



Centennial Challenges

NASA'S Centennial Challenges Program drives innovation, creates opportunity and seeks to stimulate inventors through the communication of challenge competition results.

NASA Centennial Challenges were initiated in 2005 to directly engage the public in the process of advanced technology development.

The program offers incentive prizes to generate revolutionary solutions to problems of interest to NASA and the nation. The program seeks innovations from diverse and non-traditional sources. Competitors are not supported by government funding and awards are only made to successful teams when the challenges are met.

In keeping with the spirit of the centennial anniversary of the Wright Brothers' flight and other American innovators, the Centennial Challenge prizes are offered to independent inventors including small businesses, student groups and individuals. These independent inventors are sought to generate innovative solutions for technical problems of interest to NASA and the nation and to provide them with the opportunity to stimulate or create new business ventures.

The Centennial Challenges program gathers ideas for new prize topics from the general public, industry representatives, and NASA employees.

The Future

Upcoming challenges in 2012 include an autonomous controlled sample return robot challenge, nano-satellite launch system and a night rover solar power storage competition.

The President's budget request includes \$10 million per year for Centennial Challenges prizes to allow further growth in the scope and range of prize competitions and even greater opportunities for the citizen-inventor to participate in NASA's research and development.

Competitions are managed by independent, non-profit organizations. NASA provides the Centennial Challenge prize money.

www.nasa.gov



NASA | BILL INGALLS

Team members of the e-Genius aircraft prepare their plane prior to competition as part of the 2011 Green Flight Challenge, sponsored by Google, at the Charles M. Schulz Sonoma County Airport in Santa Rosa, Calif. on Monday, Sept. 26, 2011.

Centennial Challenge objectives are:

INNOVATION

- Drive progress in aerospace technology of value to NASA's missions.
- Find innovative solutions through competition and cooperation.
- Encourage participation of teams, individuals, student groups and private companies of all sizes

OPPORTUNITY

- Leverage technology from challenge competitions for infusion into NASA missions.
- Enable Challenge competitors to develop and/or expand business models and business base.
- Enable Allied Organizations, conducting the challenges for NASA, to introduce their mission to a larger national audience

COMMUNICATION

- Share Challenge results.
- Provide a forum for public outreach



Sample Return Robot Challenge

Objective

An autonomous capability to locate and retrieve specific sample types from various locations over a wide and varied terrain and return those samples to a designated zone in a reasonable amount of time with limited mapping data.

Description

Demonstrate a robotic system to locate and collect a set of specific sample types from a large planetary analog area and return the samples to the starting zone. The analog roving area could be as large as 3 to 5 km² and could include rolling terrain, granular medium, soft soils, and a variety of rocks. A pre-cached sample and several other samples would be located in smaller sampling zones within the larger roving area. Teams will be given aerial/geological/topographic maps with appropriate orbital resolution including the location of the starting position and a pre-cached sample.

The samples should be easily distinguished from other materials present at the site since the need for sophisticated scientific instrumentation for sample identification is not an objective of this challenge. The robot systems in this challenge are envisioned to have a mass on the order of 80kg and require multiple hours to complete the task. Robots are free to use whatever method of mobility, manipulation, and navigation they choose, but are limited to resources available on a planet other than Earth.

In order to win a Level 1 prize, a robot has 15 minutes to retrieve only the pre-cached sample. Robots should be autonomous but periodic intervention with tele-operation would be permitted with penalties imposed for its use.

In order to win a Level 2 prize, a team must autonomously navigate at all times and must retrieve the pre-cached sample and several additional sample types that may include rock, regolith, gas, liquid, etc. from separate large regions



of the roving area that will be of different terrain types. Additional limits may be imposed for mass, power, etc. The winning criteria may include the shortest time to complete the task and lowest system mass.

Prize Purse

\$1.5 million is available from the Centennial Challenges Program. For more information about Sample Return Robot, visit www.nasa.gov/robot.

Educational Opportunities

In conjunction with the challenge, Worcester Polytechnic Institute will host TouchTomorrow, a festival of science, technology and robots. The event will feature displays, interactive exhibits, educational panels, games and more, with a special preview day for educators. For more, visit touchtomorrow.wpi.edu.

NASA's Marshall Space Flight Center in Huntsville, AL manages the Centennial Challenges program for the Office of the Chief Technologist in Washington, D.C.

For more information on the Centennial Challenges, visit www.nasa.gov/challenges.

For more information about the Office of the Chief Technologist, visit www.nasa.gov/oct.