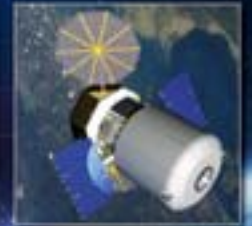




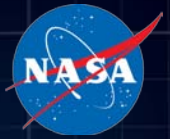
Update and Way Ahead for NASA ESMD

Doug Cooke
Associate Administrator
NASA's Exploration Systems Mission Directorate

October 22, 2010



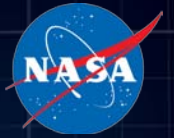
A New Path: The NASA Authorization Act of 2010



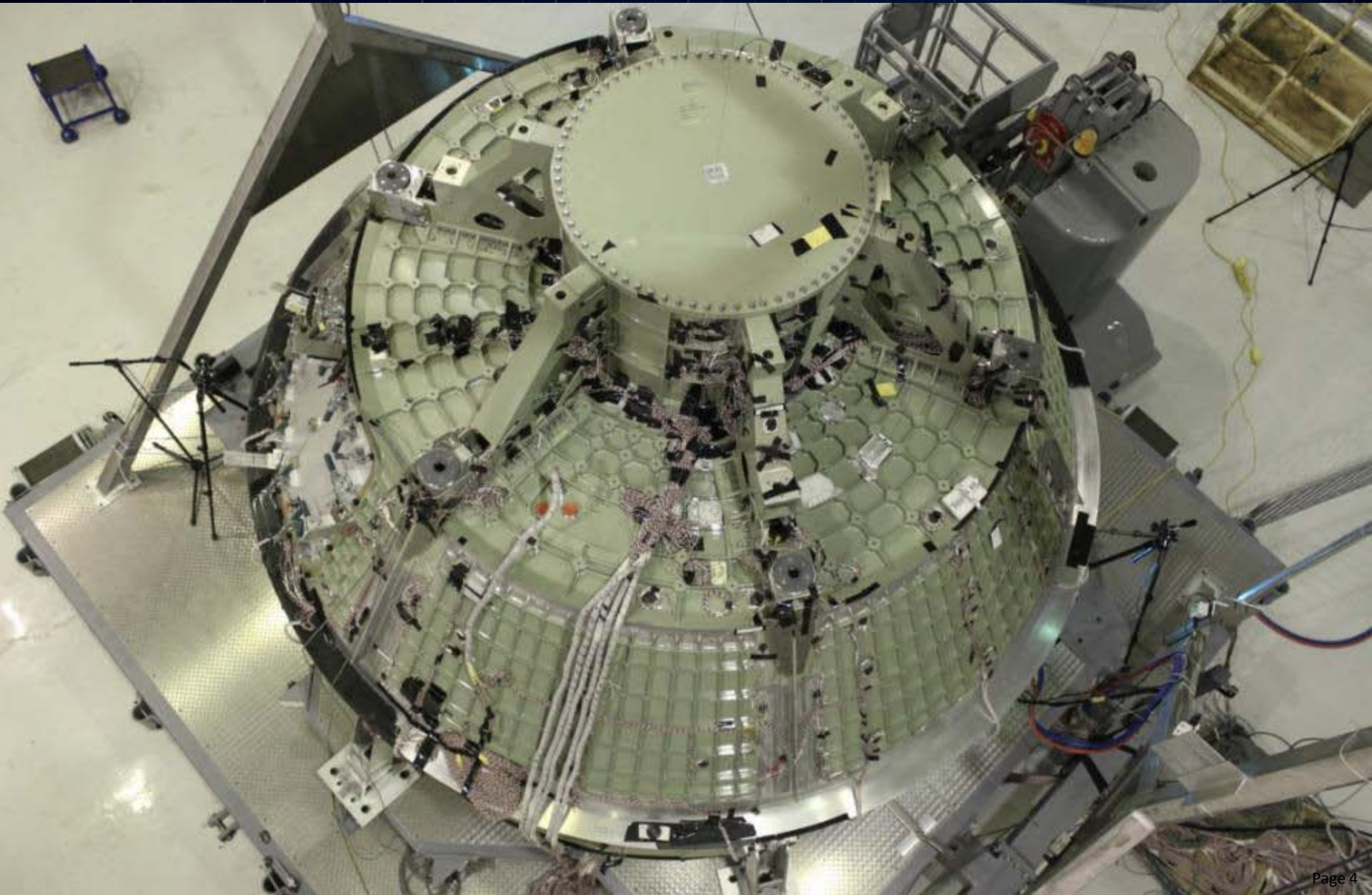
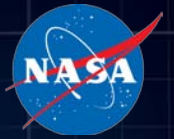
- **The Congress approved and the President signed the National Aeronautics and Space Administration Authorization Act of 2010**
 - Bipartisan support for human exploration beyond Low Earth Orbit
- **The law authorizes:**
 - Extension of the International Space Station until at least 2020
 - Strong support for a commercial space transportation industry
 - Development of a multi-purpose Crew Vehicle and heavy lift launch capabilities
 - A “flexible path” approach to space exploration opening up vast opportunities including near-Earth asteroids and Mars
 - New space technology investments to increase the capabilities beyond Low Earth Orbit



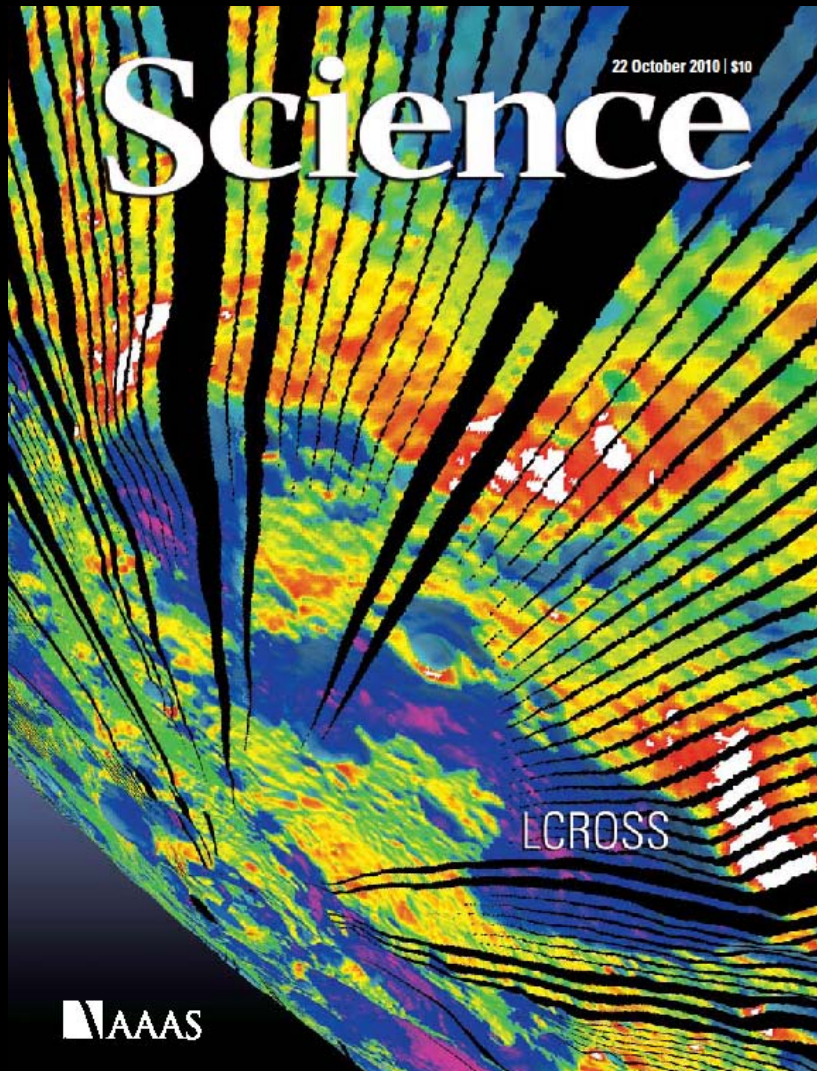
Constellation Experience: Setting the Stage to go Beyond



Successful Weld of GTA and Structural Proof Pressure Test August 2010



A Whole New Moon from LRO and LCROSS (2 covers in 6 weeks!)

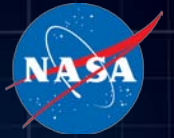


10/22/10 (today!)



9/17/10

Where We are Going: Explore to Prosper



- **Discover**

- Address grand challenges about ourselves, our world, our cosmic surroundings



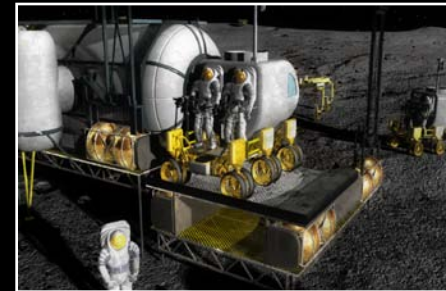
- **Innovate**

- Provide opportunities to develop new technologies, new jobs, and new markets

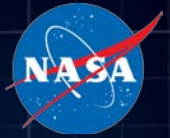


- **Inspire**

- Inspire students to explore, learn, contribute to our nation's economic competitiveness, and build a better future

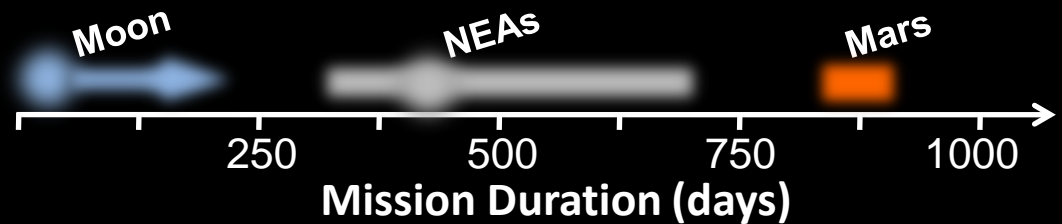
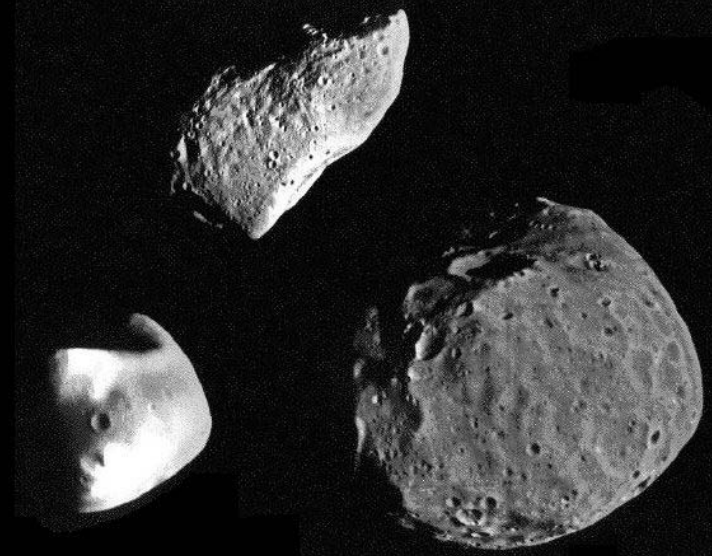
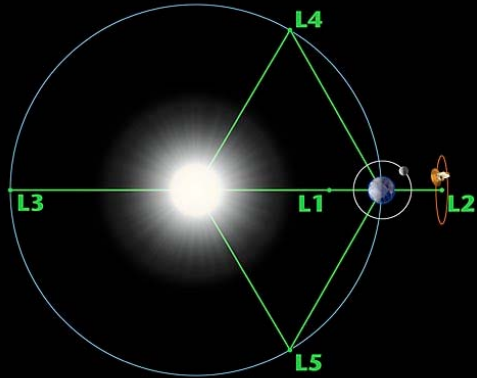
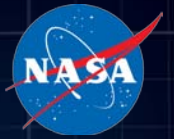


ESMD Positioned to Respond to Authorization Act

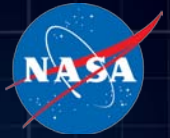


- **Currently re-energizing internal study teams to provide plans in response to NASA Authorization Act of 2010**
 - ***Orion, Heavy Lift, Commercial Crew & Cargo, Technology and Exploration Precursor Robotics all reworking plans in response to the Bill's provisions***
- **Study Team efforts are informed by Auth Bill direction and results of Human Exploration Framework Team (HEFT) ongoing analysis**
- **HEFT is the architectural planning and analysis function for human exploration, providing *decision support* to NASA senior leadership on end-to-end HSF needs, which drive near-term priority decisions**
 - **Not a decision-making body**
 - **Analyses consider technical, programmatic, and fiscal constraints; their trade studies seek to drive out *affordable* multi-destination architecture options that meet stakeholder priorities**
 - **Analyses enable Agency – level strategic and technical decisions**

Destinations for Future Human Explorers



Value of Near Earth Asteroid Exploration



Human Exploration Advancement

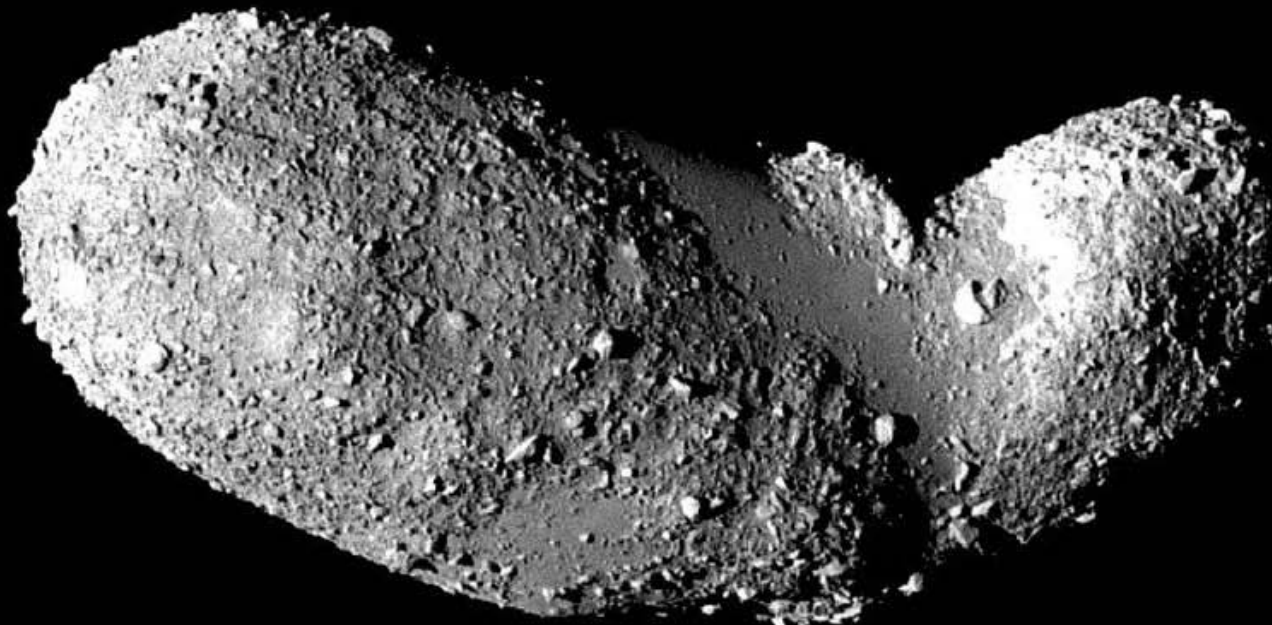
Long duration human space flight, long lag-time operation, resource prospecting/utilization, small body operations

Science

Solar system formation, sources of Earth's organics & water, meteorite collection ground truth

Catastrophic Impact Avoidance

Find them all, characterize them, develop and test deflection methods

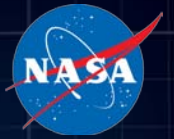


Asteroid Itokawa, 540 meters long



ISS, 100 m

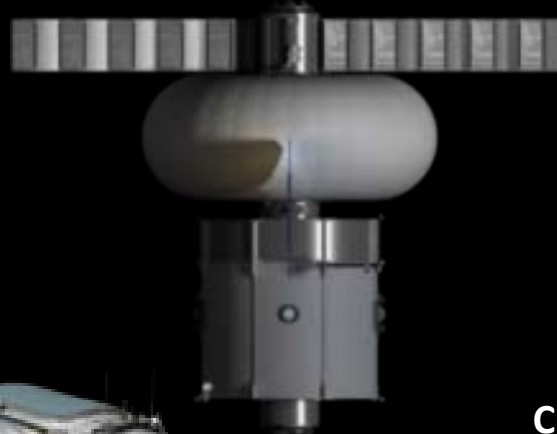
Possible Mission Elements for NEA Exploration (not to scale!)



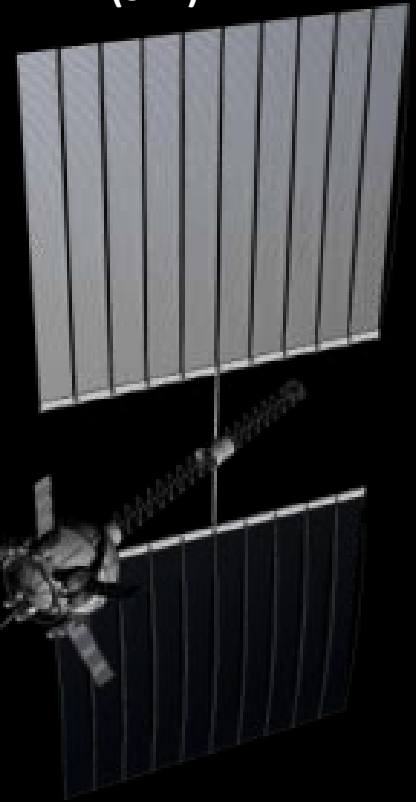
Crew Transfer Vehicle (CTV)



Deep Space Habitat (DSH)



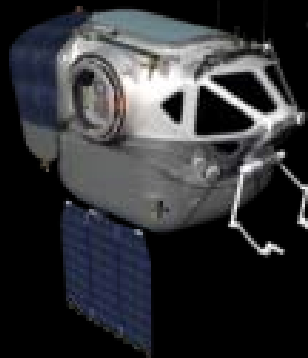
Solar Electric Propulsion (SEP)



Cryogenic Propulsion Stage (CPS)



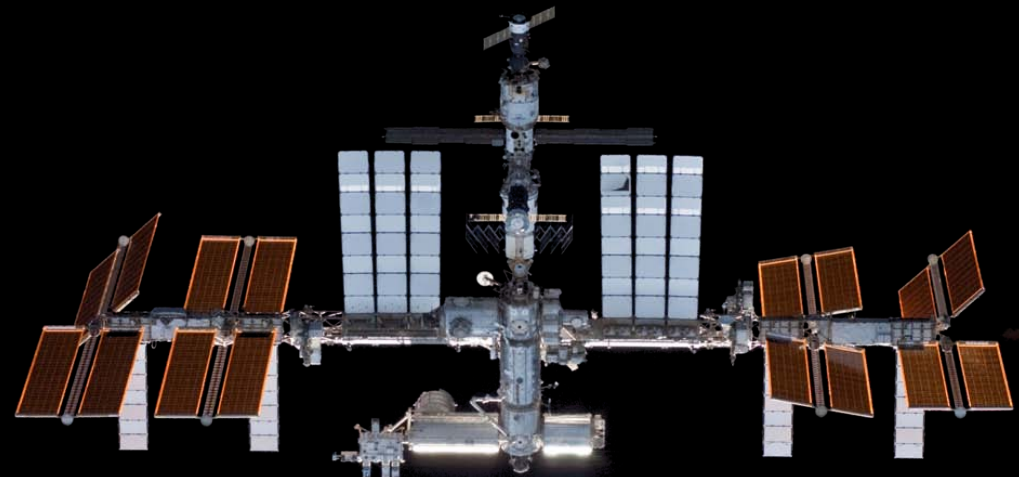
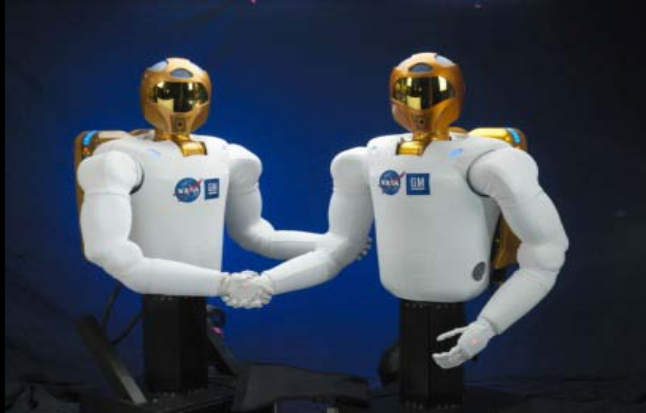
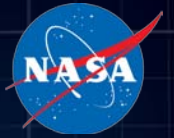
Multi Mission Space Exploration Vehicle (MMSEV)



Heavy Lift Launch Vehicle* (HLLV)

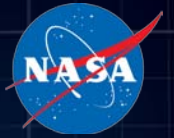
* A generic LV is shown – as originally published by T. Gray in Popular Mechanics, this one runs on Oreos, ours won't

Use of ISS as a Technology Testbed

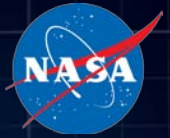


Robonaut 2, a highly dexterous, humanoid robot will fly to the International Space Station in November on STS-133

Exploration: A Global Endeavor



ESMD: Blazing a Trail Into the Solar System



- NASA's human spaceflight program seeks to extend human presence throughout the solar system
- NASA Authorization Act of 2010 represents an exciting step forward in our efforts to create a sustainable future for humans beyond Earth
- ESMD Teams are responding to direction in the Authorization Act, guided by HEFT Architectural studies and analysis
- Affordability of our future program, while balancing investments in technology and research with development of flight elements, presents ESMD's greatest challenge moving forward



To meet this challenge, NASA must catalyze a *Worldwide Exploration Movement*:

- *Engage new partners*
- *Invent new approaches*
- *Explore new places*
- *Engage the public in new ways*

