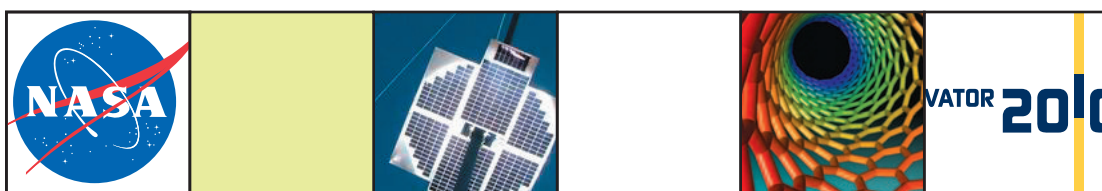


challenges

THE
SPACEWARD
FOUNDATION

"I have learned to use the word 'impossible' with the greatest caution."

– Wernher von Braun



1714 *The Longitude Prize*, for finding the longitude of a ship at sea. Won in 1773 by John Harrison.

1919 *The Orteig Prize*, for flying non-stop across the Atlantic. Won in 1927 by Charles Linbergh.

1970 *The Kremer Prize*, for flying across the English Channel with a human-powered airplane. Won in 1979 by Paul MacCready.

1996 *The X-Prize*, for a reusable manned suborbital spacecraft. Won in 2005 by Burt Rutan.

2003 *The American Space Prize*, for a reusable manned orbital ship. Still up for grabs...

Challenges are designed to focus minds and resources on specific goals, and encourage development of the technologies necessary to achieve them. Recent competitions have been very successful at this task:

- > The *X-Prize* commanded large public interest, and resulted in private investment into the commercial suborbital tourism market.
- > The *DARPA* grand challenge succeeded in making multiple university and private teams devote significant mindshare and resources to the development of autonomous vehicles.
- > *Solar Car* races have succeeded over the years in both advancing the state of the art and garnering public support for solar energy technology.

The Spaceward Foundation is interested in fundamental technologies that will allow us to greatly increase humanity's capabilities in space. Partnering with NASA's Centennial Challenges office, Spaceward is managing engineering competitions aimed at academia, private industry, and space enthusiasts to seek novel solutions to some of NASA's most difficult mission challenges.

Our challenges are formulated as annual competitions that require measurable advances in the state of the art from year to year, but are designed to fit into a yearly academic schedule, manageable within a two-semester graduate or advanced undergrad engineering project, and are conducted primarily among universities and small industry firms.

Formulated in partnership with NASA's Centennial Challenges office, the Spaceward Foundation is currently directing three competitions.



First annual Power Beaming Challenge



POWER BEAMING

(\$200,000 for years 2005 and 2006)

Power beaming is a key technology under consideration to provide energy for remote lunar and planetary surface expeditions as well as long duration aerial reconnaissance missions on Mars and the Jovian moons. Closer to home, it can power satellites from the ground as they pass through the Earth's shadow. Power beaming is also a key enabling technology for Solar Power Satellites, laser rocket propulsion and the Space Elevator.

SUPER STRONG TETHERS

(\$200,000 for 2005 and 2006)

Strong tether technology is fundamental to constructing better space worthy composite materials, large solar panels, lighter rocket bodies, and can be used for advanced atmospheric sensing using draglines. Terrestrial applications include super-long suspension bridges, permanent tethered lighter-than-air platforms, strong and light engineering materials, safety vests, and an infinite array of sporting goods application. Super-strong tethers are also the main building block for advanced concepts such as orbital tethers, solar sails, and the Space Elevator.

AUTONOMOUS ROBOTIC ASSEMBLY

(\$250,000 for 2006 and 2007)

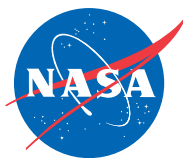
As both the range and the level of complexity of space missions increase, there will be a strong need for robotic systems to become autonomous and to collaborate among themselves. This challenge focuses attention on the mechanisms and algorithms necessary to achieve this. Terrestrial applications include search and rescue operations, construction, and defense.

Sponsorship The challenges also tie into the public awareness aspect of our activities, since they naturally generate a high level of media interest. In conjunction with our public demonstrations and displays, they form the backbone our outreach program.

While NASA's Centennial Challenges office provides the prize purse for our activities, we raise the funds for operations through a combination of donations and sponsorship partnerships. Detailed information for sponsorship opportunities can be found in the "sponsorship" datasheet.

"By making awards based on actual achievements, instead of proposals, Centennial Challenges seeks novel solutions to NASA's mission challenges from non-traditional sources of innovation in academia, industry and the public."

— NASA Centennial Challenges website



"We predict too much for the next year and yet far too little for the next ten."

— Neil Armstrong

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