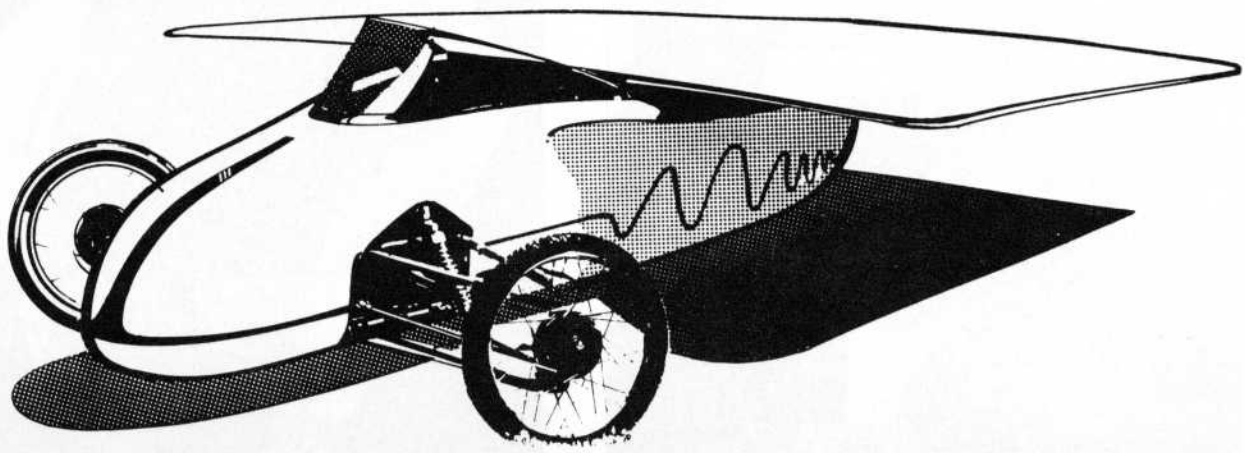
A TANKFUL OF SUNSHINE



Pound-for-pound and inch-for-inch, two Sooner seniors could have had a disproportionately weighty impact on the University of Oklahoma's reputation as an engineering leader this fall when they took turns driving a student-designed and built vehicle 1,850 miles across Australia on a tankful of sunshine.

Together Gigi Parker and Richard Liles weigh less than 225 pounds. Each standing just over five feet, they barely can reach the brake pedals on "The Spirit of Oklahoma," a three-wheeled, knee-high futuristic roadster. But with back-up driver Tod Hanley, they carried the hopes and dreams of dozens of their fellow student engineers who labored for three years against incredible odds to qualify for the World Solar Challenge 1990.

On November 11, the OU entry was matched with a formidable field of 40 other sun-powered vehicles built by industry and academia in the second international competition across the torturous Australian outback. The objective of the race from Darwin to Adelaide was to focus worldwide attention on solar power as a realistic energy source for transportation.

"It's the Indy 500 or the French Le Mans of solar racing. It's the World Cup," beams John Fagan, associate professor of electrical engineering and the project's coordinator. "Merely finishing this race would be nothing short of a victory for us, but our plan always was to win."

The Sooners, their car starting in the No. 31 position, had their work cut out. The competition included such heavyweights as General Motors, Honda, Mercedes Benz, California State-Pomona, and the universities of Michigan and Washington. GM won the first World Solar Challenge in 1988 with a budget estimated at $7.5 million. The OU team spent just over $50,000, all privately donated cash, materials and equipment.

But the students also were pitting their talent, courage and determination against the punishing conditions of the Australian outback itself. The rugged landscape. The choking dust and treacherous dust devils. Poisonous reptiles and swarms of black flies. Rocks tossed up by monstrous multi-trailer truck-trains roaring down desolate roads where there are no speed limits. And the blazing, perpetual heat.

The drivers conditioned themselves for months to endure the pavement temperatures that can top 130 degrees. Although each was scheduled to drive only two hours a day, they consumed as much as two quarts of water during this period and were monitored constantly to prevent heat exhaustion. The Oklahoma car's open cockpit and

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EDITOR'S NOTE: The following article was written as the OU solar car team prepared to leave for Australia to put "The Spirit of Oklahoma" through its paces in the only race of its lifetime. If this were fiction, the climax would come as the outclassed rookies overcome insurmountable obstacles to beat out the ostentatious veterans at the wire. But this is a true life drama. The real story here is not in the order of finish but rather in the ingenuity, hard work and determination that took these young people halfway around the world to prove a point.

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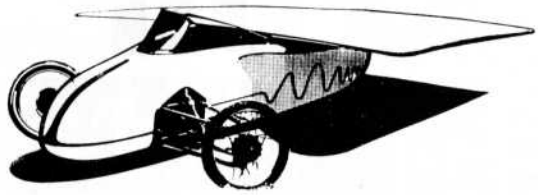
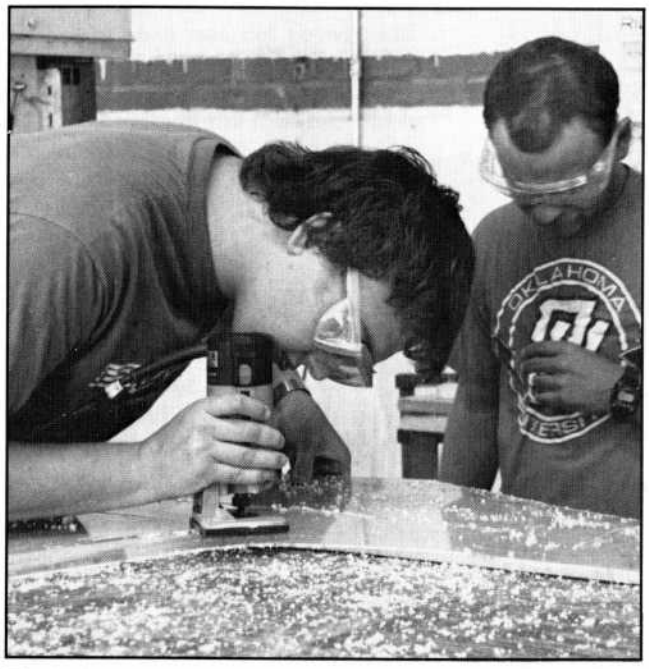
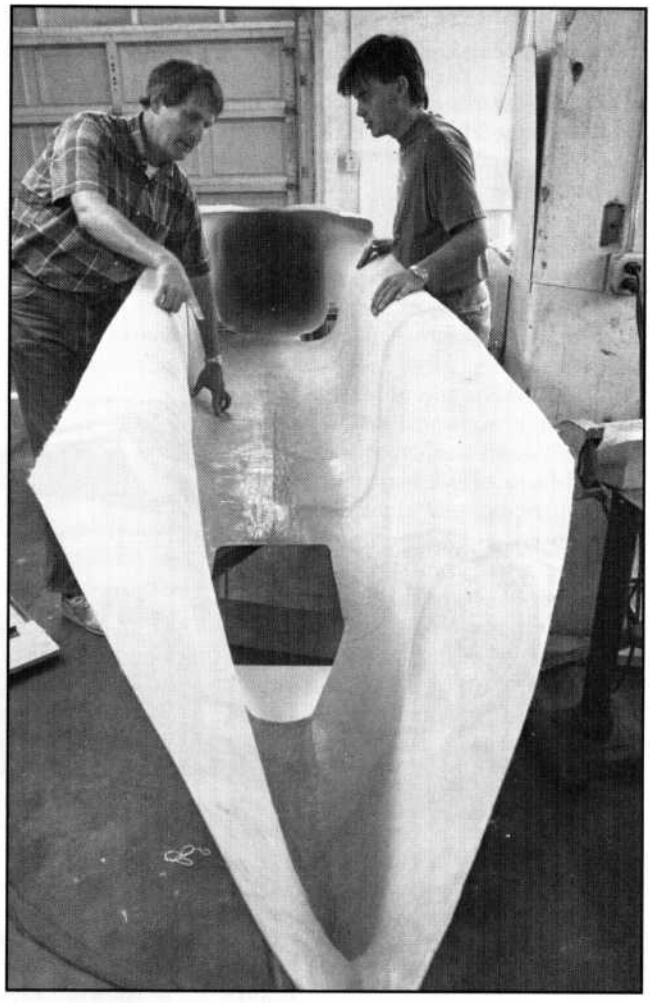




Engineering team members Mark Arens, left, and Richard Liles cut the plastic pieces to be heat formed into the windshield of the OU solar car, The Spirit of Oklahoma.



The solar car's finished fiberglass body is inspected by faculty coordinator John Fagan, left, and Mark Fischer before being placed over the chrom-moly frame.

side body venting was designed to provide an advantage over the closed cockpits of some of the other competing models.

Even when not behind the wheel, Parker, the only woman on the seven-member race team, was in communication with Liles and Hanley from the chase van that trailed The Spirit of Oklahoma. "As lead driver, it was my job to see that the energy we got from the sun was managed correctly," she explains. "During midday, we hoped to be cruising at 40 mph. We probably could do about 70, but only for a short time. Then we would have to sit on the side of the road and recharge our batteries."

Energy management was the key to GM's 1988 win. Electing to use up their batteries in a desperate effort to surge ahead of a storm, the GM team escaped a flash flood that covered the road behind them, stranding the other cars for three days. A World Solar Challenge official traveled with each team to ensure that no car operated more than a six-hour day and batteries were not charged by non-solar means.

Finally to reach the strategy-planning phase was practically a luxury for these engineers. For more than two years, three crews of students devoted their out-of-class hours, nights and weekends, to designing, building and testing the current car and two previous prototypes. Most of the race team members committed to extending their degree programs for an extra semester to participate in the three-week Australian trip.

The original team, most of whom have graduated, sold Fagan on the project after watching a documentary film on the 1988 race. After a year of research and sponsorship solicitation, a prototype car was completed and dubbed "Sunracer." Two bodies, three frames and countless mechanical and electrical modifications later, the final version was ready.

The three-wheeler, a fiberglass body over a light-weight chrom-moly frame, juts out from beneath an eight-by-13-foot panel of glittering blue solar tiles. With driver, the car weighs less than 800 pounds.

Each solar cell, identical to those used to power space satellites, is attached to the top of the panel with a tiny pedestal of silicone glue, enabling an undercurrent of air to aid in cooling. The cells cost $5 each and are "fragile as eggshells," a special concern of team captain Ken Meyers, who took along 60 spares when he accompanied the crated solar car aboard a cargo ship from Houston to Melbourne.

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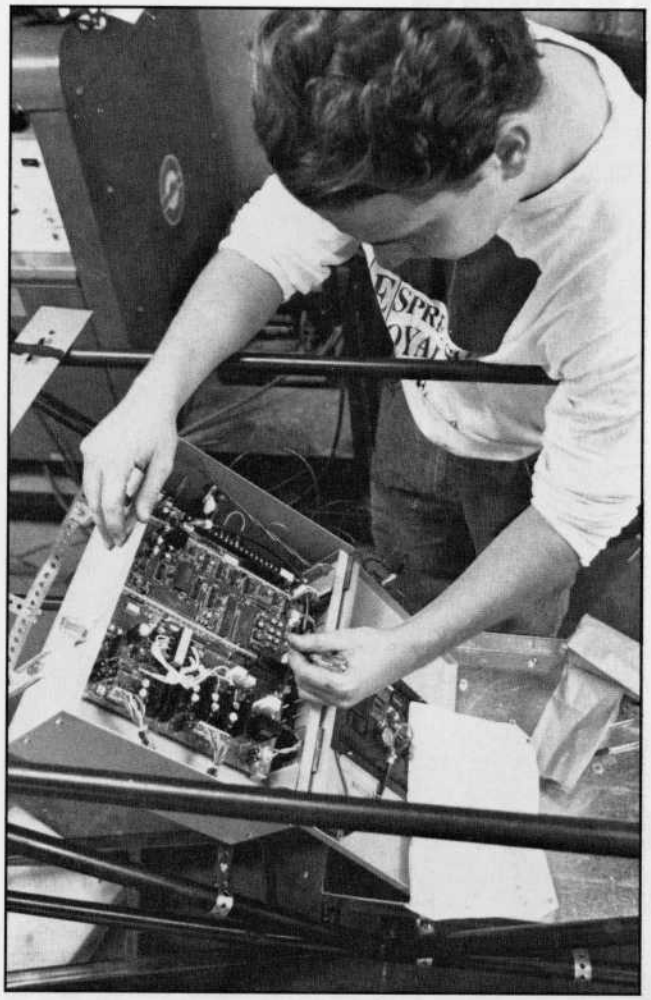

Both the controller and the motor were donated by Toshiba of Houston, headed by OU alumnus Charles Bender.

Photos by Gil Jain

Richard Vlasensky adjusts the electronic power controller for the mechanical drive system, which he developed with fellow team member Tod Hanley, also a car driver.

The solar car team, below, with Gigi Parker at the wheel, gives the motor frame assembly a parking lot test run prior to placing the fiberglass body on the vehicle.

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On a runway at Westheimer Field, the solar panel's output is tested under full sun conditions by Ken Myers, left, Richard Liles, John Fagan and Todd Hopwood.

Engineering student Tod Hanley works on the frame of the car's motor drive system.

"I worried that in Australia I'd pull out that solar panel and find half of it gone," he says. Meyers, with Parker and Todd Hopwood, designed, built and tested the car's entire electrical system and personally logged more than 300 hours on the panel's construction.

The solar panel, made of fiberglass and styrofoam with aluminum support rods, carries 814 photovoltaic cells and can produce up to 450 volts at approximately 1,500 watts. The 100-pound panel, which can be tilted to gain maximum power from the sun's moving position in the sky, was built by special arrangement with the students and faculty of Moore-Norman Vocational Technical School.

"We don't have the facilities at the University to construct a project of the magnitude of this panel," Fagan explains. "We were lucky to have a modern industrial facility such as Moore-Norman Vo-Tech located just down the road with all the latest equipment and technical personnel to assist us."

The OU team believed that their "ace in the hole" could be the solar car's unique controller and motor design. The three-phase high efficency induction motor—the only AC motor in the race—is driven by a carefully matched variable speed pulse width modulated controller.

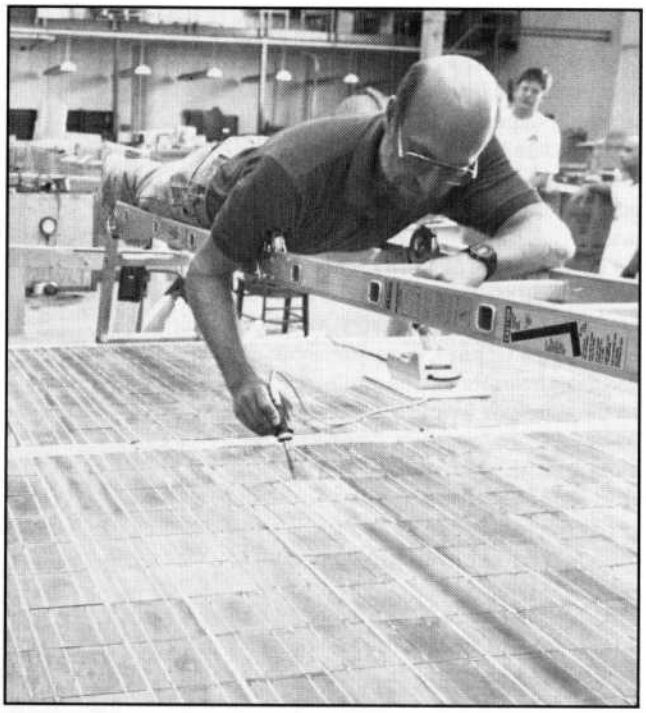
"The controller enables the car to convert DC energy from the panel to AC and in turn power the three-phase induction five-horse power motor," Fagan says. Operating at low amperes lessens problems with wiring and heat particular to DC motors. Energy stored in two dozen 12-volt lead-acid batteries assists the car when clouds obscure the sun.

Both the controller and the motor were donated by the Toshiba Corporation Industrial Equipment Division of Houston, a principal project sponsor headed by OU engineering graduate Charles Bender. Other sponsors of The Spirit of Oklahoma are ARCO Solar Products, The Benham Group, Burford Corporation, Hampden Engineering, Wilson Pinstar Corporation, Engineering Associates, Public Service Company of Oklahoma, Steven Jatras, Memorex-Telex Corporation, John Steele Zink Foundation, Holden Energy, Environmental Thermal Systems and Richard and Maxine Martin.

A small group of Norman businesses also contributing time, money and materials to the project are Palace Auto Supply, Buchanan Bicycles, Norman Body Works and Mazzio's Pizza. Each sponsoring firm received periodic progress updates and has its name emblazoned on the car's body. If Fagan can manage return of the car from Australia, sponsors may display The Spirit at their places of business.

Return shipping was problematical at the time of departure since only $50,000 of the $70,000 total project cost had been raised. Fagan personally borrowed the $2,200 race entry fee from a Norman bank and, he says ruefully, "I have $11,000 worth of airline tickets charged to American Express."

Rounding out the traveling squad to Australia were OU students Richard Vlasensky and Page Lynn and associate engineering dean Gene



Above, team captain Ken Myers repairs a single fragile solar cell of the 814 that make up the solar panel. Myers put more than 300 hours into building the panel.

Left photo, Gigi Parker, right, discusses the control system with one of the solar project's major boosters, Tulsan John Zink, a former Indy 500 race car designer.

Walker. Vlasensky developed the solar car's rear suspension and mechanical drive system with Hanley, who designed the front suspension. Lynn was responsible for the frame design and served as the team's "doctor," using expertise gained as a former fireman.

Lynn also headed the chase van pit crew charged with keeping the car in operation. His crew took their motto from advice offered by Tulsa businessman and Indianapolis 500 race car designer John Zink: "You can't win unless you can finish."

Fagan trusted the simplicity of the car design and the experience of the pit crew to pay off if difficulties arose. "How good an engineer you are is measured by how quickly you can make decisions and fix the problem," he says.

The professor is convinced that his traveling companions are very good engineers indeed. "These students know what it takes to get a job done," he insists. "When they graduate, they will be highly sought after by industry."

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The proud crew of the solar car displays the finished product for sponsors, media and the University community on the official roll-out day in September. For more than two years, three crews of students devoted their out-of-class hours, nights and weekends to qualify for the 1990 World Solar Challenge in Australia.

College of Engineering Dean Billy Crynes views the solar racer project as the ultimate in an engineering learning experience, incorporating design, actual hands-on construction, economics, teamwork, deadlines and peer competition in the international arena.

"In nearly every way, this experience simulates what our graduates are asked to do in industry and business," says Crynes, a major solar car booster throughout the project.

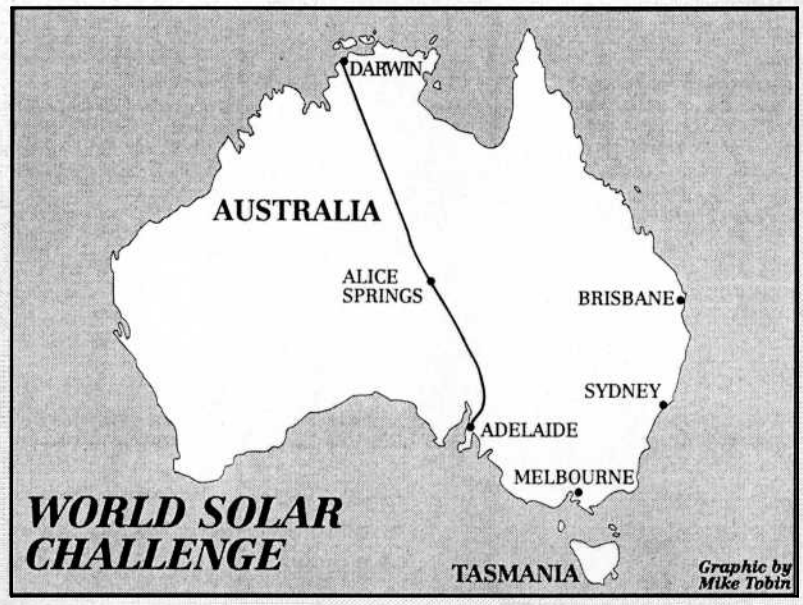
"To win—or even to finish—would be great," he reasons, "but the real victory is in the courage to compete. Our students always will value this experience because it is so difficult, unique and rewarding — no matter what happens."

Race organizers hope for additional fallout from the Australian adventure: heightened interest in alternatively fueled vehicles and a cleaner environment. Worldwide, renewable resources —hydroelectric, wind and solar—provide less than five percent of all power. While solar power is not yet practical for transportation, work on vehicles such as The Spirit of Oklahoma could yield advances in solar radiation, vehicle aerodynamics or battery technology, areas of intense interest as some U.S. automakers develop cars that run on electrical energy. General Motors plans to produce a commercial battery-powered car by the mid-1990s. Electric vans, which can travel 60 miles between charges, will hit the roads this year.

OU team captain Meyers shares the optimism of automakers but is guarded about the timetable. "I don't see people sitting around in 450-pound cars waiting for the sun to shine, but solar power is going to be a reality someday. With only 40 years of oil left and pollution problems with coal, it's going to be a reality. We need to be ready."

Solar car booster John Zink echoes the sentiment. "Obviously there is an end to the availability of fossil fuels," he says. "Then we'll have to start harnessing the sun. These students are the future. Nobody should be too busy to help them."

THE AUTHORS: Contributing to this article were Andy Rieger, John Fagan, Ken Meyers and Randall Turk.



EPILOGUE: As *Sooner Magazine* goes to press, word has been received from Australia that "The Spirit of Oklahoma" was still up and running as the whistle blew ending the grueling 11-day test of engineering skill and human endurance. Of the original field of 41, the Sooner car finished 27th with a number of the others having ended their participation broken down on the side of the rugged 1,800-mile route from Darwin to Adelaide.

"The Spirit of Biel," a $14.5 million entry from Switzerland, took top honors with the other cars being stopped in place five days after the winner crossed the finish line. In second place was the $7.5 million Japanese Honda entry, with the University of Michigan third.

Upon arrival in Darwin after a 2,500-mile trip from the entry port of Melbourne, the Oklahoma car was placed in the test car category and its finish line set at Ayers Rock, south of Alice Springs. The first race day was a virtual wash for the OU team when a large rainstorm cut in behind the early starters, stranding the sun-powered vehicle. Following were high winds, two more thunderstorms and a "whirly whirly," a dust storm that upturned the car just ahead of the Oklahomans.

The Sooners quickly determined that light as it had appeared in Oklahoma, their car was too heavy to win and better batteries were needed. Regardless, the car performed exceedingly well, proving sturdier than most and able to withstand the winds and road conditions.

As expected, the race team was superb, causing the accompanying World Solar Challenge official to tag them the "never-say-die" crew. Two minor breakdowns were dispatched in record time, and the Yanks also assisted a Japanese car in trouble. Coming upon a mother kangaroo that had been killed along the road, they even rescued the baby from its pouch and deposited the youngster at a nearby game preserve.

The whistle having ended its competition after traveling 1,150 miles, The Spirit of Oklahoma continued its journey 700 more miles to Adelaide, one of only 13 of the original 41 entries to parade through the downtown before thousands of cheering Aussies. En route, the OU team passed the second-place Honda car, which had broken down.

Experience is the key, contends OU coordinator John Fagan; the Sooners will be back. "It's a difficult, if not impossible, race to win first time around," Fagan admits. The winning Swiss team had tried four times, the Michigan crew twice. "Now that we know what we're facing, we plan to come back in '93 and win this race."

And after sharing the trials of the road the length of the continent, the Oklahomans were not about to abandon their car in Australia. When the team departed, The Spirit was loaded and ready for shipment home.