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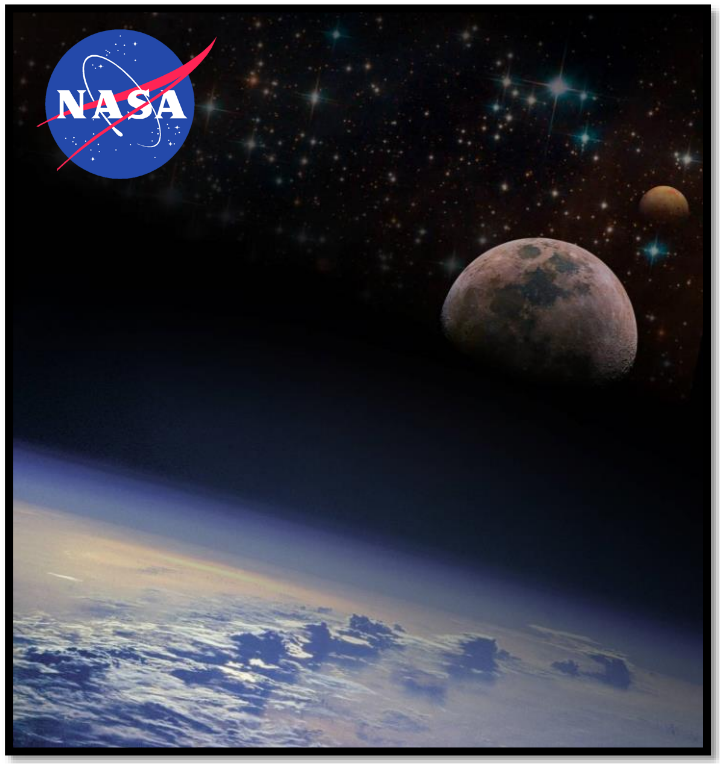
DEEP SPACE | DEEP OCEAN

Aramco Technology and
Operational Excellence Forum

Robotics Technology Development To Enable Manned, Planetary Exploration

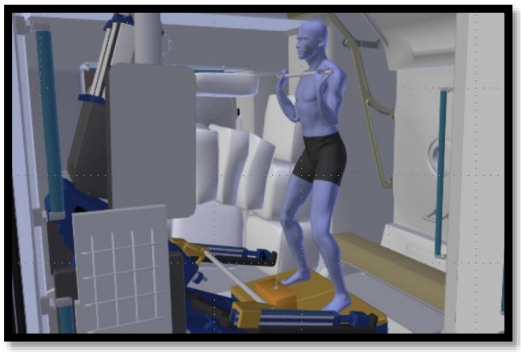
NASA Robotic Research Pointed Toward Deep Space Missions

- NASA is planning for manned deep space missions utilizing the Space Launch System and the Orion manned capsule
  - Asteroid retrieval
  - Moon
  - Mars
- Robots will play an integral role in the deep space mission architectures
  - In-transit mission phases
    - EVA spacecraft maintenance and inspection
    - IVA maintenance and inspection
    - IVA crew assistant
    - Countermeasures exercise equipment
  - Surface operations in advance of manned crews
    - Habitat assembly, checkout and operational verification
    - Habitat maintenance
  - Surface operations during manned visits
    - Assistant
    - Explorer
    - Rovers



Robots Will Play a Key Role In Transit Spacecraft Operations

- In-transit Phase Developments
  - Robonaut 2 and 3
  - Autonomous EVA Robotic Camera
  - Robotically assisted space suit
  - Miniature Exercise Device



Planetary Surface Operations Will Be Supported By Robots

- Surface operations will be performed prior to manned operations
- Robots will support crews during manned operations
- Chariot rovers designed for planetary traversal
- Valkyrie will perform assembly, maintenance, and science on the planet surface