

### ***Centennial Challenges***

*NASA Prizes for the Citizen-Inventor*

[www.nasa.gov/challenges](http://www.nasa.gov/challenges)

Transparency  Participation  Collaboration

The Centennial Challenges program seeks new solutions to specific technical problems of interest to NASA. The Challenges, which encourage participatory research and development, are open to private companies, universities, independent teams, and individual inventors. Our original seven prize challenges have been successful in encouraging broad participation by a diverse group of innovators. Many of these technical challenges also have direct relevance to pressing national and global needs such as energy and transportation.

The Centennial Challenges program is a multi-year activity with funding from previous years available for on-going competitions until the challenges are met and the prize money is won. All of the Centennial Challenges funding is applied to the prize purses. The program relies on partnerships with non-profit organizations to administer each challenge.

#### **Overview**

The Centennial Challenges program was conceived in 2003 and its name refers to the centennial of the Wright Brothers' first powered flight and commemorates their spirit as independent inventors. We worked with our partners in Congress to amend the Space Act to include Section 304 – Prize Authority. The Prize Authority allows us to use appropriated money to competitively award cash prizes to stimulate innovation.

The first competitions were held in 2005. Between 2005 and 2009, 19 competition events have been held in 7 challenge areas. We have awarded \$4.5 million to 13 different teams. Most challenges have taken several years for competitors to achieve success.

Prize programs encourage diverse participation, which leads to different approaches to a solution. A measure of diversity is seen in the geographic distribution of participants (from Hawaii to Maine) that reaches far beyond the locations of the NASA Centers and major aerospace industries. The participating teams have included individual inventors, small startup companies, and university students and

#### **Regolith Excavation Challenge**

[regolith.csewi.org/](http://regolith.csewi.org/)



*Paul's Robotics, a student team, wins \$500,000 in the Regolith Excavation Challenge*

In the third year of the Regolith Excavation Challenge, many teams were able to excavate and move significant amounts of the simulated lunar soil. Three teams did exceed the minimum requirement of excavating 150 kilograms in 30 minutes and the winning team excavated three times that amount. The first place winner was a team from Worcester Polytechnic Institute led by an undergraduate student named Paul Ventimiglia. Paul's team won half of a million dollars and immediately formed a robotics company. The most successful teams posted news of their progress on their Web sites and were in communication with each other throughout the period leading up to the competition.

professors. An example of multiple solution paths was seen in the 2009 Regolith Excavation Challenge when teams developed more than 20 different working prototypes that were demonstrated to our judges. When NASA does its own development, it typically budgets for only two working prototypes. All of these prototypes were developed at no cost to the government. NASA expended \$750,000 in prize money for three years of competitions around this challenge, with dozens of teams investing tens of thousands of hours.

The return on investment with prizes is exceptionally high as we only issue the prize funds when the accomplishment is demonstrated. We provide the prize money, which ends up being the only cost to NASA since non-profit organizations administer the competitions at no cost to the government. Teams must finance their own development efforts.

Prizes also raise visibility of NASA programs and generate interest in science and engineering. Live Web casts of Centennial Challenge competitions attract thousands of viewers across the nation and around the world. The 2009 Power Beaming competition resulted in more than 1,000 news articles and Web features.

The Centennial Challenges program offers a great opportunity for the government to encourage private individuals to pursue technology advances that will benefit society. It offers an opportunity to showcase the skill, determination, and creativity of these exceptional people. The Challenges are inspirational to the next generations of innovators by showing otherwise ordinary people doing extraordinary things, and having fun doing it.

### How This Fits into Open Government

Opening the door to all interested individuals and groups and providing the incentives of prize money and publicity increases the chances that valuable new technologies will be developed. As part of that openness, the government does not manage the activities of the competitors. Instead, we set the challenges and teams work on their own to come up with solutions. Centennial Challenges has proven its value, not only with new technologies to meet our needs but by tapping new sources of innovation, leveraging the tax-payer investment to create new businesses and partnerships, and increasing public involvement in science and technology.

#### Lunar Lander Challenge

[space.xprize.org/lunar-lander-challenge](http://space.xprize.org/lunar-lander-challenge)



*X-Prize Organized Lunar Lander Challenge (left) and winner Masten Space Systems receives national recognition from industry (right).*

Many prize competitors are already-existing small businesses. The competitions allow them to focus their efforts and provide them with visibility and credibility not easily attained in fields such as rocket propulsion, which are dominated by huge corporations. In this case Masten Space Systems created a lunar lander that could simulate trips between the Moon's surface and lunar orbit. Not only did they win the Challenge, they were recognized for their efforts as "Space Entrepreneur of the Year" by *Aviation Week* magazine.

**Open Government Goals**

- Three Months
  - Announce several new challenge topics, solicit bids, and select allied organizations to manage those new competitions.
  - Continue to work with existing allied organizations for three on-going challenges.
  - Increase participation by increasing publicity for the events, reaching out to potential new competitor communities and seeking new government partnerships and new venues for the competitions.
- Six Months
  - Execute the next round of ongoing Power Beaming and Strong Tether Challenges.
  - Work with the allied organization for the 2011 Green Flight Challenge.
  - Arrange partnerships for new challenges, post rules for public comment, and re-open the opportunity for public suggestions for new prize challenges.
- One Year
  - Plan and conduct the ongoing and new challenge competitions.
  - Hold a second Centennial Challenges Technical Symposium and a Recognition Ceremony, if we have had prize winners in 2011.
- Two Years
  - Aim for increased funding to allow for more ambitious challenges including prizes for actual spaceflight and exploration demonstrations (e.g., low cost access to space, activities on the International Space Station, lunar sample returns, etc.).

**Useful Links**

1. Prize Authority in the Space Act:  
[www.nasa.gov/offices/ogc/about/space\\_act1.html#Prize](http://www.nasa.gov/offices/ogc/about/space_act1.html#Prize)
2. Green Flight Competition: [cafefoundation.org/v2/gfc\\_main.php](http://cafefoundation.org/v2/gfc_main.php)
3. Strong Tether Competition: [www.spaceelevatorgames.org/](http://www.spaceelevatorgames.org/)
4. Power Beaming Competition: [www.spaceward.org](http://www.spaceward.org)
5. New Competition Suggestions:  
[www.nasa.gov/offices/ipp/innovation\\_incubator/centennial\\_challenges/future/ideas.html](http://www.nasa.gov/offices/ipp/innovation_incubator/centennial_challenges/future/ideas.html)