



## Centennial Challenges Program Space Technology Mission Directorate

# CubeSat Lunar and Deep Space Challenges



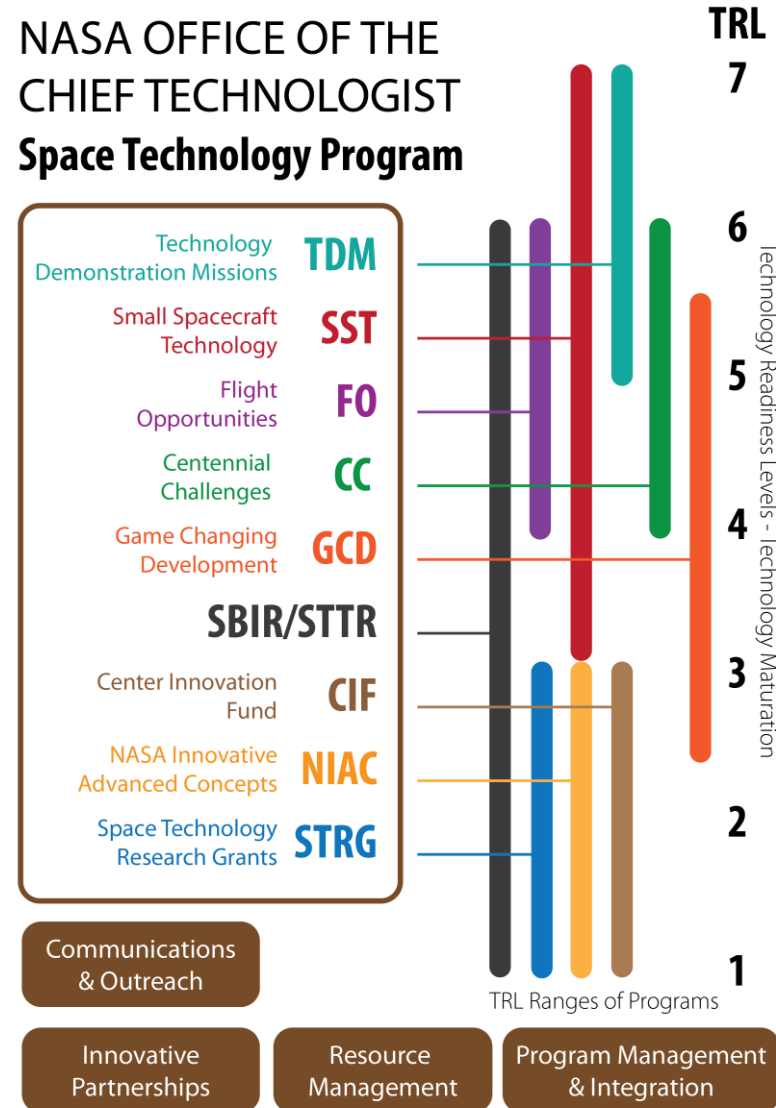
# Centennial Challenges



- Centennial Challenges Program is unique in Space Technology Program
  - Stimulates innovative development using cash prize competitions
  - Targets technical solutions in areas of interest to NASA
  - Challenge competitors
    - US citizens, permanent residents, or US entities only
    - Intellectual Property rights
    - Minimal reporting and government oversight
- Reaching solutions beyond the typical government solicitations and methods

# We Need You!

## NASA OFFICE OF THE CHIEF TECHNOLOGIST Space Technology Program





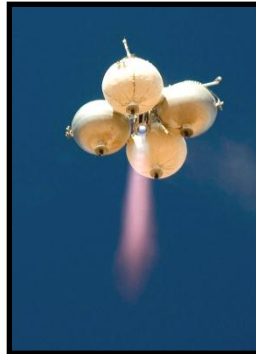
# Previous Centennial Challenges



Since 2005, 24 competitions held in 9 Challenges  
~\$6.0M in prizes awarded to 16 different teams



**Regolith Excavation – \$750K**



**Lunar Lander – \$2M**



**Astronaut Glove – \$550K**



**Power Beaming - \$900K**



**Personal Air Vehicle - \$250K**



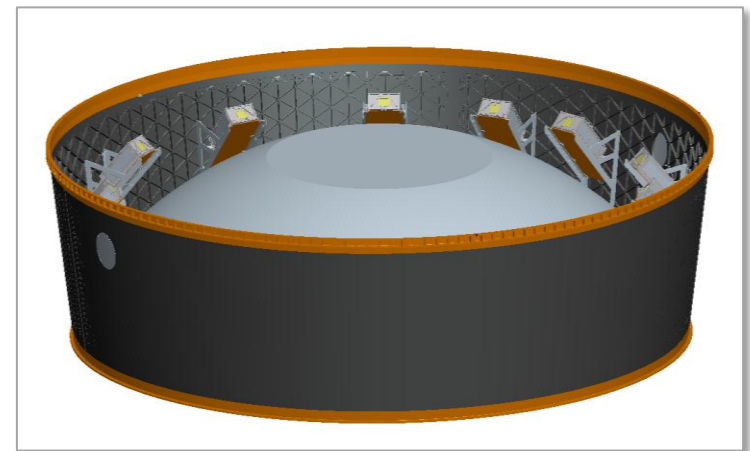
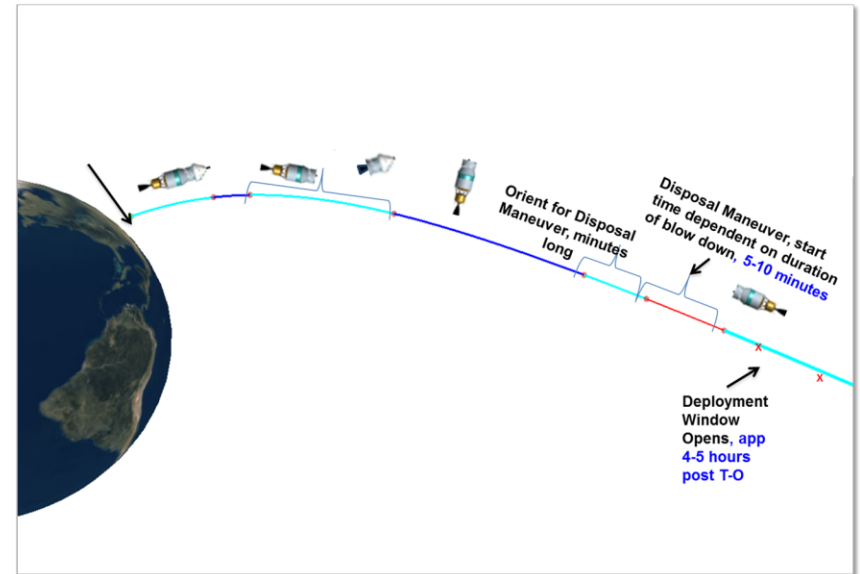
**Green Flight – \$1.470M**



# New Challenges



- Centennial Challenge Program is pleased to announce two new challenges to kick off this Winter
  - The CubeSat Deep Space Communications Challenge
  - The CubeSat Lunar Propulsion and Communications Challenge
- 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
  - Deploy after Trans Lunar Injection maneuver





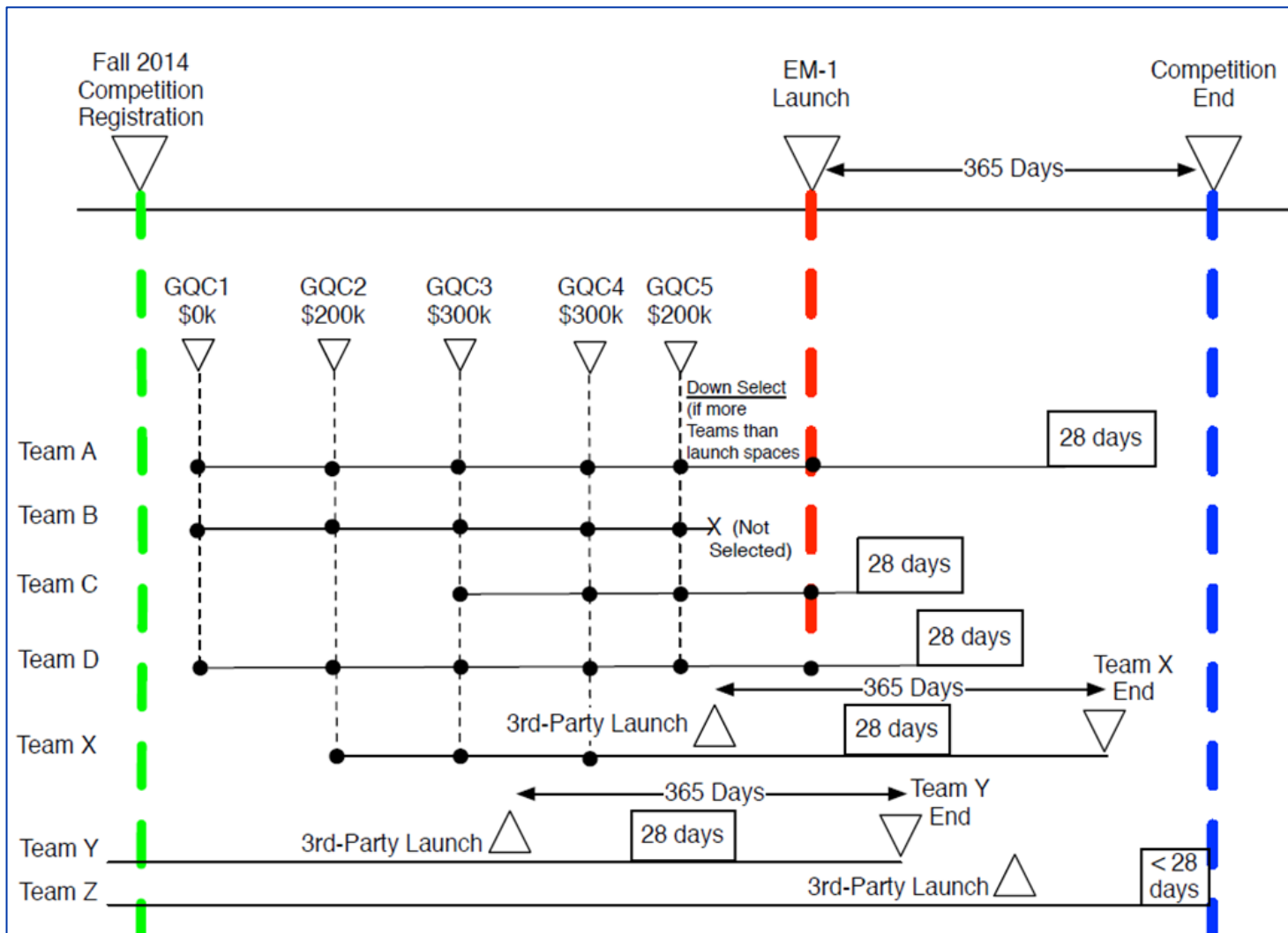
# Prize Structure

- Lunar Challenge Will Award Up To \$3M
  - Achieve Lunar Orbit \$1.5M (*shared*)
  - Error Free Communication \$1.0M
  - Longevity (*Orbit maintenance*) \$500k
- Deep Space Communication Challenge Will Award Up To \$1.5M
  - Error Free Communication \$1.0M
  - Longevity (*No maintenance needed*) \$250k
  - Distance \$250k
- Ground Qualification Competition (GQC) Will Award Up To \$1.0M
- Challenges End Date is 365 Days After Launch Date
- Winner(s) Determined by Submitted Results At The End of Competition Period
- Teams Competing In More Than One Challenge
  - Must Use A Single Spacecraft (*applies to EM-1 opportunity*)
  - Must Meet All Respective Challenge Rules To Qualify for Prize

**\$5.5M Allocation of Prize Money**



# Hypothetical Time Line





# Summary



- New Challenges Starting
  - CubeSat Deep Space Communications
  - CubeSat Lunar Propulsion and Communications
- Challenge Information
  - Registration to Begin Later this Fall 2014
  - Kickoff Summit Will Be Held in January 2015
  - For More Information Go To NASA Centennial Challenges Website

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



# BACKUP





# Challenge Rules Team



Centennial Challenge Deputy Program Manager	Eric Eberly
Centennial Challenge Program Manager	Sam Ortega
CubeSat Deep Space and Lunar Challenges Administrator	Jim Cockrell, ARC
Communications Technical Advisors	Steve Horan, LARC; Steve Townes, JPL
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SMD Representatives	Dr. Pete Panetta, Planetary Sciences Division; Dr. David Klumpar, Heliophysics Division