the body design for the final *MaizeBlaze* car has been finalized and frozen. This freeze on the design ended many hours of computer simulation work, wind tunnel testing, and CAD design and have resulted in the sleekest and most aerodynamic University of Michigan Solar Car to date.

After numerous computer simulations had been done at various locations, including Chrysler, Ford, Altair and EDS, the team felt that we had a design that was very close to what were are looking for. We called upon Mack Industries to build a second wind tunnel model which we were able to test in the University of Michigan's 5'x7' wind tunnel near the end of June. The results of this test were phenomenal and showed just how far we had come from our first wind tunnel model. The design required only a few minor changes before it was as close to perfect as we could make it, a design with the least amount of drag than any previous Michigan Solar Car has had.

With the finalization of the body design, work can now begin on the construction of the body molds. This process has already been begun with msx International providing us both machine time and materials for the construction of these molds. It won't be long before we will have started laying up surfaces and parts of the car will begin to appear.

Other parts of the team have been hard at work to get the companies needed to construct the canopies required for our car. Material selection and molding techniques have had to be researched as well as canopy shapes and designs. Ventilation is also being worked on with designs for inlet ducts being evaluated. Ducting within the car is also being researched so that all parts of the car, batteries, motor, solar cells, and driver will be kept cool.

Stategy Team Update

by Russ Moerland, Strategy Team Leader

On the software front, the simulation is com ing along nicely, thanks to MathWorks donation of a license of Matlab. I have a working version of the simulation program in Matlab and we are in the process of converting over to C++ to make it run faster. As far as the race route is concerned, we will be doing a survey of the route at the end of August. This is somewhat behind what we originally planned, but it will work out better because we are driving a more recent iteration of the route. On the hardware and telemetry side of things, Keithley Instruments is providing us with a much needed update to our telemetry system. Software development to interface with the Keithley data aquisition units will be beginning shortly after school starts again. In general, progress is being made and we are looking forward to Sunrayce 99 to be a strong competitor.

Mechanical Team Update

by Chris Ancona, Steering Systems Engineer

In the world of the mechanical team lies a small system called steering. The steering system on *MaizeBlaze* is a completely new design compared to past U of M cars. This system was designed using the old saying "Keep it simple, stupid". The whole system consists of only seven simple components which are all extremely light.

The steering is well on its way to completion for the test chassis. All design work is complete from 3D UG models, to FEA, to prints.

Suppliers have been found for the components. HI-LEX Corporation and Adwest Bowden TSK Ltd will be supplying new technology in control cables which contribute to removal of "play" in the overall system. Fega Tool & Gauge will machine or wire EDM parts and Alro group will be supplying the component material. Machining has been moving forward as scheduled and we are looking ahead to completion by the beginning of next month.

FOR MORE INFO:

On The Team:

Jed Christiansen
(734) 764-2257

On The Race:

Bryan Arnold
Sunrayce HQ
(800) 606-8881

On the University of Michigan:

Dean Gene Smith
(734) 647-7106

On How to Become a Sponsor:

Nader Shwayhat
(734) 764-2257

On The Webpage:

Sean Kennedy
(734) 764-2257

For Press Information:

José Alvarez
(734) 764-2257

Where has Wolverine been?

by Heather Nettle, Array Team Leader and Jed Christiansen, Project Manager

This summer has been very busy for *Wolverine*. We've had many requests to show the car and we've tried to honor as many requests as possible, considering our limited availablility over the summer. Here's some of the places and events the car has been this summer...

July 10 Summer Engineering Academy

The Summer Engineering Academy is a program for under-represented minority students who are preparing to enter top-tier colleges of engineering after high school. We participated in the SEA Expo, where departments and programs from both inside and outside the University demonstrated opportunities in engineering for these prospective students.

July 13 Governor's Initiative on Youth Problem Solving

Detroit Edison requested the particapation of the *MaizeBlaze* Solar Car Team in the Governor's Initiative on Youth Problem Solving. Students working with the Michigan Future Problem Solving Group learned about alternative energy sources with the Solar Car Team and the Detroit Edison SolarCurrents facility. These students also had an opportunity to tour the Ann Arbor Landfill and Power Grid facilities.

Ryan Smith and Heather Nettle show Wolverine to the Governor's Initiative on Youth Problem Solving

July 27 National Envirothon

The National Envirothon is an annual competition held for high school students throughout North America. Designed as a way to teach kids about environmental education, the best teams from over 45 states and provinces come together during the summer to compete with one another in five subjects: Wildlife, Forestry, Soil, Aquatics, and Current Environmental Issues. The winners get nationwide publicity for their school, and receive Canon National Envirothon Scholarships that can be used for college. The Solar Car Team was on hand to show our car and to answer questions about solar energy for the students in the competition.

Nader Shwayhat , Heather Nettle and Ryan Smith at Management Briefing Seminars

August 3 – 7 Management Briefing Seminars

Management Briefing Seminars is an annual conference held at the Grand Traverse Resort in Traverse City. This year's conference centered around the vanishing boundaries between suppliers and manufacuters in the automotive industry. The University of Michigan Solar Car Team exhibits at this conference every year to increase exposure in the automotive industry.

August 12 Detroit Edison's Educators' Energy Workshop

Detroit Edison organized a three-day workshop that provided teachers with tours of Fermi 2, Detroit Edison's nuclear power plant; the SolarCurrents facility, one of Detroit Edison's two solar-powered facilities; the Monroe Power Plant, the third largest coal-fired plant in the world; and a presentation by the University of Michigan Solar Car Team. This workshop was held to provide teacher's with material to energize their science curriculum.

SPONSOR SPOTLIGHT: Johnson Controls Inc.

by Chris Ancona, Steering Systems Engineer

Through almost a decade of building solar-powered vehicles, we have learned a few lessons. One of the most important is, whatever you do, you must do it right. For the University of Michigan to maintain its reputation as one of the best solar-powered vehicle teams, it takes the right equipment and the right tools to do the job.

Machine area of our Carpenter Road workspace

The University of Michigan Solar Car Team would like to recognize Johnson Controls, Inc. (JCI). JCI has come through for the team in recent months with a generous donation of a horizontal milling machine, a shaping machine, a welder and a pipe bender with tooling. This donation adds much needed equipment to our new machine shop, which has allowed the team to move forward with componenet construction for the test chassis. The test chassis is important in that it allows us to test our design concepts as one complete system and to work out any bugs that we may have. Completing the test chassis early in the project is imperative to providing the time required to do the testing thoroughly and correctly. Historically, this has helped us to build top-notch solar cars and has given us a competitive edge over other teams. JCI's donation has contributed to this important stage of the project.

The donation of this equipment, which is in excellent condition, will allow this team, as well as future teams, to maintain their position as both one of the best extracurricular, cross-disciplinary student teams, and as a leader in solar-powered vehicle technology across the world.

SPONSOR SPOTLIGHT: IBM, Hewlett Packard, & Microsoft

by Russ Moerland, Strategy Team Leader

It works!" was a phrase not often heard when referring to the computers in the office. That is, until gracious donations by IBM, Hewlett Packard and Microsoft changed that. IBM has donated, thus far, three of their latestest Intellistation PC workstations to the team. Hewlett Packard donated, among other items, a LaserJet 6MP printer and a JetDirect adapter to plug the printer into the office network. So, what does this mean? It means that people are doing work in the office on our machines because they either outperform or outfeature most of the computers available for student use at the University. The new printer allows solar car team members to print from any PC or Macintosh in the office, something that hasn't been done since before I joined the team two and a half years ago. Microsoft has donated licenses of many popular software packages for both the PC and Macintosh platforms. Team members are able to work faster and smarter on whatever computer suits their needs without worrying if something will print or if it is compatible with other computers in the office or University. One team member said "Wow, I can actually be productive!"

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Jose Jose Alverez
Marilyn Christiansen
Ulrike Klopfer
Colman and Ann McDonough
Robert and Ann Scherba
Herbert E. Smith
Tuscon Alumni Club
Senator Joe Young, Jr.

MaizeBlaze
University of Michigan
Solar Car Team
3411 EECS, 1301 Beal Avenue
Ann Arbor, MI 48109-2116

www.engin.umich.edu/solarcar/

by Sean Kennedy, Solar Car Webmaster

Recent visitors to our website have probably noticed that it has undergone a lot of changes in the past few months. I took over the position of webmaster from Meghan Hartman this February, and have been hacking away ever since. I have tried to keep the same spirit and flow of the old site, but have added what I feel to be graphical or structural improvements where necessary.

Front page of UM Solar Car webpage

The goal of our website is to provide information to whoever is interested, and to publicize the help our sponsors provide. Obviously, we have to watch what information is provided. We are involved in very competitive events, and our opponents are definitely frequent visitors to the website. The Team also wants to give our sponsors as much publicity as possible, and many of them are happy to increase their presence in cyberspace.

I also want the page to be a newsletter and archive of what the team is doing and has done. I have started scanning in photos and posting writeups of events, as well as copies of the Team newsletter, Solar Express. I have also been encouraged by the help that Team alumni have been providing. Jeff Wimble, who was involved with our last two cars, provided me with a corrected sponsor list for Team Solar Vision. Matt Brown, who was on the Sunrunner Team, has provided some excellent scanned photos which are now on the webpage.

Please stop by the webpage and see what we've been doing. Feel free to email suggestions, corrections, ideas or contributions to smkenned@umich.edu.