

# Innovation @ NASA

National Aeronautics and  
Space Administration



**Dr. Juan A. Román**  
**NASA/GSFC**





# About NASA



The National Aeronautics and Space Administration (NASA) was established in 1958 by President Dwight D. Eisenhower encouraging peaceful applications in space science. It's the United States government agency that is responsible for the civilian space program as well as for aeronautics and aerospace research.

Since its inception, NASA has accomplished many great scientific and technological feats in air and space. NASA technology also has been adapted for many none-aerospace uses by the private sector.

NASA remains a leading force in scientific research and in stimulating public interest in aerospace exploration, as well as science and technology in general.



# The Best Places to Work

IN THE FEDERAL GOVERNMENT 2013

2012



Congratulations to  
**National Aeronautics and Space Administration**

Ranked First: Large Federal Agency



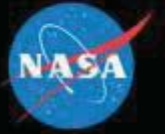
**PARTNERSHIP FOR PUBLIC SERVICE**



# NASA Centers

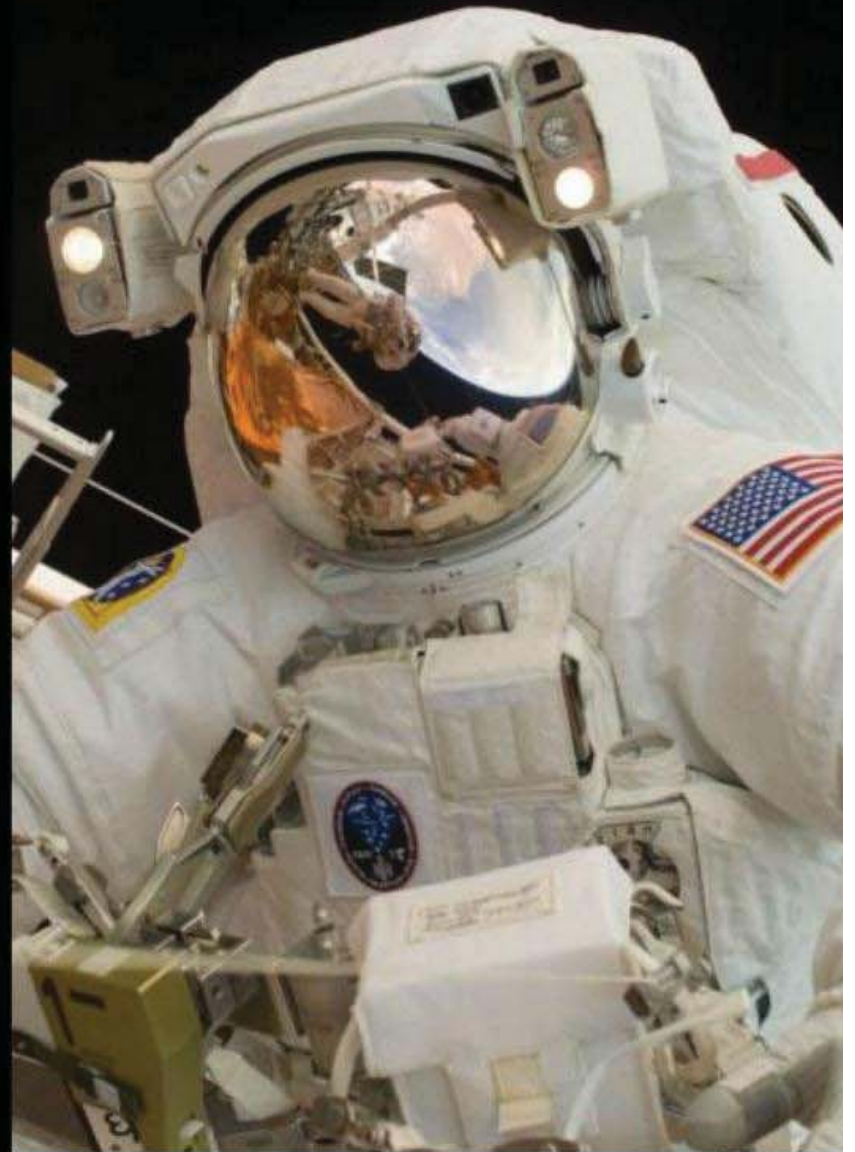


# Our Mission



Innovate  
Explore  
Discover  
Inspire

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





# Message from Administrator

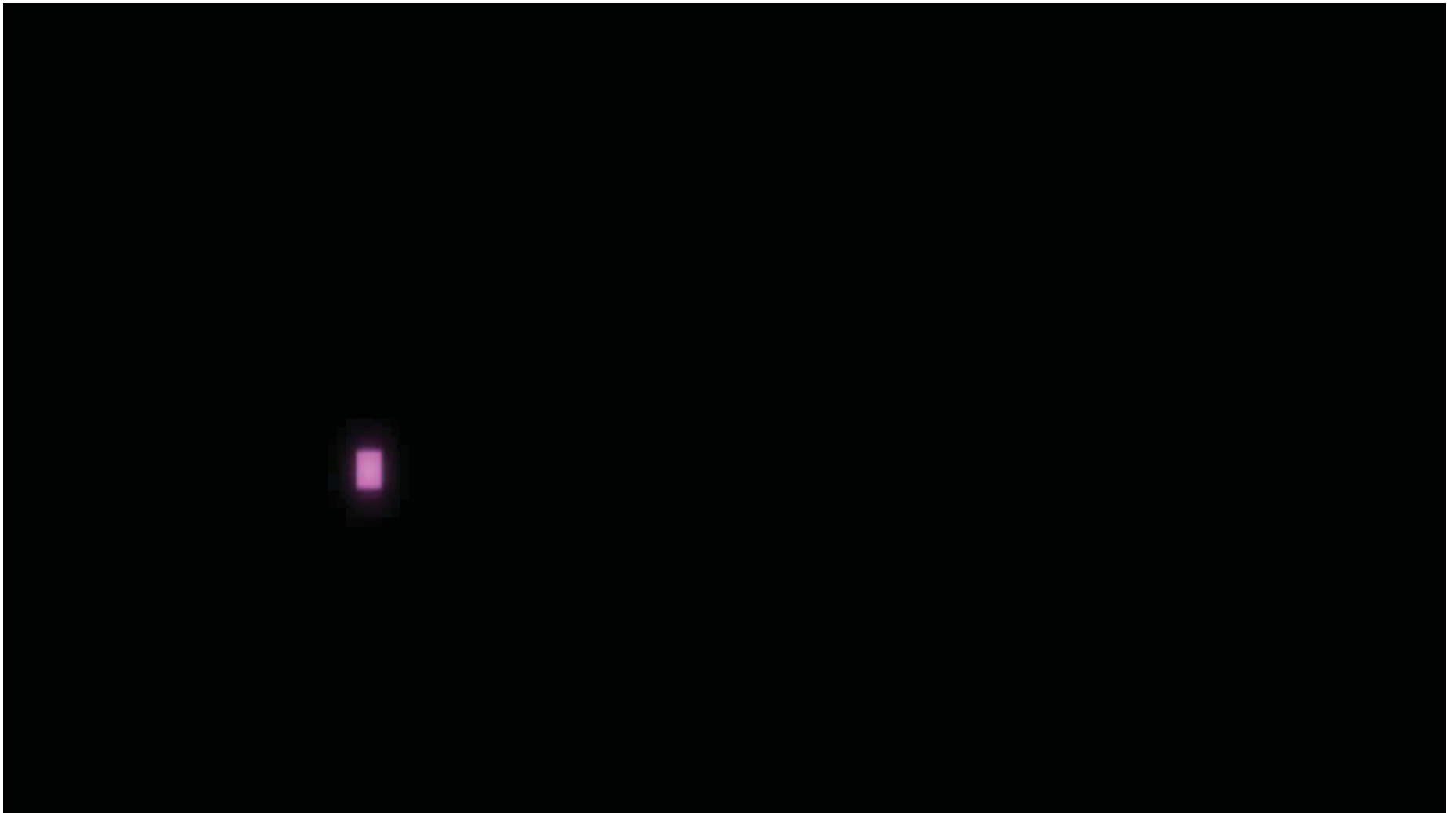


“NASA's missions of the future are going to depend on new technologies that will be evolvable and applicable across a broad range of missions. We are dedicated to extending human presence into the solar system and to the surface of Mars, and new technologies and advanced capabilities are essential to safely taking us from Earth-reliant to Earth-independent missions, and the surest path to an eventual crewed landing on Mars. Sustained investment in these technologies advances the agency's exploration capabilities and supports the innovation economy.” June 3, 2014



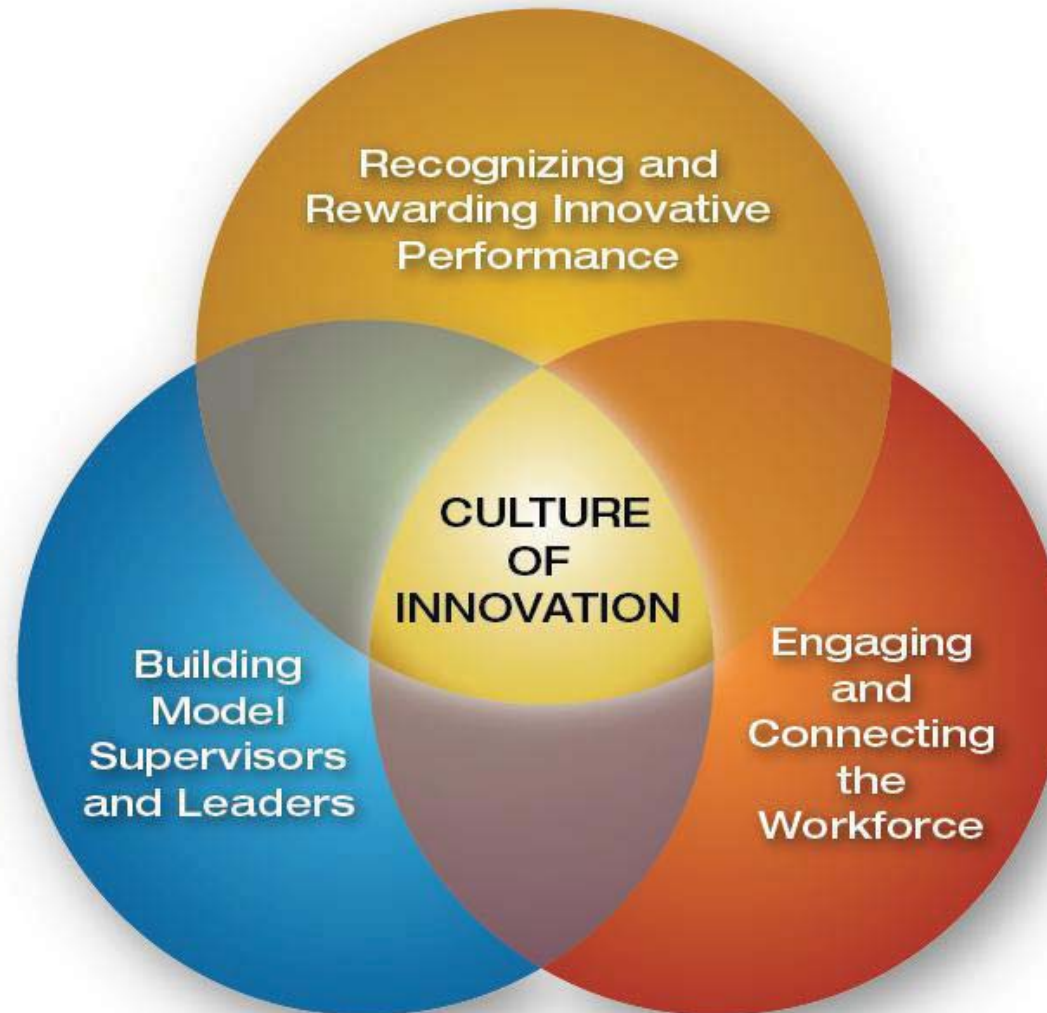


# Innovation @ NASA





# NASA's Culture







# Recognizing & Rewarding Innovative Performance



- Lean Forward; Fail Smart Award
  - Dare to Try
  - Perseverance
  - Learning
  - Collaboration
- Champion of Innovation Award
  - Leadership
  - Visionary
  - Relationship Builder
  - Role Model

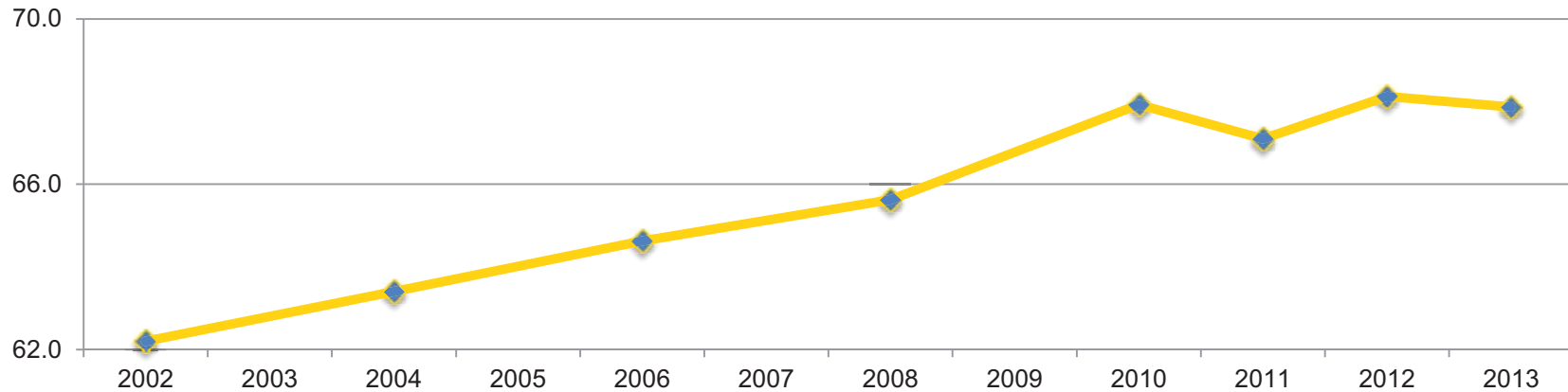


# Recognizing and Rewarding Innovative Performance



Reward and appreciate employees for their innovative performance and contributions to their workplace

Index Trend Line (% Positive Responses)



Recognizing Innovation Index	2002	2004	2006	2008	2010	2011	2012	2013	Change
Employees are recognized for providing high quality products and services.	61.9	61.9	63.5	65.0	70.8	70.4	71.0	69.8	7.9
Employees are given a sense of personal empowerment with respect to work processes.	56.3	58.7	58.4	60.4	63.2	62.4	62.1	63.3	7.0
I feel encouraged to come up with new and better ways of doing things.	72.0	75.2	76.3	75.1	75.4	74.3	76.5	76.8	4.8
Creativity and innovation are rewarded.	58.6	57.8	60.3	62.0	62.3	61.3	62.9	61.6	3.0
<b>Trend Line</b>	<b>62.2</b>	<b>63.4</b>	<b>64.6</b>	<b>65.6</b>	<b>67.9</b>	<b>67.1</b>	<b>68.1</b>	<b>67.9</b>	<b>5.7</b>



# Building Model Supervisors & Leaders



- Supervisors and Leaders take an active role fostering innovation by:
  - Engaging with employees and getting to know their strengths
  - Tailoring employees' projects to their strengths
  - Building trust with employees and giving them autonomy
  - Providing opportunities for collaboration and cross-pollination
  - Advocating for and lifting employees whose projects aren't successful

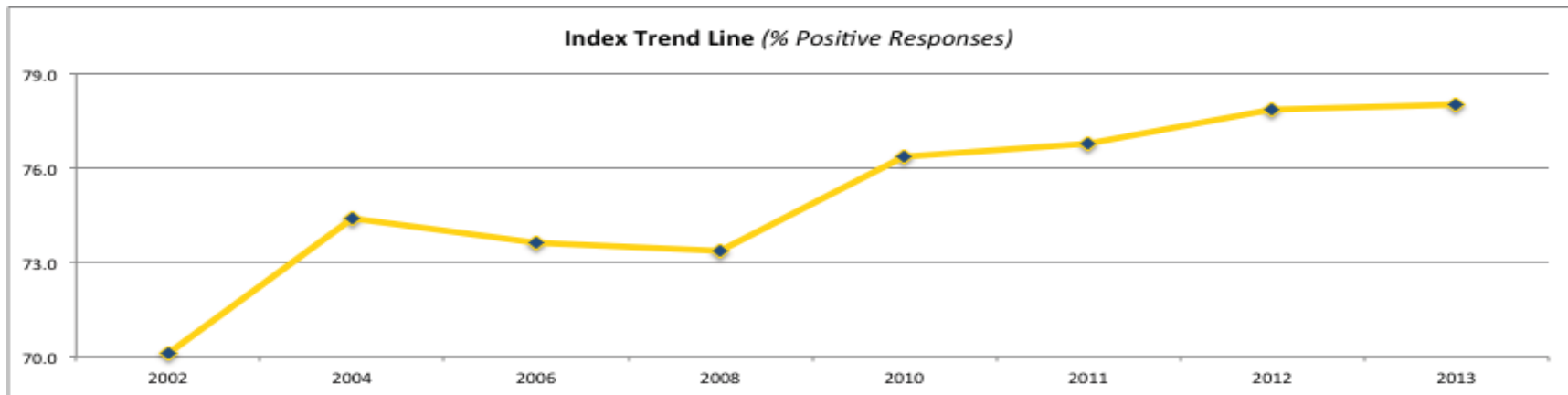




# Building Model Supervisors and Leaders



Develop supervisors and leaders who view developing employees as an important and productive use of time



Supervisory Effectiveness Index	2002	2004	2006	2008	2010	2011	2012	2013	Change
My supervisor/team leader provides me with the opportunities to demonstrate my leadership skills.	70.5	73.7	74.2	74.0	77.5	78.0	79.6	79.8	9.3
Supervisors/team leaders in my work unit support employee development.	72.0	80.6	80.4	79.5	79.9	80.7	80.8	80.8	8.8
Overall, how good a job do you feel is being done by your immediate supervisor/team leader?	72.1	75.2	75.2	75.6	78.8	79.0	80.1	81.1	9.0
Discussions with my supervisor/team leader about my performance are worthwhile.	67.8	68.9	66.3	66.6	71.6	71.6	73.1	73.3	5.5
<b>Trend Line</b>	<b>70.1</b>	<b>74.4</b>	<b>73.6</b>	<b>73.4</b>	<b>76.3</b>	<b>76.8</b>	<b>77.8</b>	<b>78.0</b>	<b>7.9</b>



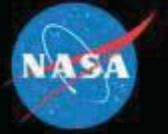
# Engaging & Connecting the Workforce



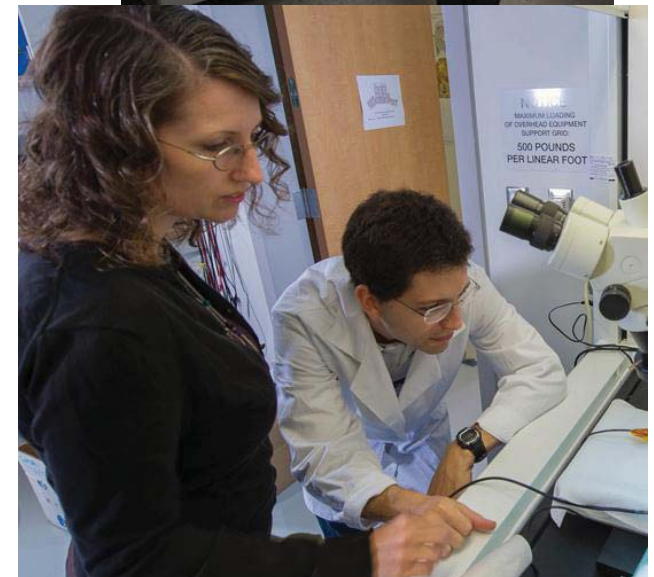
- Workforce Initiatives
  - Creativity and Innovation Initiatives
  - Science Engineering Collaboration Program (SECP) & Research Engineering Program
- Fairs and Symposia
  - Innovation Forum/Innovation Day/Innovation Expo
  - Internal Research & Development Poster/Networking
- Open Innovation Platforms, Prizes, and Challenges
  - Centennial Challenges
  - Mars Challenge
- Facilities and Creative Spaces
  - Concurrent Engineering Design Teams & Facilities

# Dr. Stephanie Getty

## GSFC Innovator of the Year!



- Stephanie Getty was in SECP-1 group
- Selected as 2012 Goddard's Innovator of the Year for her trailblazing work in the area of advanced mass spectrometer instrumentation
- Won \$1.2 million from NASA's Astrobiology Science and Technology Instrument Development to advance the Organics Analyzer for Sampling Icy Surfaces (OASIS) to study the chirality of amino acids on the icy moons of the outer planets, asteroids, and Kuiper Belt Objects
- Serves as mentor to other SECP participants



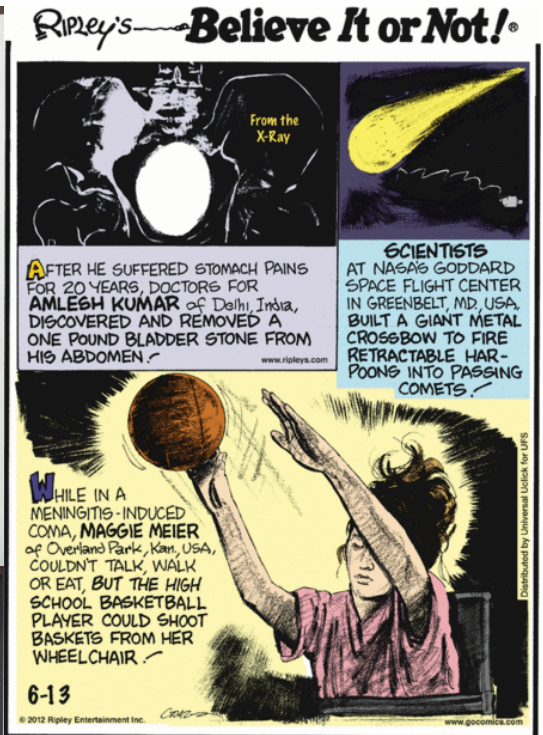




# Don Wegel Comet Harpoon



- Don Wegel (SECP-2) featured in NASA Tech Briefs on his Sample Collecting Comet Harpoon work
- Popular Science Magazine Publishes Comet Harpoon Story
- Comet Nucleus Sample Return II featured on Ripley's Believe it or Not



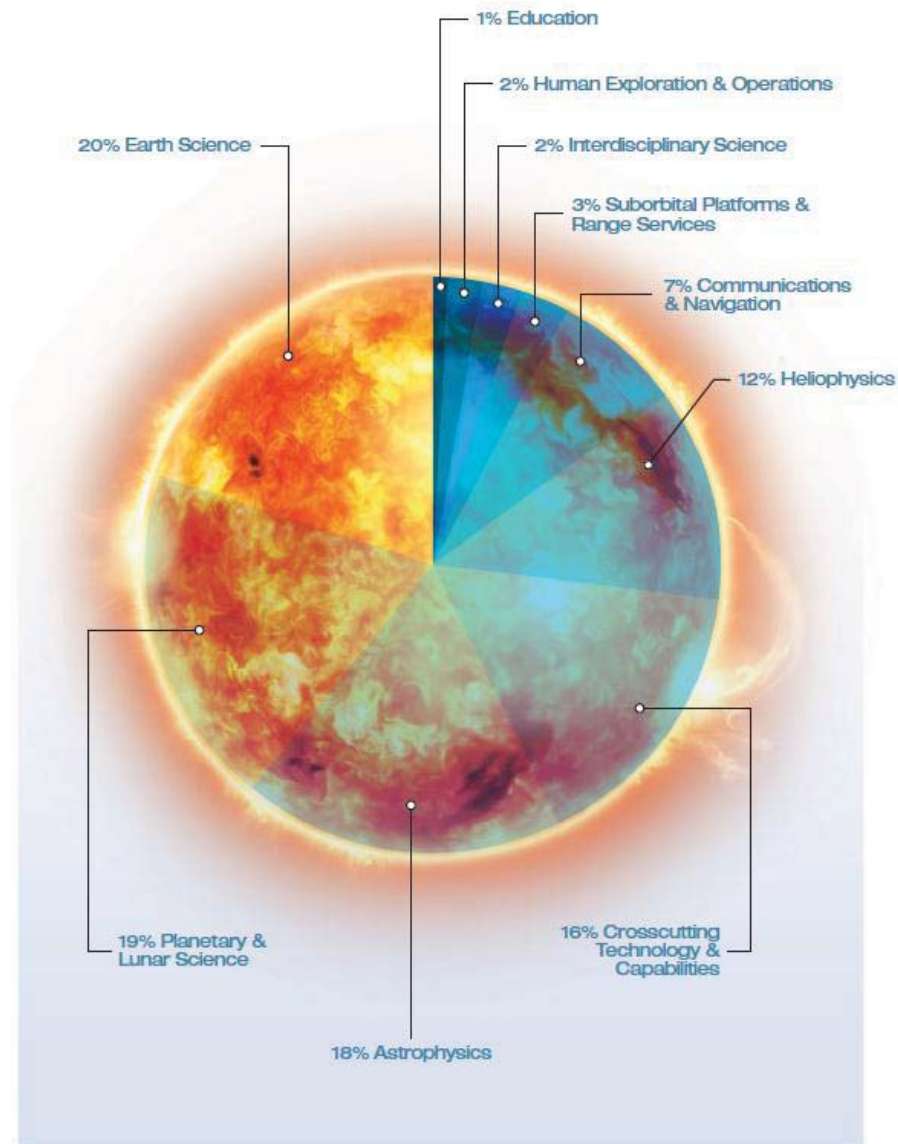


# Engaging & Connecting the Workforce



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# GSFC FY13 IRAD Investments





# IRAD Poster & Networking Session



*Over the course of three hours, this year's IRAD Poster Session attracted hundreds of visitors, as evidenced by this photo taken from the audio/visual skybox overlooking the Building 8 auditorium.*



*The theme of this year's annual IRAD Poster Session — Goddard Technology: Enabling Science Through Innovation — captured in just a few words the principal goal of the center's Internal Research and Development program. Principal Investigator Semion Kizhner is in the background.*



*Students from Montgomery County's Bethesda-Chevy Chase High School talk with Principal Investigator Fred Minetto, who has created a novel way to clean mirrors and lenses in clean rooms using a one-atmosphere electron gun whose prototype hardware is displayed on the table.*



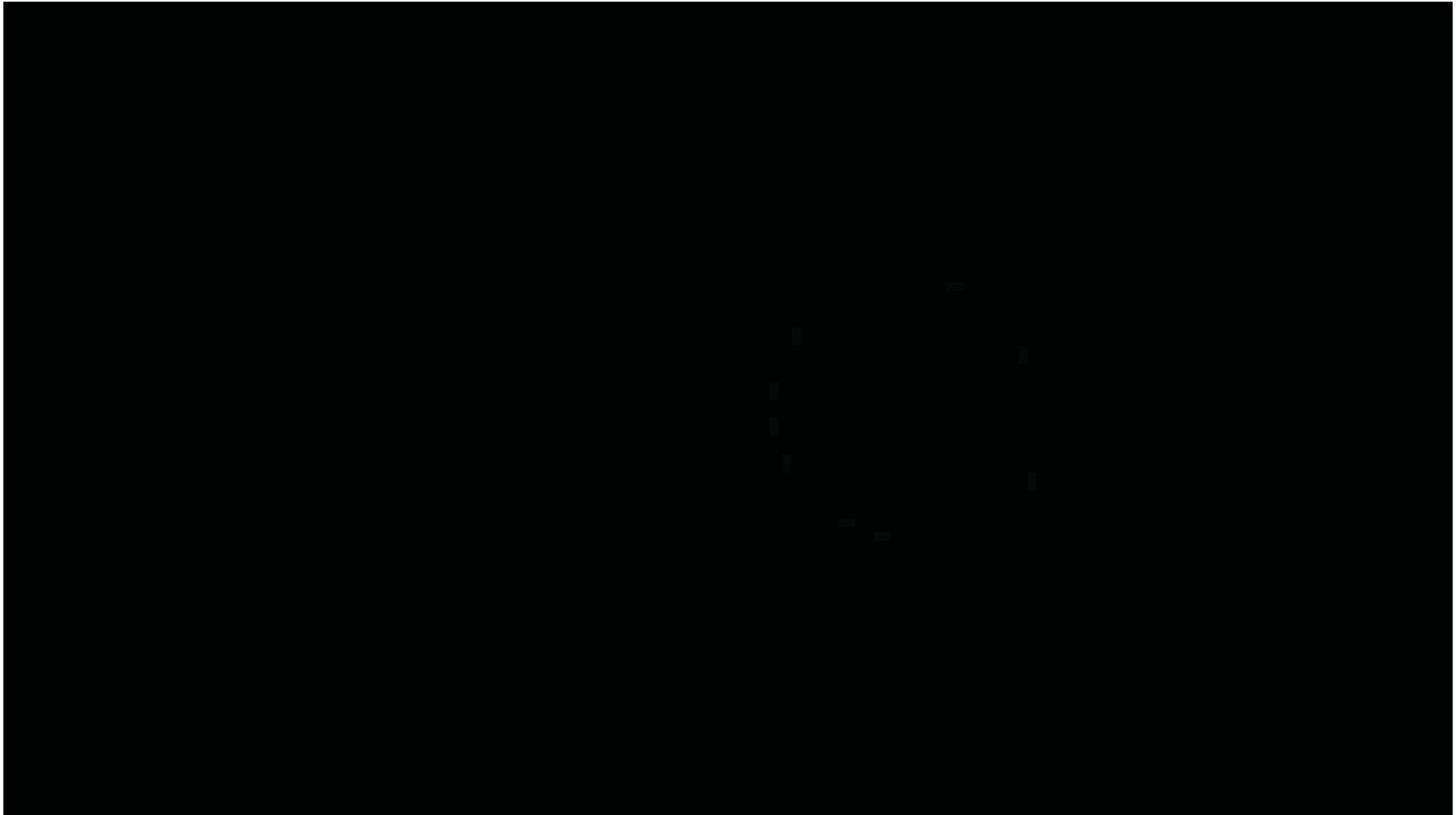
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# Centennial Challenge





National Aeronautics and Space Administration



# MARS

Balance  
MASS  
Challenge



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





# Engaging & Connecting the Workforce

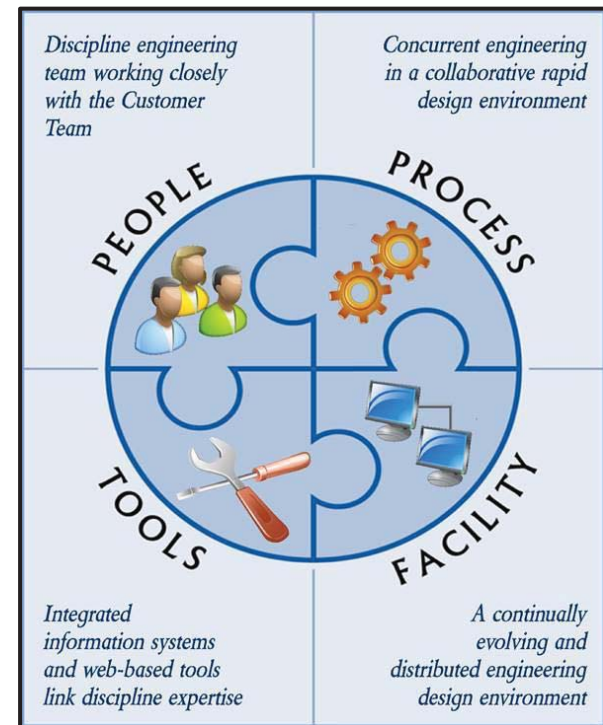


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# Concurrent Engineering Design Teams

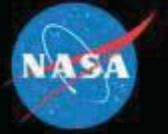


An environment that facilitates multi-disciplinary, concurrent, collaborative, space system engineering design and analysis activities,



to enable innovation and rapid development of science instrumentation, mission, and mission architecture concepts.

# Facilities



State-of-the-art engineering workstations, software and information technology to ensure engineering excellence.

← **Mission Design Lab (MDL)**



Comfortable, well-equipped workspaces to facilitate dynamic interaction within team

**Instrument Design Lab (IDL)** →



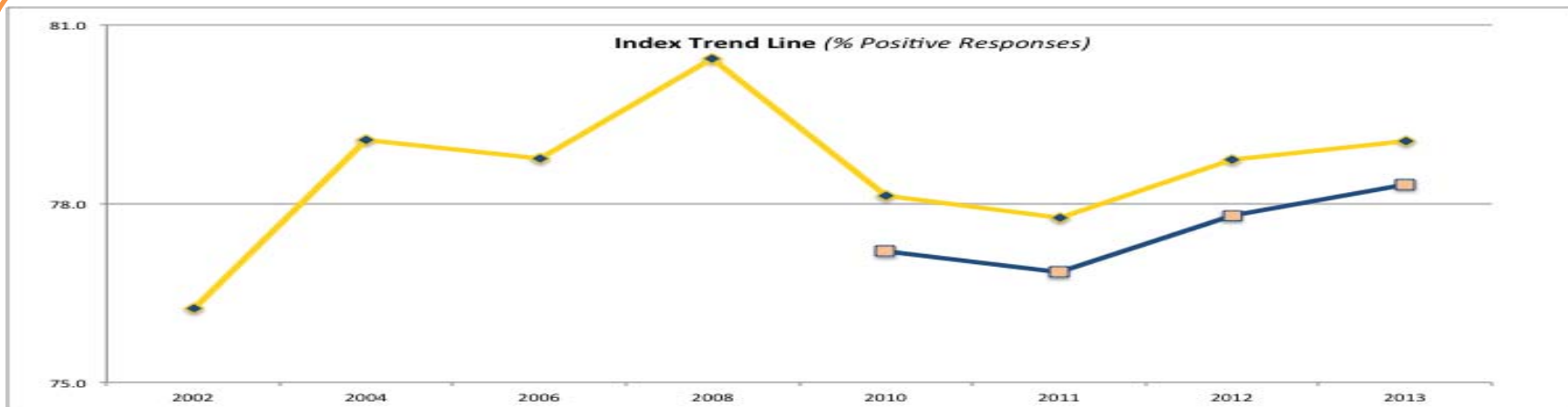




# Engaging and Connecting the Workforce



Engage employees in the NASA mission and enable them to cooperate, collaborate, and network with one another




Connecting and Collaborating Index	2002	2004	2006	2008	2010	2011	2012	2013	Change
Managers promote communication among different work units.	63.6	66.4	67.5	69.4	69.9	69.0	69.4	70.4	6.8
Employees in my work unit share job knowledge with each other.	77.8	79.4	78.5	80.6	78.7	79.3	81.2	81.4	3.6
The people I work with cooperate to get the job done.*	87.3	91.4	90.3	91.3	85.8	85.0	85.6	85.3	-2.0
<b>Trend Line</b>	<b>76.2</b>	<b>79.1</b>	<b>78.8</b>	<b>80.4</b>	<b>78.1</b>	<b>77.8</b>	<b>78.7</b>	<b>79.1</b>	<b>2.8</b>
Managers support collaboration across work objectives.**	--	--	--	--	74.4	74.1	75.0	76.1	1.7
<b>Trend Line</b>	--	--	--	--	<b>77.2</b>	<b>76.9</b>	<b>77.8</b>	<b>78.3</b>	<b>1.1</b>

\* Wording change in 2013; previous surveys were worded "The people I work with cooperate to do my job well."

\*\* Question first introduced in 2010 EVS.





# Styles of Innovation

- Innovation through Discovery and Invention
- Innovation in Assigned Work
- Program Innovation



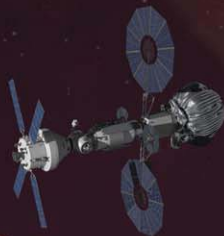




# Technology Path to Mars



Asteroid Retrieval Mission



Hypersonic Inflatable Aerodynamic Decelerator



Optical Communications

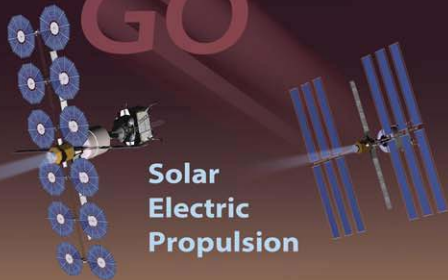


GO

LAND

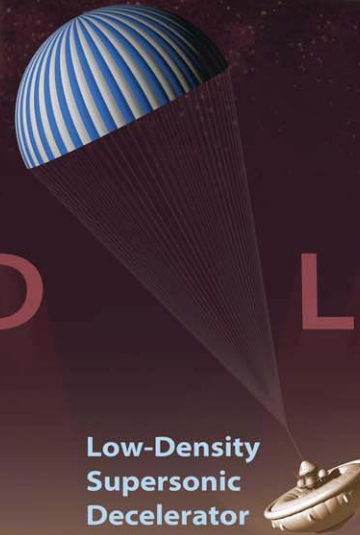
LIVE

LEAVE



Solar Electric Propulsion

Low-Density Supersonic Decelerator

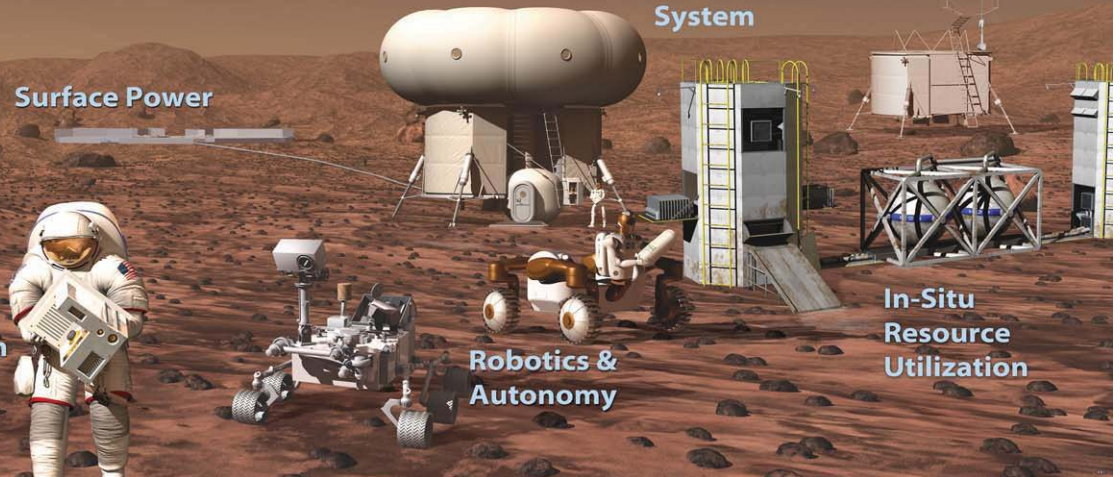


Environmental Control & Life Support System



"Developing the capabilities to land humans on Mars will require considerable resources and technological innovation in many disciplines to accommodate the environments to be encountered in space and during surface operations."

Surface Power



Next Generation Spacesuit

Robotics & Autonomy

In-Situ Resource Utilization

nasa.gov

# Curiosity: Seven Minutes of Terror



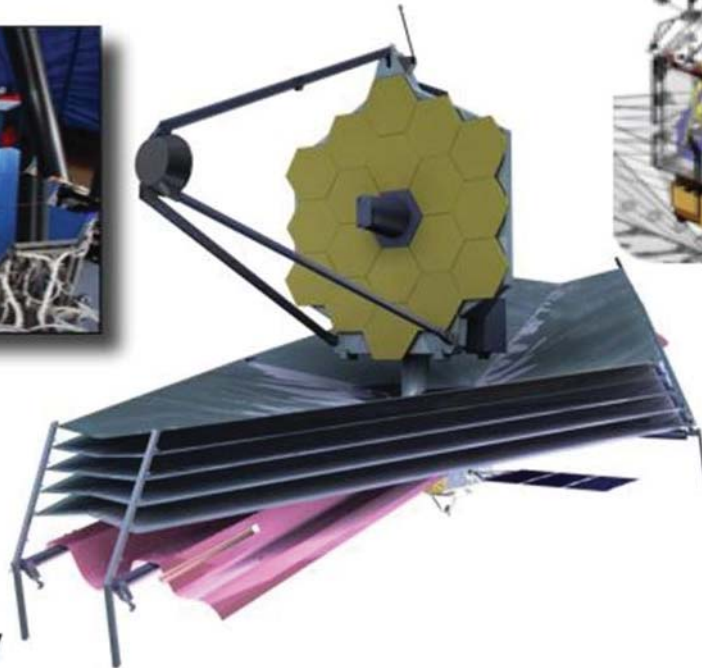
TDC



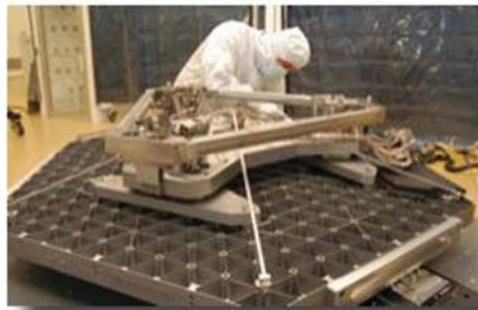


# JWST Technology Milestones

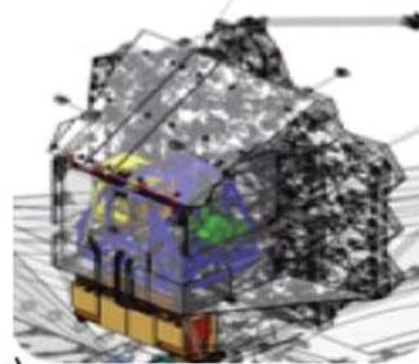
**Mirror Phasing Algorithms**



**Beryllium Primary Mirror Segment**



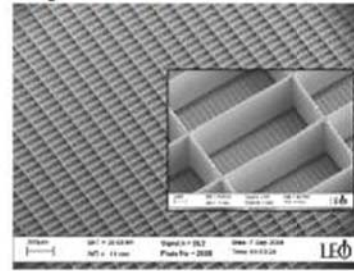
**ISIM**



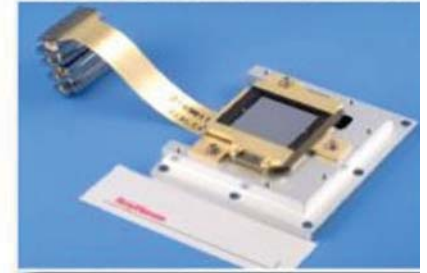
**Near-Infrared Detector**



**$\mu$ Shutters**



**Mid-Infrared Detector**



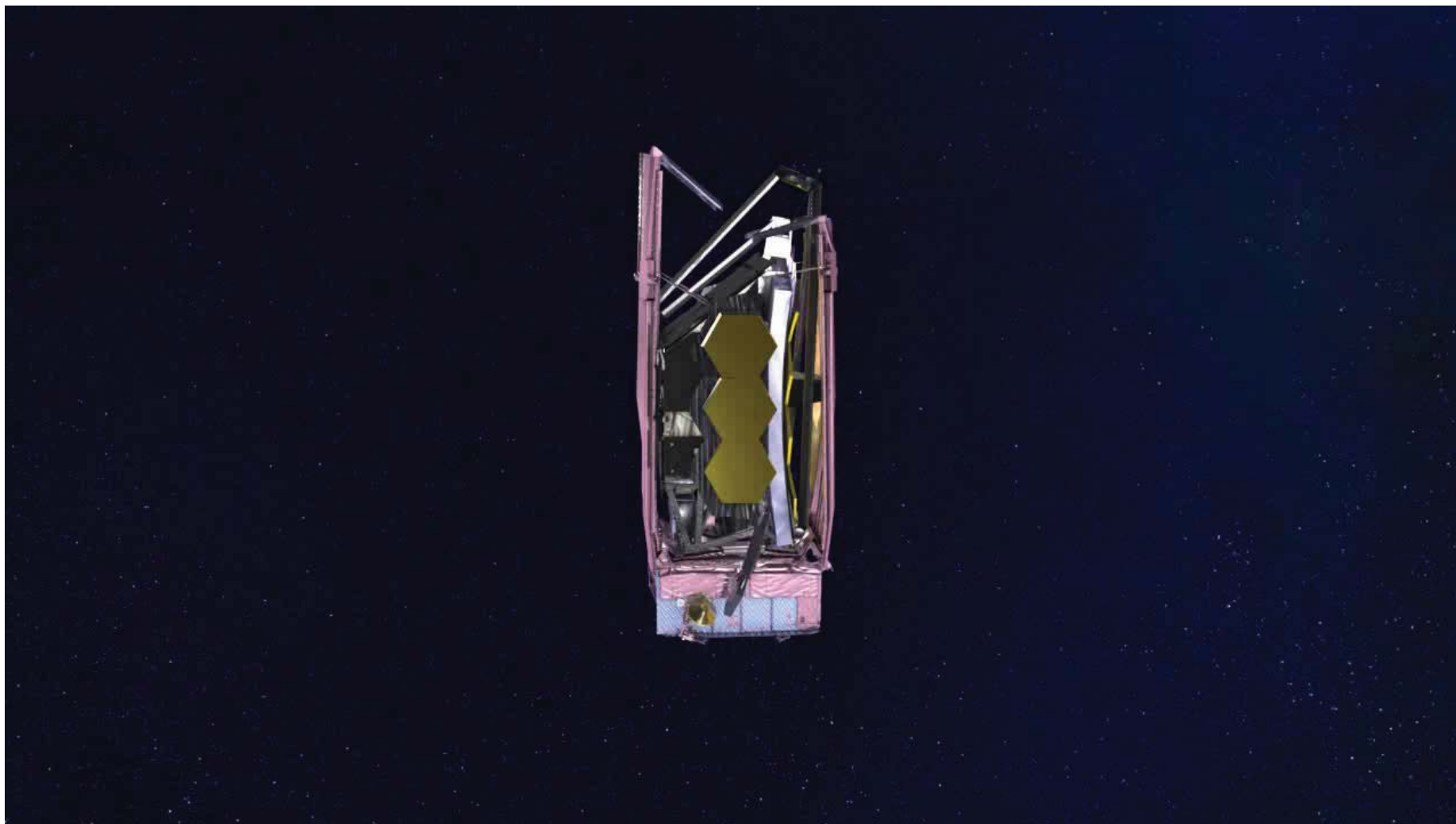
**Cryocooler**



**Cryogenic ASICs**



# JWST Deployment





# Space Technology Innovation



Transformative & Crosscutting Technology Breakthroughs

Pioneering Concepts/ Developing Innovation Community

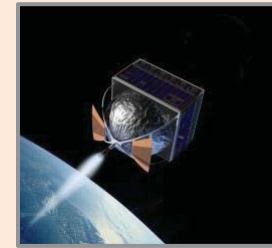
Creating Markets & Growing Innovation Economy



**Game Changing Development**



**Technology Demonstration Missions**



**Small Spacecraft Technology**



**Space Technology Research Grants**



**NASA Innovative Advanced Concepts (NIAC)**



**Center Innovation Fund**



**Centennial Challenges**



**Small Business Innovation Research & Small Business Technology Transfer (SBIR/STTR)**



**Flight Opportunities**

# Questions





