Research Possibilities Beyond Deep Space Gateway

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Deep Space Gateway with propulsion bus, node, logistics, and small habitat elements

Large volume research facility based on the Deep Space Transport habitat.

Asteroid capture vehicle or other commercial / international elements
Research Facility Assumptions

• Beyond Deep Space Gateway
  – Ongoing crew & logistics supplies available
  – Large volume launched on SLS, similar to the Deep Space Transport habitat but designed as a research laboratory
  – Can be utilized for Mars Transport demonstrations in the cis-lunar environment including dedicated 300 to 1000 day mission durations

• Permanent facility in cis-lunar space
  – Support deep space science and engineering research, technology and systems development, and technology and mission demonstrations
  – Support in-situ resource utilization development and testing from lunar and asteroid resources
  – Support long-term human research and deep space operations in the cis-lunar environment

• Continuous presence
  – 4 to 6 crew for ongoing operations
  – 8 to 12 crew during rotation

Figure 3-2. SLS Block Configurations

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SLS Derived Module

Fabrication utilizes SLS propellant tank tooling for pressure vessel

Mock up in MSFC’s bldg. 4649

Transport version uses lab equipment volume for stowage to support 4 crew / 1000 day missions
Notional Research Equipment

• **Materials & Geological Research**  
  (assumes availability of lunar and asteroid materials for in-situ resource utilization development)  
  – Workstation 1: Physical Sciences  
  – Multi-purpose Glovebox  
  – Research Lab 1: Scanning Electron Microscope  
  – Research Lab 2: Gas Chromatography Mass Spectrometer  
  – Window and Sample Stowage 1: Freezer/Incubator for Geo samples  
  – Thermal/Vacuum Control System

• **Medical Research**  
  – Workstation 2: Medical and Life Sciences  
  – Waste Management with access to medical & life sciences  
  – Sample Stowage 2: Freezer/Incubator for Bio samples

• **Zoology Research**  
  – (space environments research on life forms)  
  – Research Lab 4: Live Animal Quarters  
  – Life sciences glovebox & cold sample storage

• **Astronomy**  
  – Window observational research facility  
  – Exterior equipment tele-workstation  
  – Portable equipment for additional locations

• **Physics**  
  – Research Lab 5: Microgravity Lab

• **Engineering Research**  
  – Experimental shower & experimental washer & dryer facilities (includes waste water recycling development)  
  – Workstations 3 & 4: Maintenance workstation including 3d printer equipment and printer materials processing

• **Botany**  
  – Research Lab 6: Plant growth chamber  
  – Life sciences glovebox (botany)

• **External Payloads**  
  – Cameras, Telescopes & Detectors  
  – Robotic arm, internal tele-robotic workstation  
  – EVA Airlock & Materials Sample Airlock