

National Aeronautics and Space Administration



# INVESTMENTS IN OUR FUTURE: EXPLORING SPACE THROUGH INNOVATION AND TECHNOLOGY



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**NASA Chief Technologist**

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

# NASA's Grand Achievement Defined Rocket Science



# What is the Equivalent of Our Generation's "Space Race"?



# My View of Our Space Exploration Future

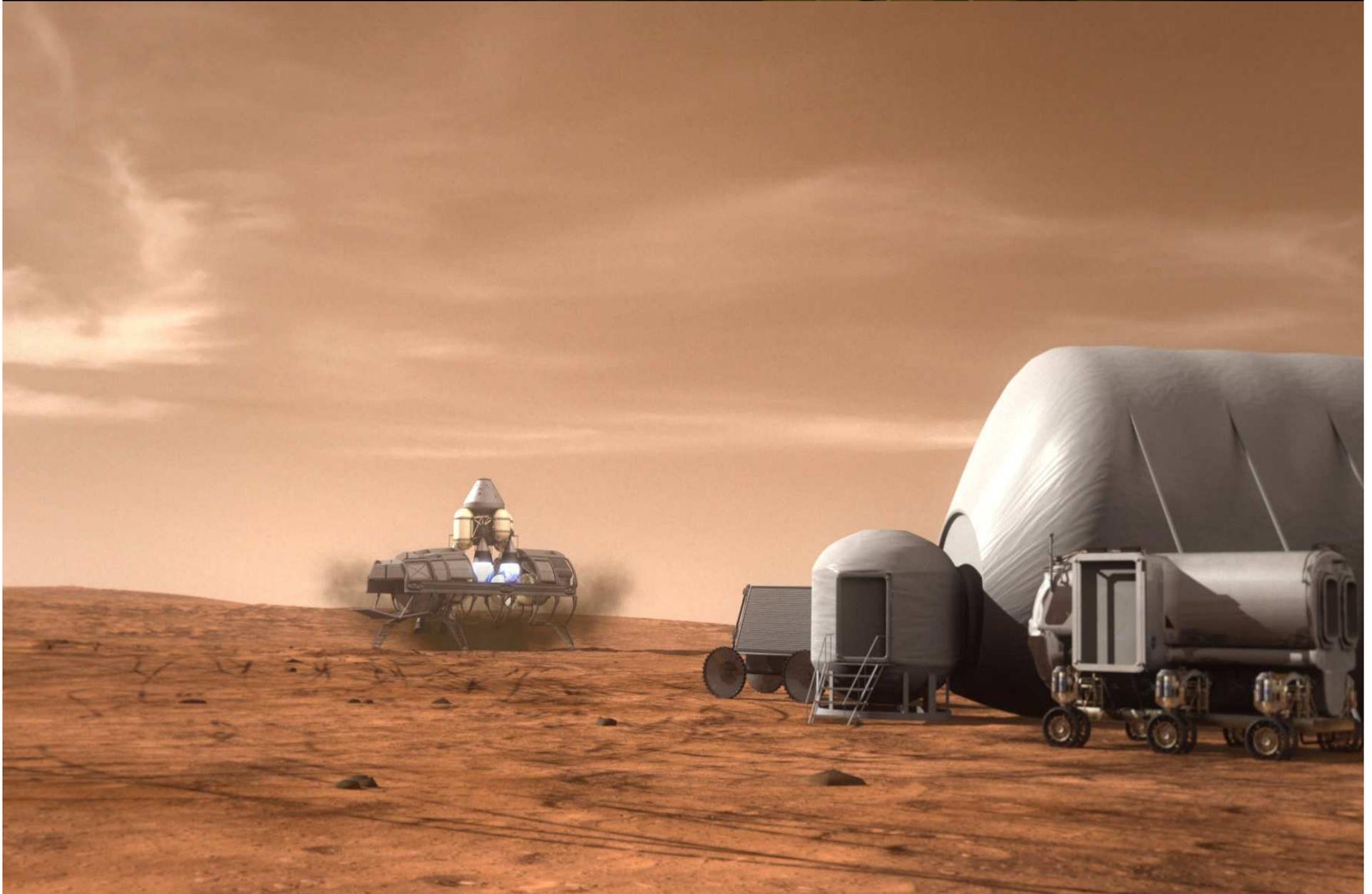
## 9 Game-Changing Civil Space Possibilities Within Our Grasp\*:

- Quantify Causes, Trends and Effects of Long-Term Earth Climate Change
- Accurately Forecast the Emergence of Major Storms and Natural Disasters
- Develop and Utilize Efficient Space-Based Energy Sources
- Prepare an Asteroid Defense
- Identify Life Elsewhere in our Solar System
- Identify Earth-like Worlds Around Other Stars
- Initiate Interstellar Robotic Exploration
- Achieve Reliable Commercial Low-Earth Orbit Transportation
- Achieve Permanent Human Presence Beyond the Cradle of the Earth

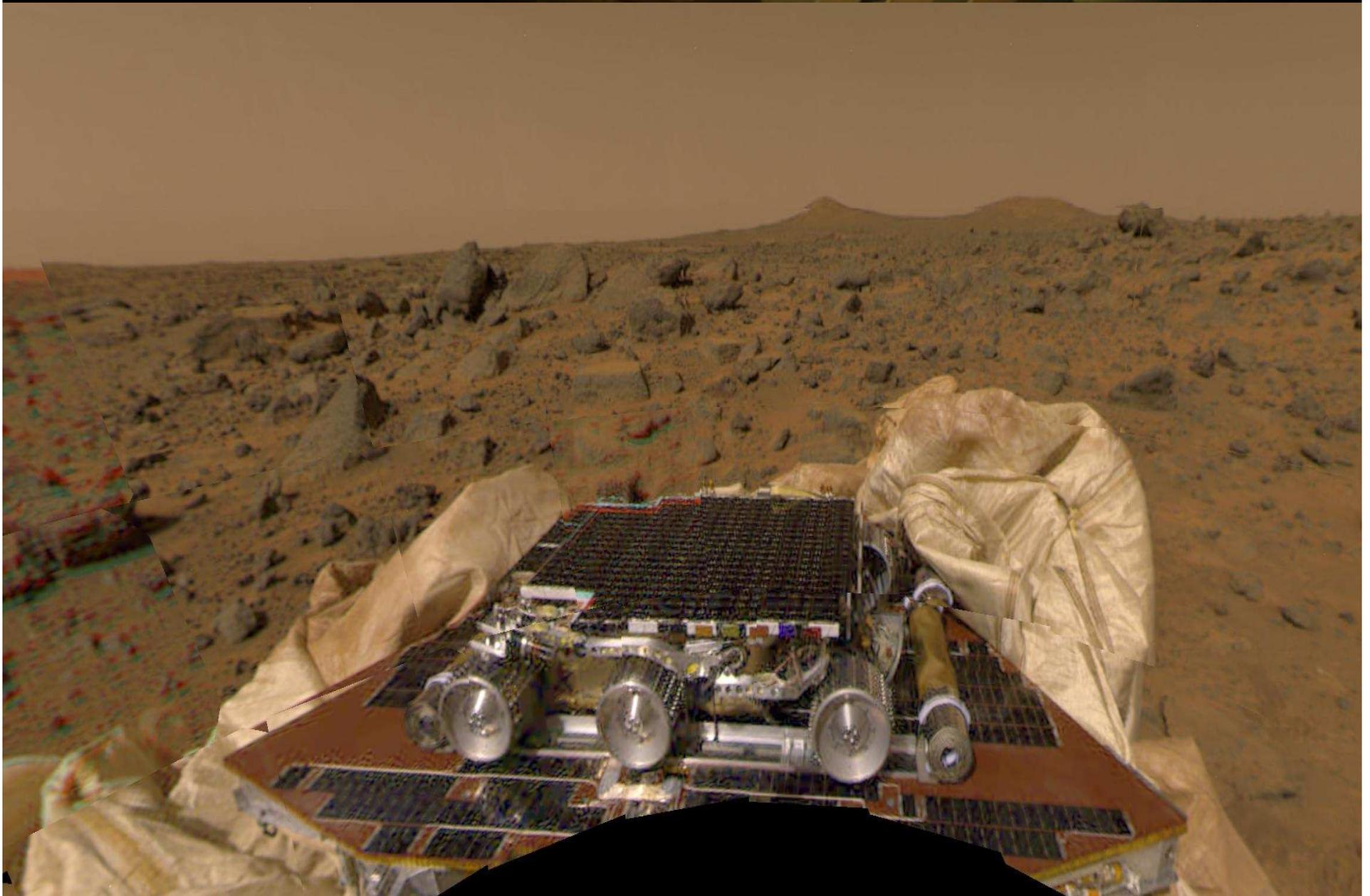


\*From *Introduction to Aerospace Engineering* course notes, AE1350, R.D. Braun, Georgia Tech, Fall 2008.

# Human Mars Surface Exploration: A Significant Technological Challenge



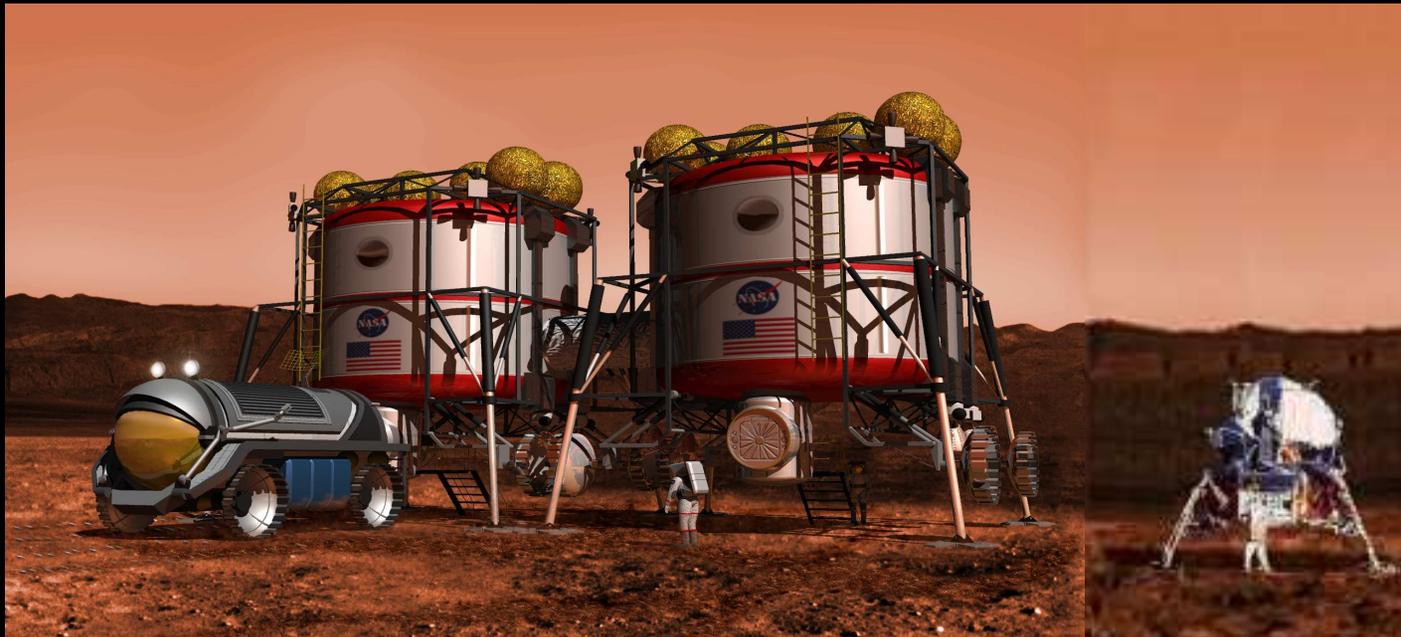
# Mars Pathfinder- July 4, 1997





# Humans Mars Exploration

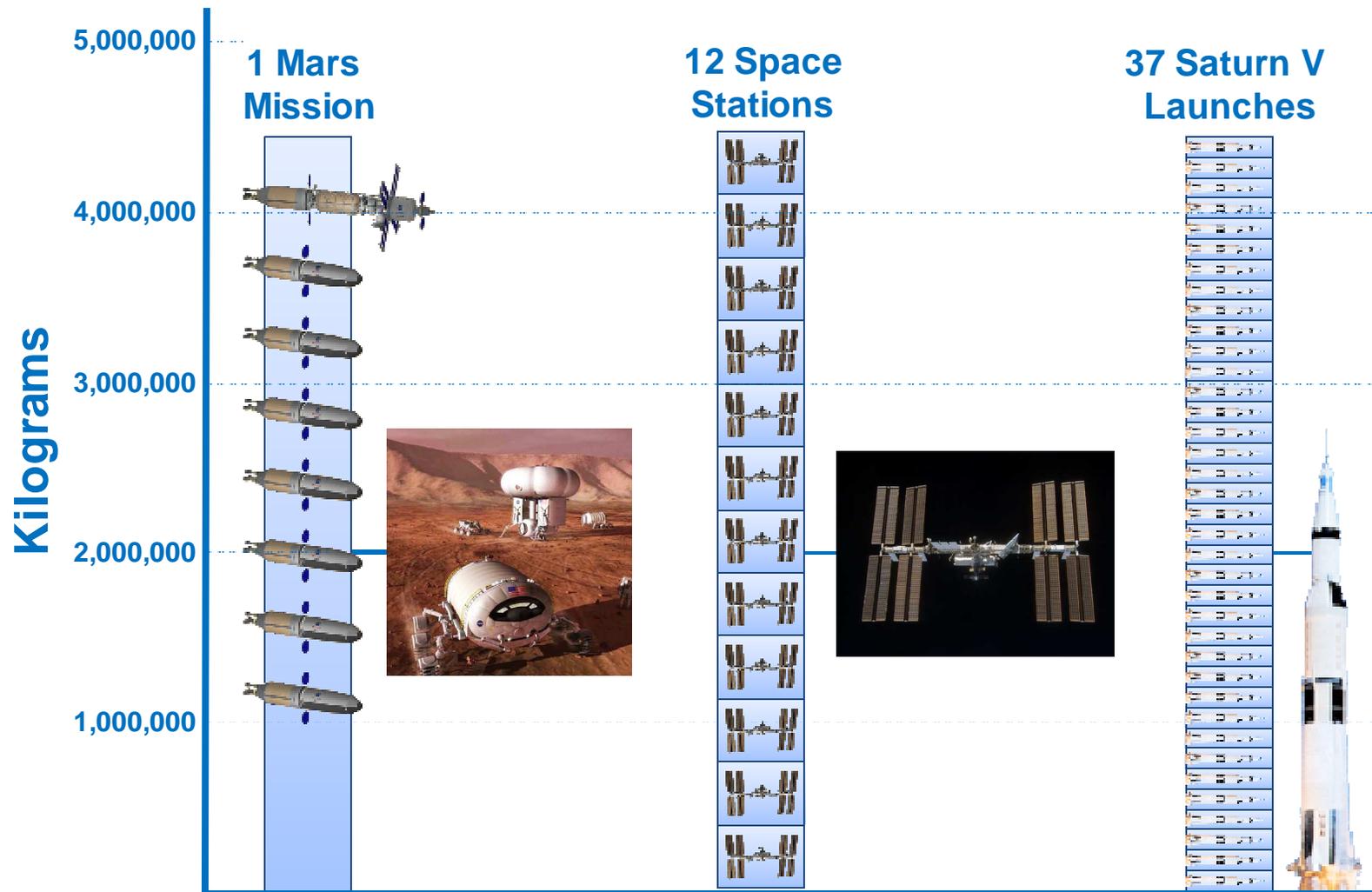
Mars Science Laboratory  
1 Metric Ton



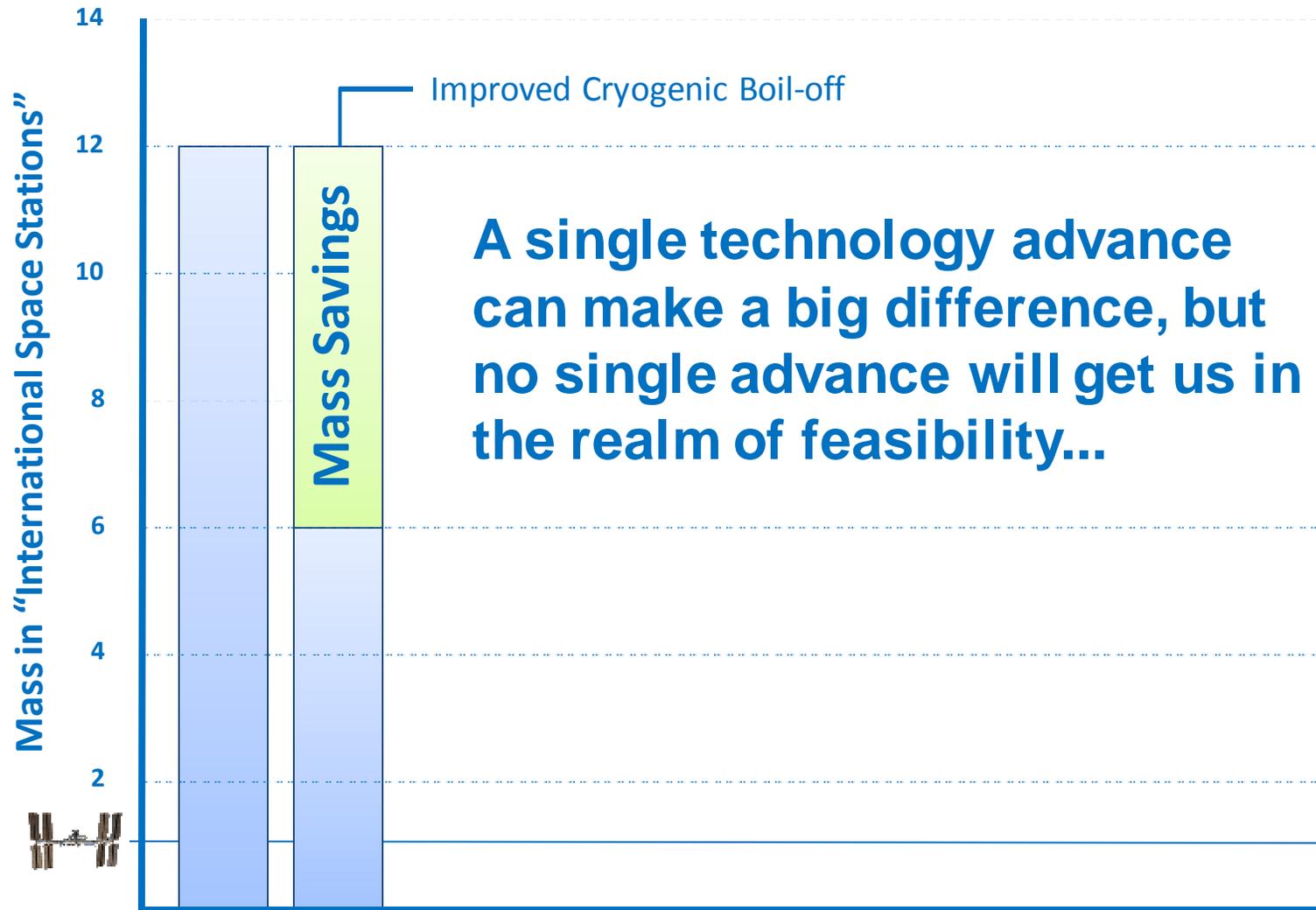
Human Mars  
Mission  
40-100 Metric  
Ton  
Per landing

**How Do We Land Something This Big?**

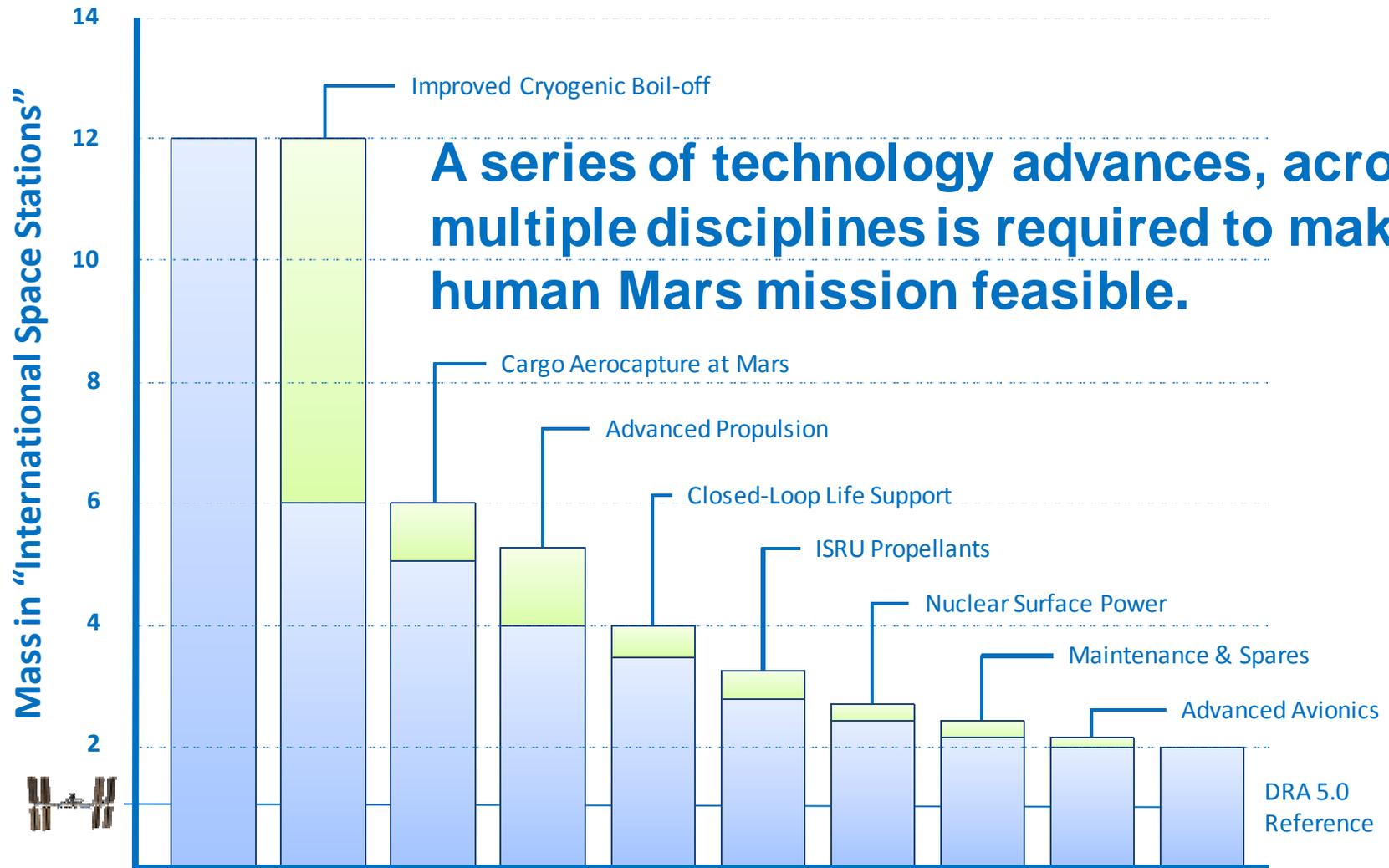
# Human Mars Exploration Low Earth Orbit Departure Mass Requirement



# The Impact of Technology Advancement



# The Impact of Technology Advancement

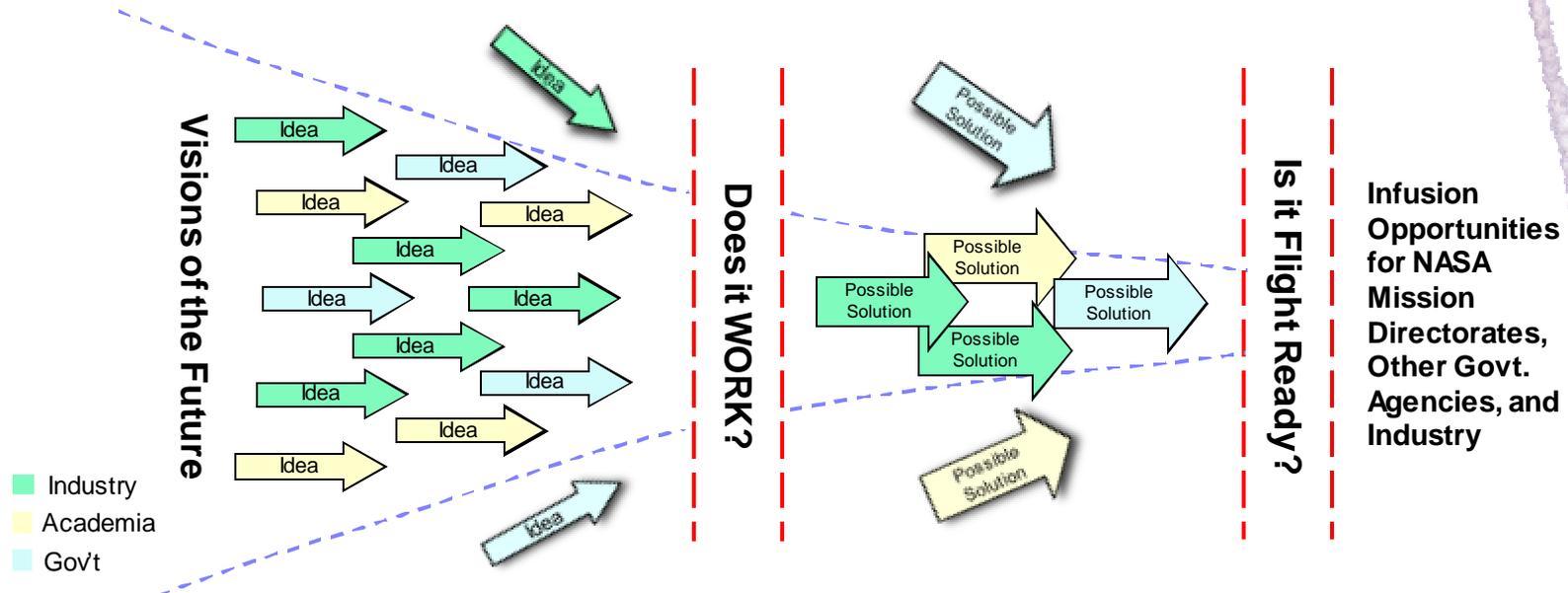


# Space Technology: Investments in Our Future

- **A Renewed NASA Focus on Technology and Innovation:** Brings into balance the Agency's three long-standing core competencies: Research and Technology, spaceflight hardware development, and mission operations
- **Enabling Our Future in Space:** By investing in high payoff, disruptive technology that industry cannot tackle today, *Space Technology* matures the technology required for NASA's future missions in science and exploration while proving the capabilities and lowering the cost of other government agencies and commercial space activities.
- **NASA at the Cutting Edge:** Pushing the boundaries of aerospace and taking informed-risk, *Space Technology* allows NASA and our Nation to remain at the cutting-edge.
- **Economic Competitiveness:** NASA's Space Technology investments will stimulate the economy and build our Nation's global economic competitiveness through the creation of new products and services, new business and industries, and high-quality, sustainable jobs.



# Space Technology: Investments in Our Future



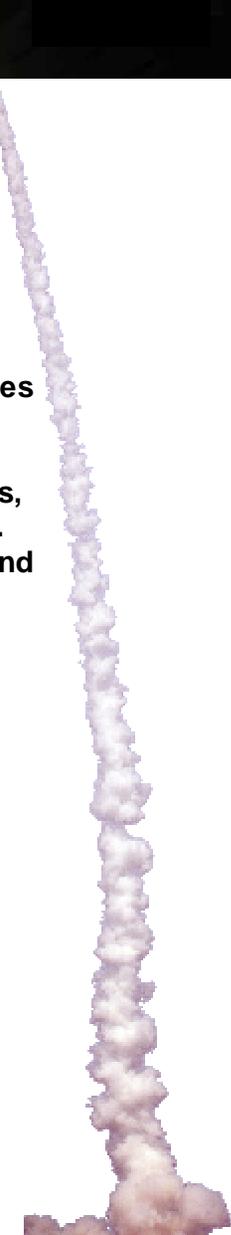
Creative ideas regarding future NASA systems or solutions to national needs.



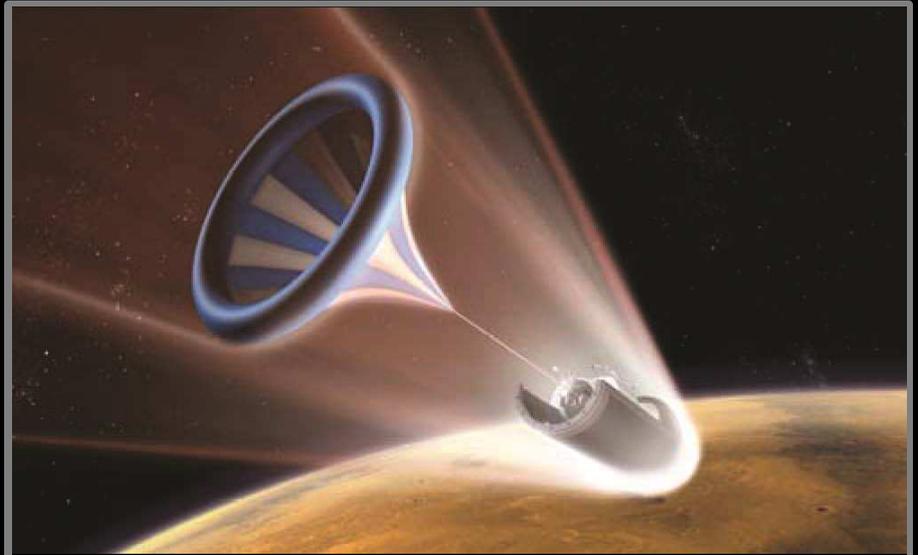
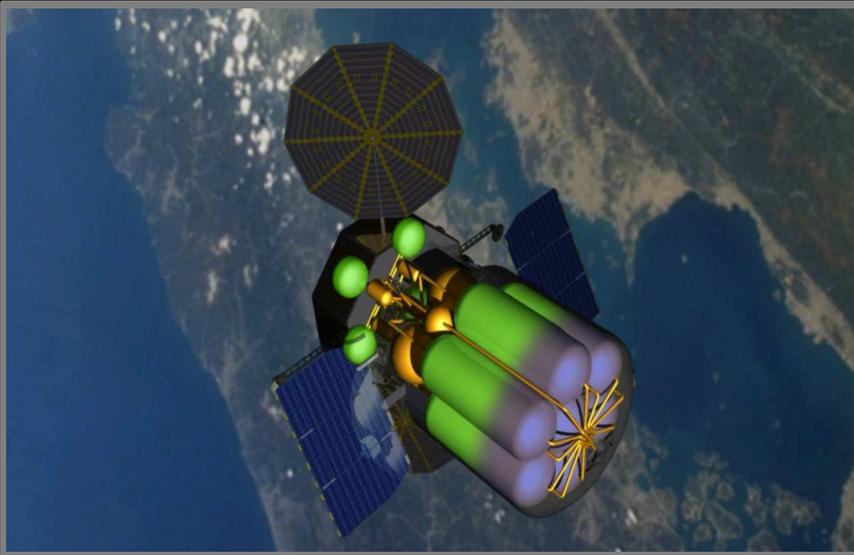
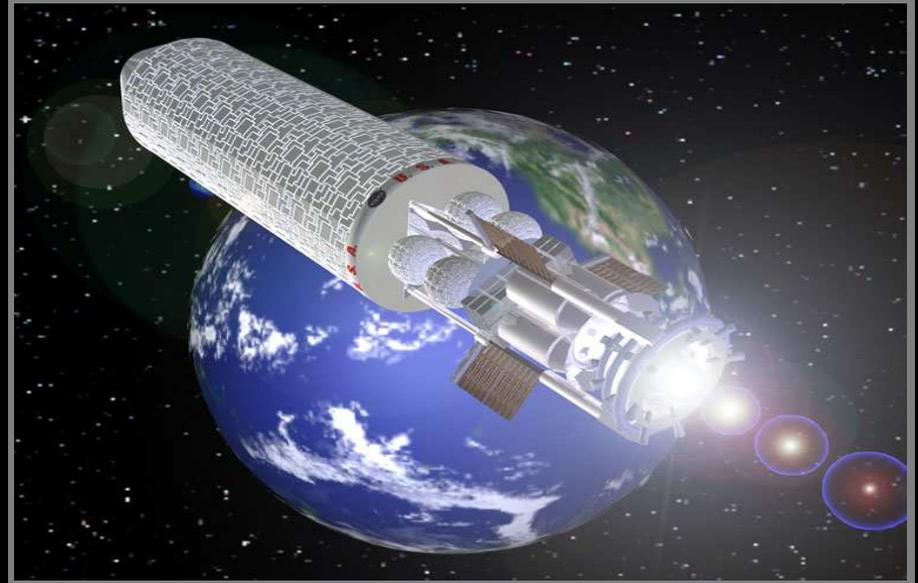
Prove feasibility of novel, early-stage ideas with potential to revolutionize a future NASA mission and/or fulfill national need.



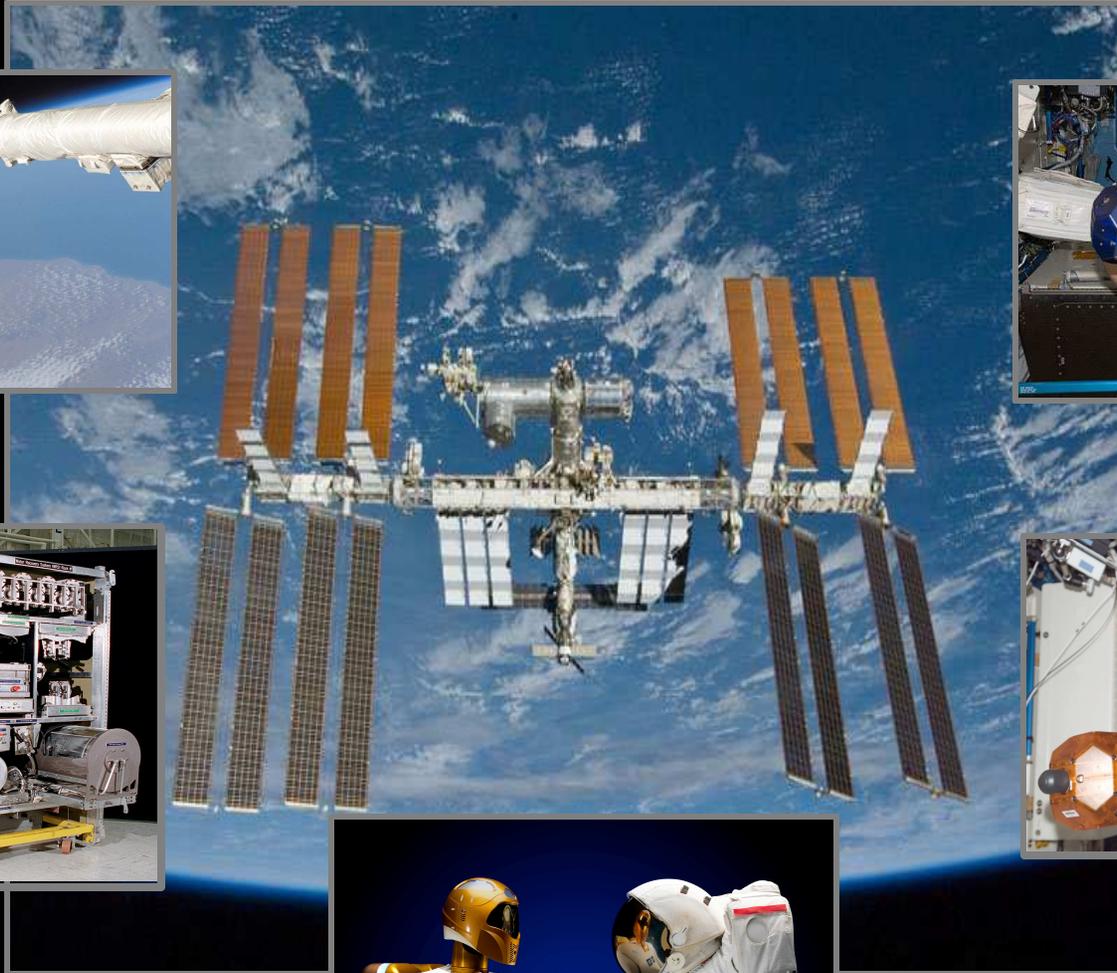
Mature crosscutting capabilities that advance multiple future space missions to flight readiness status



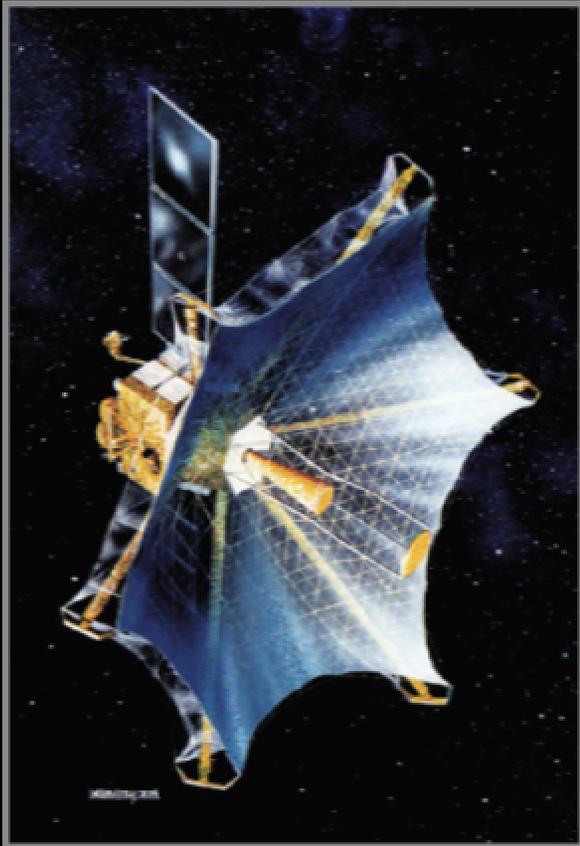
# Technology-Enabled Approaches to Exploration



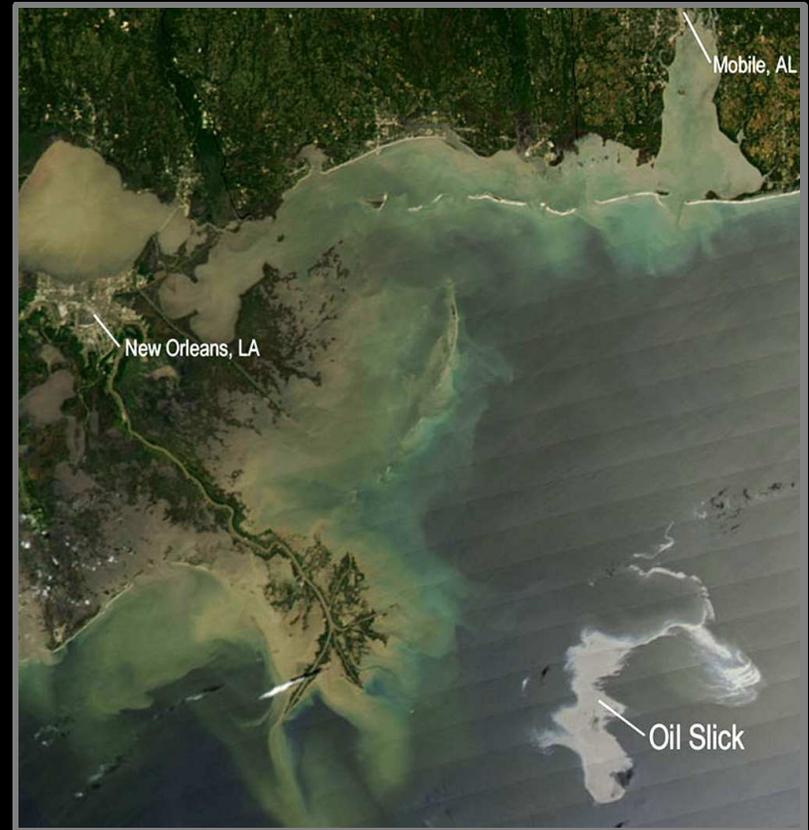
# Effective Use of ISS as a Technology Testbed



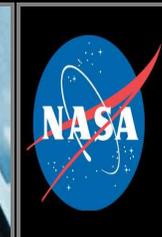
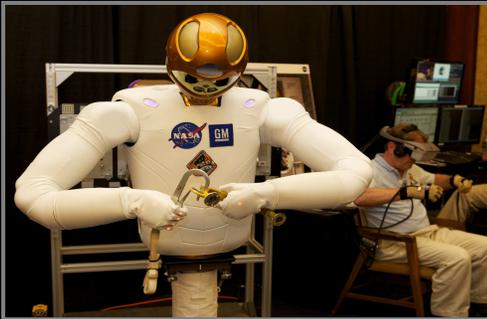
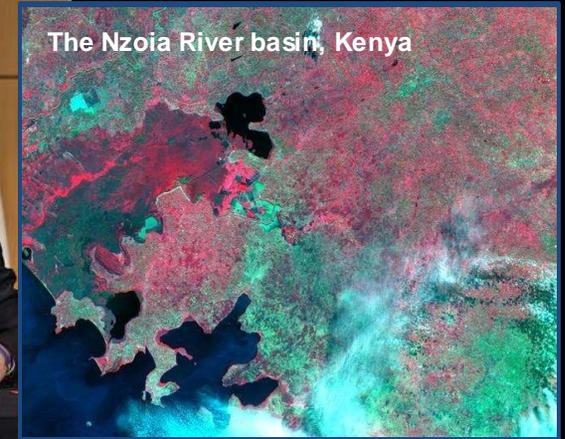
# Technology-Enabled Approaches to Science



# Down-to-Earth Applications of Space Technology



# Partnerships and Technology Transfer



# NASA Space Technology Improving Our Lives



**Advanced Diagnostic  
Ultrasound in Microgravity**



**LED Light Therapy For Pain  
Management**



**Groundwater Remediation**



**Clean Energy**



**Winglets Save Fuel Cost**



**Lithium Batteries for Cars**



**Aerogel Insulation**



**Eye Exams**



**Infrared Thermometers**



**Memory Foam**



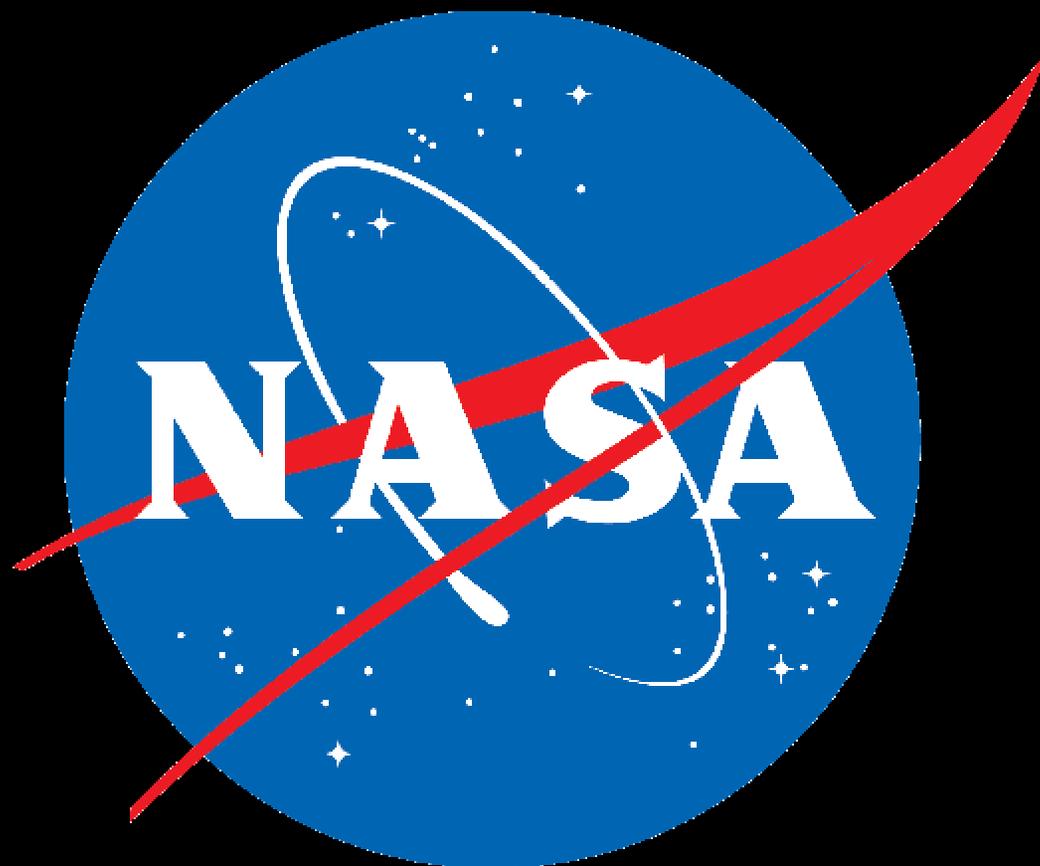
**Nutritional Supplements**



**Sports and Recreation**

The background of the slide is a dark, cosmic scene. It features a large, reddish-orange planet (Mars) in the center, a smaller grey planet (the Moon) at the bottom, and a portion of the Earth with blue oceans and white clouds at the bottom right. The space is filled with numerous small, grey, irregularly shaped asteroids or meteoroids of various sizes, some appearing to be in motion. Bright, multi-pointed stars are scattered throughout the dark background, adding to the celestial atmosphere.

**Technological Leadership:  
The “Space Race” of  
Our Generation**



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