National Aeronautics and
Space Administration

NASA

Centennial Challenges Program
Space Technology Mission Directorate

Cube Quest Challenge
Lunar Derby and
Deep Space Derby

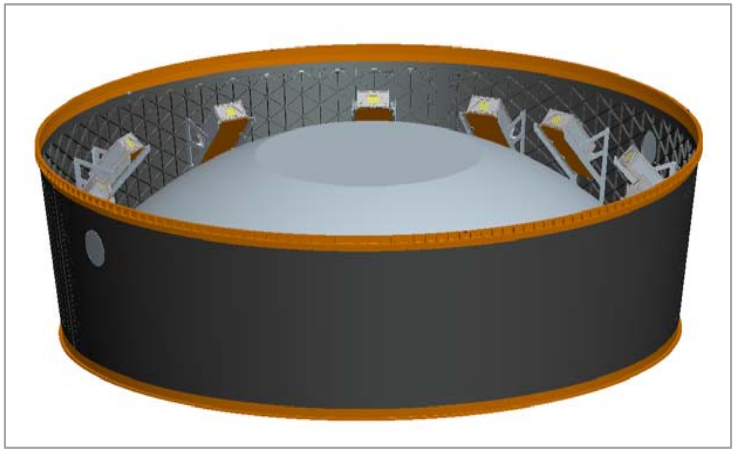
2015 Cube Quest Challenge Summit

01/07/2015

www.nasa.gov/spacetech

New Challenge

- Centennial Challenge Program announces Cube Quest Challenge
  - The Deep Space Derby
  - The Lunar Derby
- Qualified Teams will launch on board NASA's Exploration Mission EM-1 at no cost
  - EM-1 is the first uncrewed lunar flyby of Orion
  - Secondary Payloads will deploy during trans lunar orbit



Why Cube Quest Challenge?

- CubeSat Form Factor
  - Advantages include
    - Low cost
    - Small size, mass, and power
    - Easier launch vehicle integration
  - Current limitations include
    - Short-term operations, in Low Earth Orbit (LEO)
    - Communications subsystems
      - Low-bandwidth data rates
      - Low transmit power
      - Low-gain
      - Unique protocols, or amateur radio wavelengths
    - No in-space propulsion (with limited exceptions)
    - No deep space navigation
- Future Applications include
  - Astrophysics
  - Planetary Exploration
  - Heliophysics
  - Earth Science
  - DoD Applications
  - Near Earth Object Exploration
- Successful teams will demonstrate sustained spacecraft and ground-segment capabilities necessary for deep-space exploration.

Goal: Incentivize small spacecraft deep space operations capabilities development, leading to the economic achievement of NASA, other government agencies, academia, and industry objectives.

Challenge Firsts

- First opportunity for non-government entities to develop spacecraft, and compete to operate at the moon and beyond
- Challenge incentivizes alternate solutions to
  - Deep Space Communications
    - Ground station networks
    - Deployable CubeSat antennas
    - Improved transmitters
    - Game-changing high bandwidth optical
  - In-Space Propulsion
    - CubeSat market poised to offer a variety of propulsion systems
    - To date, only NanoSail-D has demonstrated propulsion in LEO
    - Anticipated (but not limited to) propulsion types
      - Solar sail
      - Solar electric
      - Chemical (subject to SLS approval)
  - Longevity in Deep Space:
    - New approaches to rad hardening
    - Thermal and power management
    - Advanced CubeSat GN&C to achieve lunar orbit and steer antennas
- First ever in-space Centennial Challenge

Summary

- New Challenge Starting
  - Deep Space Derby
  - Lunar Derby
- Challenge Information
  - Registration is open ☑
  - Kickoff Summit **Now** ☑
  - For More Information Go To NASA Centennial Challenges Website

www.nasa.gov/challenges

BACKUP

Challenge Team

Role	Name
CCP, Deputy Program Manager	Eric Eberly
CCP, Program Manager	Sam Ortega
Cube Quest Challenge Administrator	Jim Cockrell, ARC
Judges	1) Dr. David Klumpar, Heliophysics Division 2) George Norris, SLS Secondary Payloads 3) TBD 4) TBD 5) TBD