

UT Solar Car Abstract:

The University of Toledo Solar Car Team (UTSC) was founded in 2008 with the goal to build and race a solar-powered car in the 2012 American Solar Challenge. The event is a cross-country time/endurance race across public highways. The team is currently designing the university's first solar car with the mission to educate students and the greater community on alternative energy and its applications, as well as to build a practical solar car that could have real world applications upon further technological advances. The team has a strong desire to innovate and use local technology and resources. Since Toledo is moving to redefine itself as America's Solar City, the UTSC desires to build a car that stands out and represents the alternative energy community in Northwest Ohio. The team is currently designing its car and actively seeking sponsors. The final product is going to feature new and original technology including a custom built energy efficient Hub Motor as well as other unique energy-saving technologies. The organization is very excited to be part of the alternative energy solution and to help raise community awareness about solar technology.

The University of Toledo Solar Car Team (UTSC) was originally founded in 2008 but due to most of the team graduating, did not get off the ground until the summer of 2010. With momentum building, the team has chosen to focus its efforts on five main goals:

1. Education
2. Innovation
3. Promoting local technology
4. Design, build and race a *practical* solar car
5. Compete in the 2012 American Solar Car Challenge

We strive to educate students and the local community about various alternative energy technologies. The innovation refers to taking those previously developed technologies and trying to use them in different applications. We also aim to not only promote our University but also to help Toledo with its goal of trying to reinvent itself as the Solar City.

As for *practicality*, one way we wish to be practical is economically. We are estimating the price of our car to be somewhere between \$60,000- \$80,000 whereas other solar cars could be anywhere between \$1 million and \$10 million. We plan to keep expenses down partially by building our own motor and not using space grade solar cells. The other ways we will keep our expenses down are by the different technologies that we are planning on incorporating into our car which will maximize the car's energy usage.

Once every two years, Universities all over the country have competed in this "rayce" (the American Solar Challenge) to see who can finish first in this cross-country event ranging anywhere between 1200-1600 miles across public highways. The previous race went from Broken Arrow, OK to Naperville, IL. The next race will occur in the summer of 2012 but the specifics have not yet been announced.

Because the group was recently founded and has no previous models, the team has chosen to investigate all facets of the car to try and gain an advantage against the more established teams. Some of the mechanical aspects that the team is trying to be innovative with include: an in-wheel hub motor design, possibly airless tires, and also the body design of the car. Most cars in the Solar Car Challenge look very similar to flat pancakes on wheels. Our body design

looks more like a tear drop or wing shape to increase aerodynamics and so the car resembles more of a “normal” car shape. All other mechanical aspects of the car will be consist of parts that can either be easily be fabricated or bought so as to minimize the complexity of not only building, but also working on the car.

For the upcoming race, the team has chosen to spend a lot of time innovating the electrical side of the car, trying to make it as unique as possible. This past semester, the electrical team has been busy at work researching and doing simulations to figure out the optimum design for the in-wheel hub motor design. The other electrical aspects of the car that students have been working with are the battery management system and a solar golf cart project. This battery management system uses a pulse controller, which will maximize the efficiency of energy transfer during charging and discharging of the batteries.

Another process of electrical designing is the hub motor. It is based on the unique technology invented by Flynn Motor Technologies, but our system has the unique ability to recover inductive energy while the motor is in operation, and this is in addition to the standard regenerative breaking technology. These technologies will integrated to give our car both performance, and energy efficiency advantages.

Since our car and the technology involved is a reflection of the innovations taking place at UT, we are working on various innovative electronics and battery systems to allow us to leverage some of these amorphous solar technologies in our system design to show how a solar car could someday be developed into a practical technology for everyday use.

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