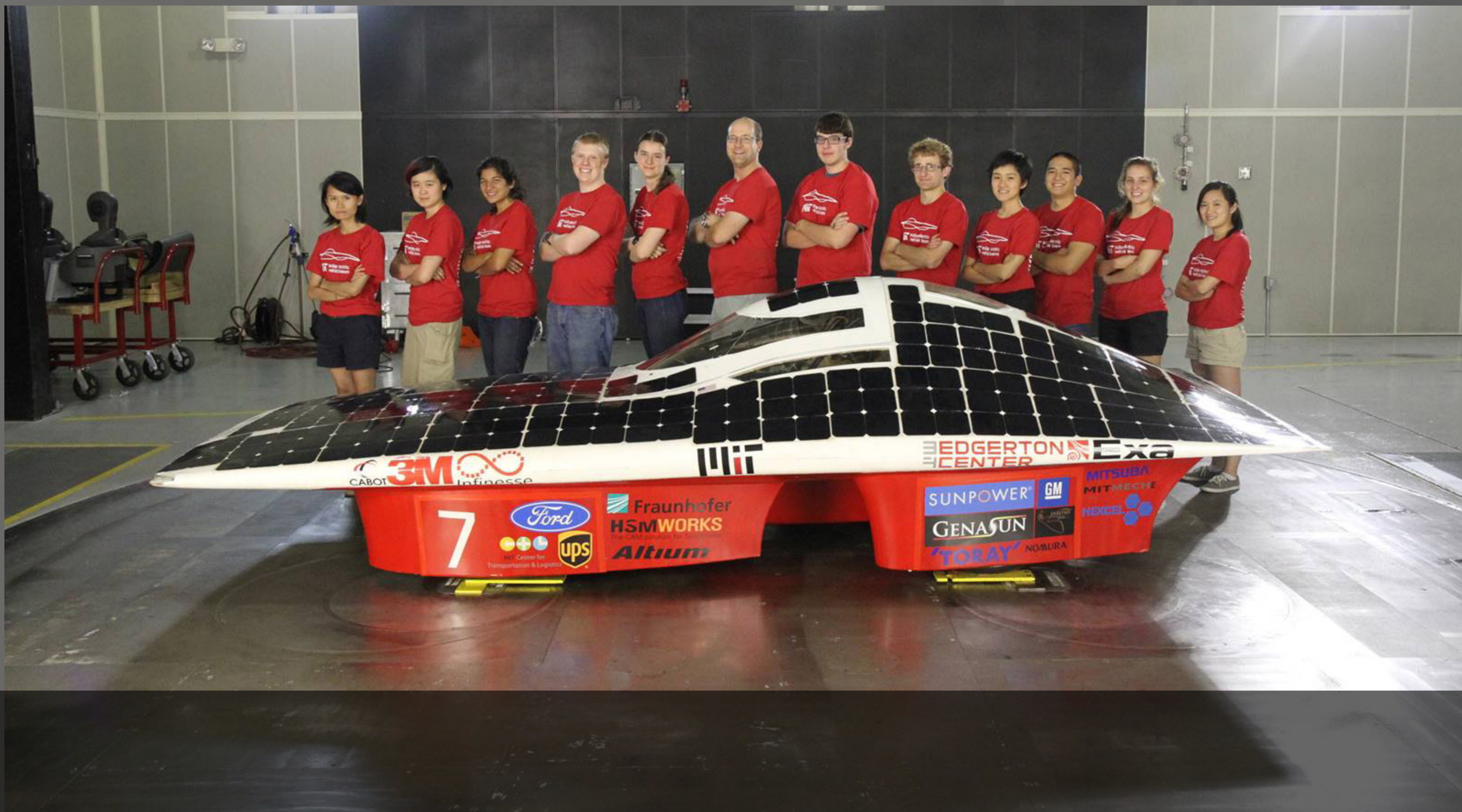
MIT SOLAR ELECTRIC VEHICLE TEAM



The MIT Solar Electric Vehicle Team (SEVT) is a student organization dedicated to demonstrating the viability of alternative energy-based transportation. The team was founded in 1985 and since 1993 has worked under the auspices of MIT's Edgerton Center.

We build each vehicle from the ground up, allowing us to apply our theoretical knowledge while gaining hands-on manufacturing experience and project management skills. Team members work with professors and industry to overcome the design and fabrication challenges inherent to this complex project. Since its creation, the SEVT has built nearly 15 vehicles and competed successfully in national and international races, most recently the 2015 World Solar Challenge in Austrailia. We are currently constructing our newest race vehicle for competition in the 2017 World Solar Challenge.

We share our enthusiasm for applied engineering and renewable technologies by actively reaching out to local schools and the Greater Boston community. Through our interactions, we hope to educate the public about alternative energy and transportation, as well as inspire the next generations of innovators.

TEAM GOALS:

- Facilitate continuous innovation and development in all fields related to solar electric vehicles through international participation and competition
- Give our sponsors publicity through positive exposure and press coverage.
- Provide members of the MIT community with incomparable experience in engineering, management, marketing, and business.
- Be active in the community, promoting alternative energy and transportation.
- Inspire children to pursue careers in science and engineering.

WHAT IS SOLAR RACING?

In a solar car race, highly specialized vehicles that run entirely on solar power are driven across continents at highway speeds. These vehicles are designed and built by teams of engineering students. Today's two largest races are the World Solar Challenge in Australia, and the North American Solar Challenge. The vehicles drive during the day and stop at night, covering 3000 to 4000 km in three to twelve days.

Each solar car is accompanied by lead and chase vehicles to provide support and ensure the safety of both the solar car and other vehicles on the road. Before each race, officials perform strict inspections, a process known as scrutineering, to ensure the vehicles comply with race rules and safety standards.

Teams exploit the latest technologies to make every possible improvement in efficiency and performance of their vehicles. Each vehicle is the focus of a major group effort that involves leadership, planning, business, marketing, and publicity.

As the years have passed, the technology used in our cars has continuously improved. The following timeline charts the evolution of our vehicles and their successes at races around the world.

Chopper del Sol

'11 World Solar Challenge (15th)
'12 American Solar Challenge (10th)

Valkyrie

'14 American Solar Challenge

Arcturus

'15 World Solar Challenge

Solectria 4

'87 Swiss Tour de Sol (15th)
'87 World Solar Challenge (9th)

Solectria 5

'88 Swiss Tour de Sol (6th)
'88 American Solar Cup (1st)
'89 American Tour de Sol (3rd)
'89 Canadian Solar Cup (1st)
'90 American Tour de Sol (1st)

Galaxy

'90 GM Sunrayce (6th)
'91 American Tour de Sol (1st)
'92 Swiss Tour de Sol (2nd)

Aztec

'92 American Tour de Sol (2nd)
'93 American Tour de Sol (1st)
'94 American Tour de Sol (1st)

Manta

'95 GM Sunrayce (1st)

Manta GT

'97 Sunrayce (2nd)
'98 Suzuka Dream Cup (5th)
'98 World Solar-Car Rally (3rd)

Manta GTX

'99 World Solar Challenge (1st in class)

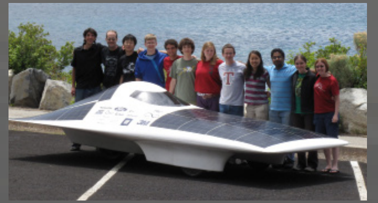
Manta Elite

'01 American Solar Challenge (10th)

Tesseract

'03 World Solar Challenge (3rd)
'05 American Solar Challenge (3rd)
'05 World Solar Challenge (6th)

Eleanor



'09 World Solar Challenge (5th overall, 2nd in silico class)

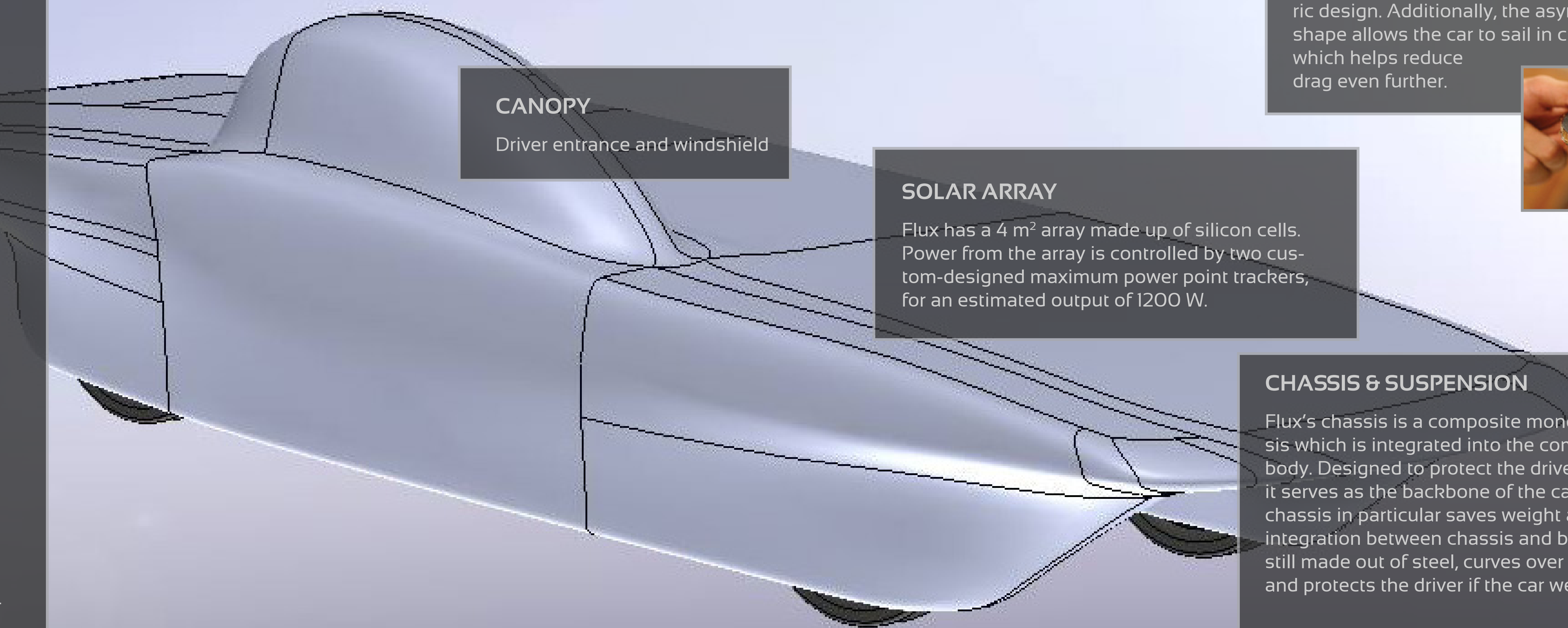
ANATOMY OF A SOLAR CAR

Flux represents several steps forward in solar vehicle technology. The latest race regulations have included significant rule changes designed to bring solar vehicles closer to commercial passenger cars. Vehicles are now required to have a driver-controlled parking brake, and the solar aray area has been significantly reduced.

Flux uses an asymmetric design to minimize aerodynamic drag. We were able to aerodynamically optimize the shape of the car with CFD (computational fluid dynamics) using Ansys.

The electrical system for Flux was also redesigned for efficiency. One design change is that Flux has one motor on one of the rear wheels, allowing a simpler, lighter electrical system but having minimal effects on driving the car.

The car's monitoring and control electronics have also been reworked, providing increased safety for the driver and greater communication between the solar car and the support vehicles. This data has been useful not only in improving the design of our next car, but also allows our strategy team to create predictive functions that can give us an edge during the race. These innovations represent significant improvements in performance, reliability, and safety.



PERFORMANCE

Max speed: 70 mph (motor can go up to 90 mph)

Cruise speed: 60mph

Weight: 450 lbs (without driver)

Dimensions: 4.45 m x 1.72 m

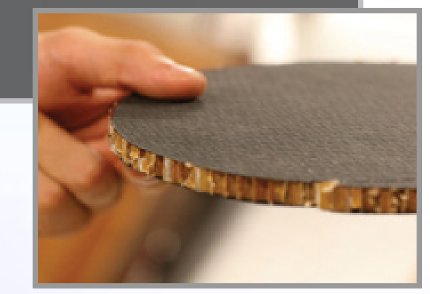
ELECTRICAL SYSTEM

The high voltage system includes the array, battery pack, and motors, while driver controls such as the steering wheel, throttle, camera, and horn make up the low voltage system.

A CAN network links the primary vehicle computer to various monitoring components in order to alert the driver of any irregularities, and enables constant communication between the solar car and the support vehicles.

AERODYNAMIC BODY

Each car's aerodynamic shape is designed in Rhino, simulated in Ansys, and tested in the Ford Wind Tunnel. Flux's shape is asymmetric which reduces drag by 2/3 what it would be for a symmetric design. Additionally, the asymmetric shape allows the car to sail in cross-winds which helps reduce drag even further.



CANOPY

Driver entrance and windshield

SOLAR ARRAY

Flux has a 4 m^2 array made up of silicon cells. Power from the array is controlled by two custom-designed maximum power point trackers, for an estimated output of 1200 W.

CHASSIS & SUSPENSION

Flux's chassis is a composite monocoque chassis which is integrated into the composite lower body. Designed to protect the driver from impacts, it serves as the backbone of the car. The composite chassis in particular saves weight and allows better integration between chassis and body. The roll-bar, still made out of steel, curves over the driver's head and protects the driver if the car were to ever roll.

Both the two front wheels and the driven rear wheels have dual wishbone suspensions to improve handling and reduce energy dissipation over bumps and rough surfaces.

MOTOR

A Mitsuba hub motor is mounted on each of the rear wheels, with a maximum power output of 3 hp (2.25 kW) per motor. Flux has less than one tenth the engine output of a typical compact car.

The motor has also been equipped with regenerative braking, allowing for further charging of the battery pack.

FAIRINGS, WHEELS & TIRES

Aerodynamic fairings minimize the drag around Flux's wheels and tires. The carbon fiber wheels and low rolling resistance tires are manufactured specifically for solar vehicles.

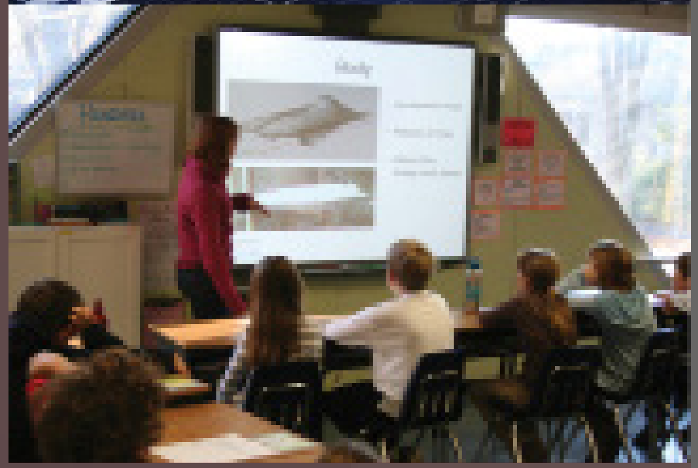
BATTERY PACK

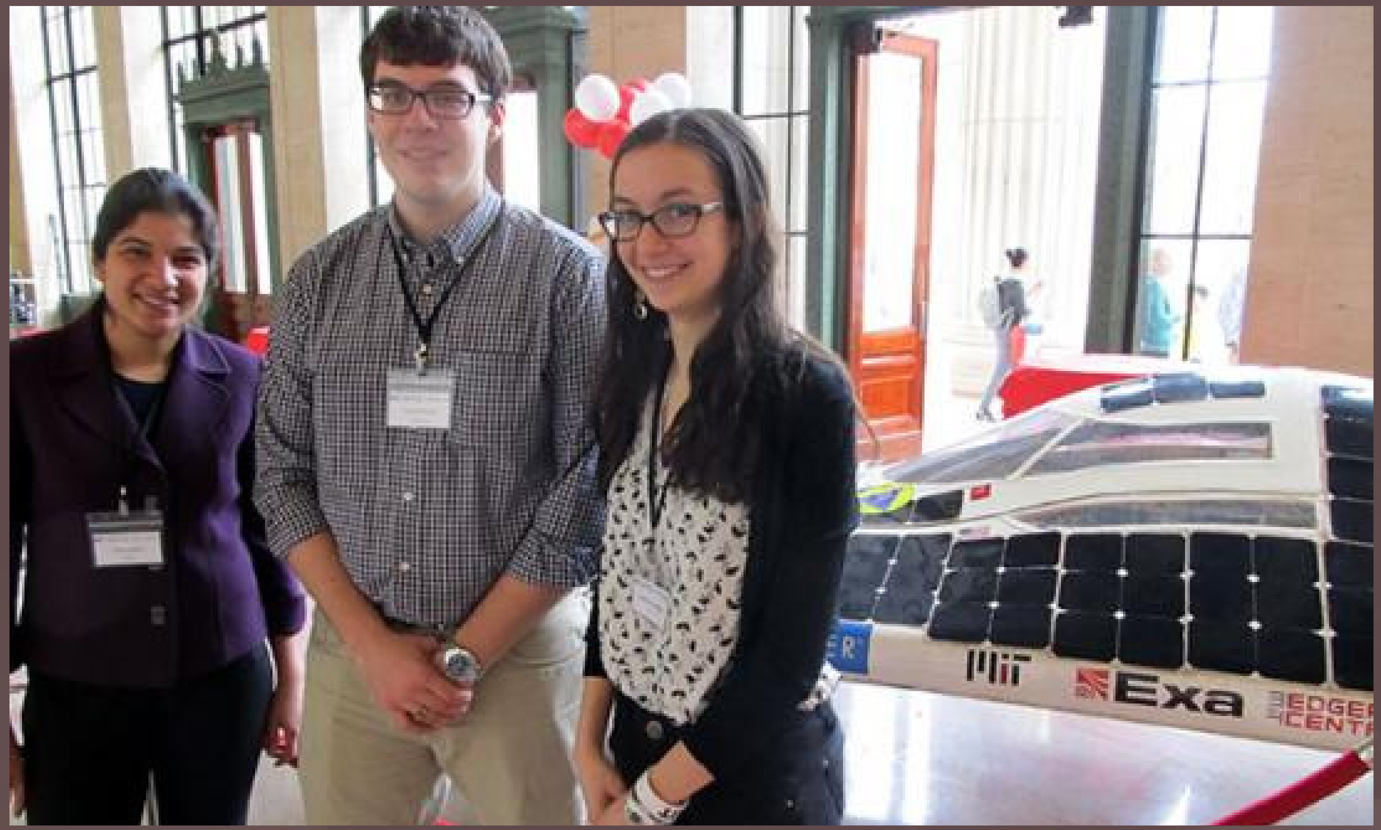
Flux's pack is constructed from 434 Lithium Ion cells, and has a capacity of 43 Ahr. Microprocessors monitor the temperature and voltage of the pack in real time, and alert the driver if any problems arise.

OUTREACH EVENTS

One way in which SEVT distinguishes itself from other student engineering projects is our commitment to being active in the community. Each year, dozens of K-12 students visit our shop to learn about our vehicles, alternative energy and the opportunities available in engineering. We also display vehicles at local events, fairs and museums.

This past year we participated in the Cambridge Science Festival and saw over 100 students walk through our shop over the course of a Saturday afternoon and were able to answer any and every question about working on the team, designing and buliding solar cars, and competing in the World Solar Challenge.





SEVT also held a Homecoming Party for the return of the latest car, Arcturus, from the 2015 World Solar Challenge. Open to the entire MIT community, students, staff, and faculty alike were able to see the car in person, talk to current members, and learn about the latest updates on the team.

Photos above: SEVT marching in the South Boston St. Patrick's Day Parade; SEVT members giving a presentation to local elementary school students; SEVT members at the Arcturus Homecoming Party.

Photos left: *Eleanor* on display at the Tech Museum in San Jose, CA, and the Detroit Children's Museum;

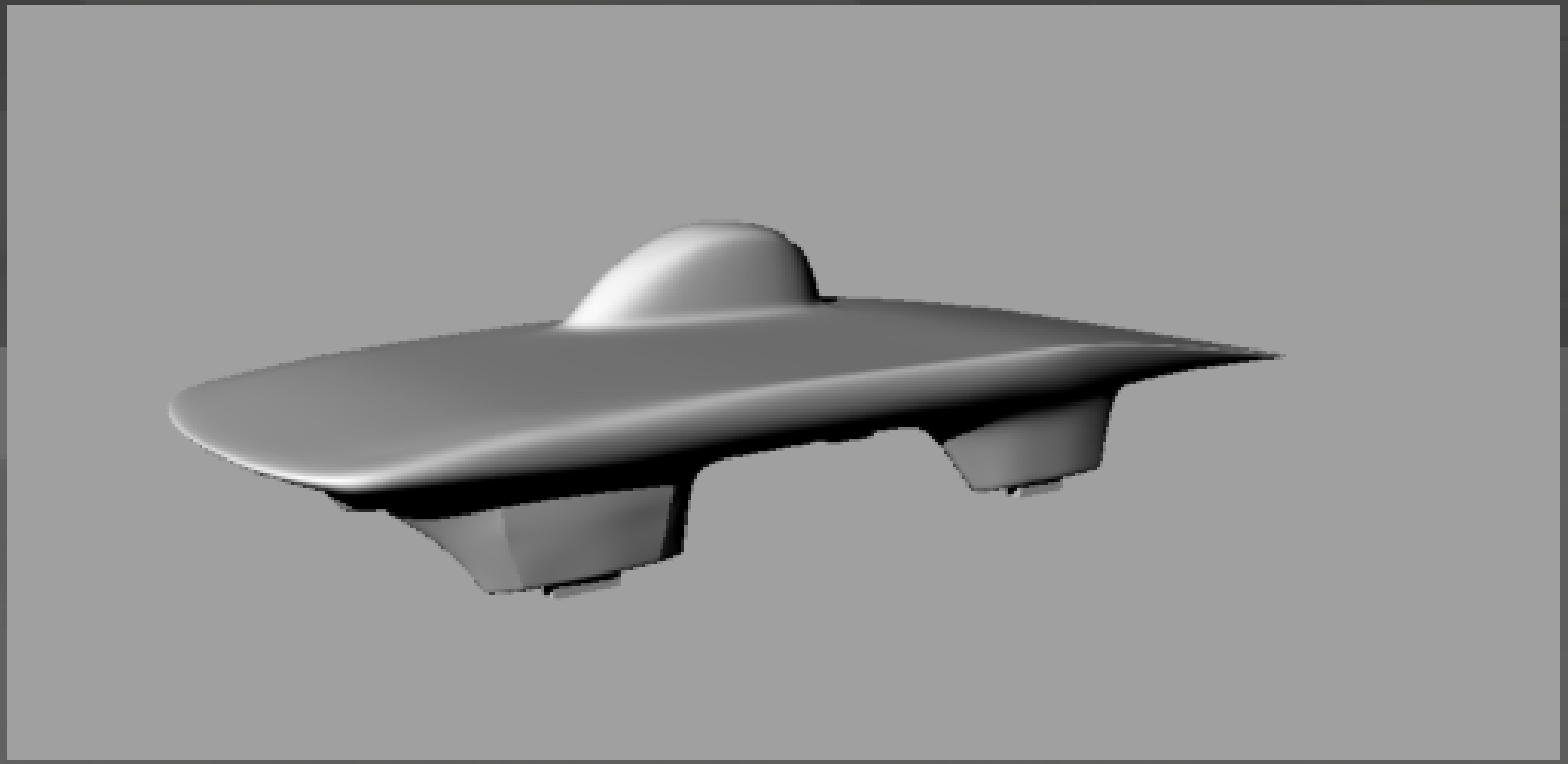
LOOKING AHEAD

The design of Arcturus's successor, Flux, includes lessons learned from the building, testing and racing Arcturus as well as a few new concepts.

One of our overarching design goals for Flux is to reduce the car's weight because it increases overall efficiency. Among many weight optimaztions for each compoment of the mechanical system, the SEVT will be switching to a composite chassis. since composite panels have a higher strength to weight ratio than steel. Again this year, the aerodynamics team is crafting a streamlined body, and one major design change is making the vehicle asymmetric. By positioning the driver on one side of the car, the reduced frontal area will minimize drag, and therefore, power consumption of the solar car. The aerodynamics team is trying various designs for the canopy, for the fairings, and for the airfoil-inspired body to maximize the favorable laminar flow over the body. Most of the modeling is done in Rhino 3D, while the meshing and simulation is done through Ansys's CFD packages, including FLUENT and CFX.

The electrical team will be making new changes in its components, and in particular we are using only one motor to drive the car. Flux will also have redesigned driver interface electronics. The team will be designing and constructing the battery pack in house.

Below: Flux, this year's car, as rendered in Rhino. This is our first asymmetric vehicle, as well as our first vehicle with a monocoque chassis.



2015 WORLD SOLAR CHALLENGE

The Bridgestone World Solar Challenge is the most prestigious solar car race. In this race teams design and build solar cars to race from Darwin to Adelaide, 3,000 kilometers through the Australian outback. This year 47 teams will compete representing 25 countries. The challenge accepts 3 classes of cars, Challenger, Cruiser, and Aventurer. We compete in the Challenger class where teams push the speed limit of solar technology with single-person solar vehicles. Cars are required to have 4 wheels, an upright driver, less than 4 square meters of solar cells, and less than 20 kg of batteries.

For the first week of the competition, teams go through scrutineering where professionals in the field test the entries for safety and compliance with the regulations. Aero dynamical properties, mechanical components, electrical wiring and programming are all gone over in detail. The next week the cars set off into the outback. While the sun is up, they race, and overnight the team fine tunes and fixes. Teams are given up to a week to travel 3,000 kilometers and reach the other coast.

CATEGORIES OF SPONSORSHIP

The MIT Solar Electric Vehicle Team will provide your company or organization with cost-effective media exposure while demonstrating its commitment to the environment, education, and innovation. Our vehicles have been featured in a wide variety of media sources from the local to the international level. SEVT sponsors have used vehicle pictures and race publicity in their own advertisements and publications, and have borrowed vehicles for display purposes. We maintain high functional and cosmetic standards for the vehicles and go out of our way to best utilize the opportunities for exposure provided by races and outreach events.

The SEVT's consistent success is made possible by the assistance of forward-looking individuals

SPONSORSHIP LEVELS

PLATINUM: $50,000

- Logo prominent on all race related vehicles, team apparel, and website
- Promotion during all media interviews and public appearances
- Availability of team members for recruiting and to give presentations

GOLD: $25,000

- Logo visible on front half of all race related vehicles, team apparel, and website
- Promotion during all public appearances
- Access to team resume book

SILVER: $10,000

- Logo visible on rear half of all race related vehicles, team apparel, and website
- Subscription to team publications and newsletters

BRONZE: $2,000

- Logo visible on support vehicles during races, team apparel, website

DONOR: Under $2,000

- Promotion on website, www.mitsolar.com
- Name on trailer
- Tax recognition

Levels of sponsorship include all benefits of lower levels.
(All amounts are per project and include cash and in kind

BUDGET

Electrical	
- batteries	$10,000
- board components	$5,000
- array	$150,000
- motor and controller	$14,000
- software	$5,000
Aerodynamics & Composites	
- molds	$25,000
- materials	$25,000
- consumables	$7,000
- protective equipment	2,000
- wind shield	$1,500
- chassis	$2,000
Mechanical	
- suspension	$12,000
- wheels	$4,500
- tires	$7,000
- brakes	$2,000
Logistics	
- transport car and gear	$17,000
- lodging	$10,000
- trailer	$5,000
- rental vehicles	$15,000
- fuel	$6,000
- team uniforms	$2,000

CURRENT SPONSORS

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