



Centennial Challenges Program Space Technology Mission Directorate

**New Challenge Model to Grow
University Participation**

Introducing New Challenge Model



- Universities are potentially a significant source of challenge competitors but for most part have not been participating.
- Some Input from Universities
 - Challenges are too difficult
 - No continuity of Challenges; can't build and refine over time like Moon Buggy, Lunabotics, Solar Car, etc.
 - We don't have any funding for challenges



Tailoring Approaches



- Difficulty:
 - Better scale initial challenge prize awarding goals to university capabilities – SOA +5%?
- Continuity:
 - Commit to multi-year challenges with annual competitions aligned with university calendars
 - Raise goals annually based on prior year results
- Funding:
 - Provide competitive grants to universities



Adapting “DARPA Model”

- Open competitions with two tracks:
 - Open Track: Unfunded but open to all eligible parties
 - Procurement Track: University Teams Selected for Grants based on response to parallel solicitation
 - Current plan is to support 5-10 teams @\$100-200K each
 - Funded teams would still have to register and meet all Challenge requirements to qualify to win the Challenge prize.

Status

- Conceptual Approval from NASA OGC & Procurement
- **Looking for candidate concepts**
- late FY14 start



What's Your Challenge Idea?



- Appeals to many universities
- Achievable near term and ultimate goals
- Public/Media would find it interesting

- Send short description to –
<hq-stmd-centennialchallenges@mail.nasa.gov>
Use University Challenges in Subject Line



Some Ideas

- **Europa Ice Challenge**
 - Demonstrate innovative, scalable solutions to penetrate very thick, low temperature ice that is likely to be found on Europa.
- **Space Race**
 - Ground based robotics competition demonstrating autonomous detection, rendezvous, and capture of orbiting sample cache.



Some Ideas II

- **Aerial Robotic Explorers**
 - Demonstrate a miniature (flying insect class) sensor package able to sense and transmit data and fly for more than 10 minutes at Mars surface conditions.
- **Micro Lander Challenge**
 - Demonstrate miniature (<25 kg) vertical takeoff, vertical landing rocket vehicles that can make unfueled round trip between two landing pads.



Some Ideas III

- **Earth Entry Vehicle Landing Shock Attenuation**
 - Demonstrate new ways to attenuate impact deceleration forces on sample return impactors.
- **Precision Lander Challenge**
 - Without using GPS, autonomously land a payload within a prescribed target area when dropped from altitude of >20,000 feet.



Some Ideas IV

- **Mars Ascent Vehicle Challenge**
 - demonstration of an end-to-end autonomous operation to sequentially accomplish the following tasks: picking up the sample cache, inserting the cache into a single stage rocket in a horizontal position, erecting the rocket, launching the rocket to an altitude not less than 800m, deploying a sample container with the cache internally sealed and landing the container at less than 6m/s terminal velocity.



Ideas V



- **Venus Thermal Challenge**
 - Thermal control subsystem development for a notional probe exposed to Venus surface atmospheric conditions. Competitors demonstrate a thermal control system to maintain the probe electronics within a predefined range of pressures and temperatures for a set period of time.



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