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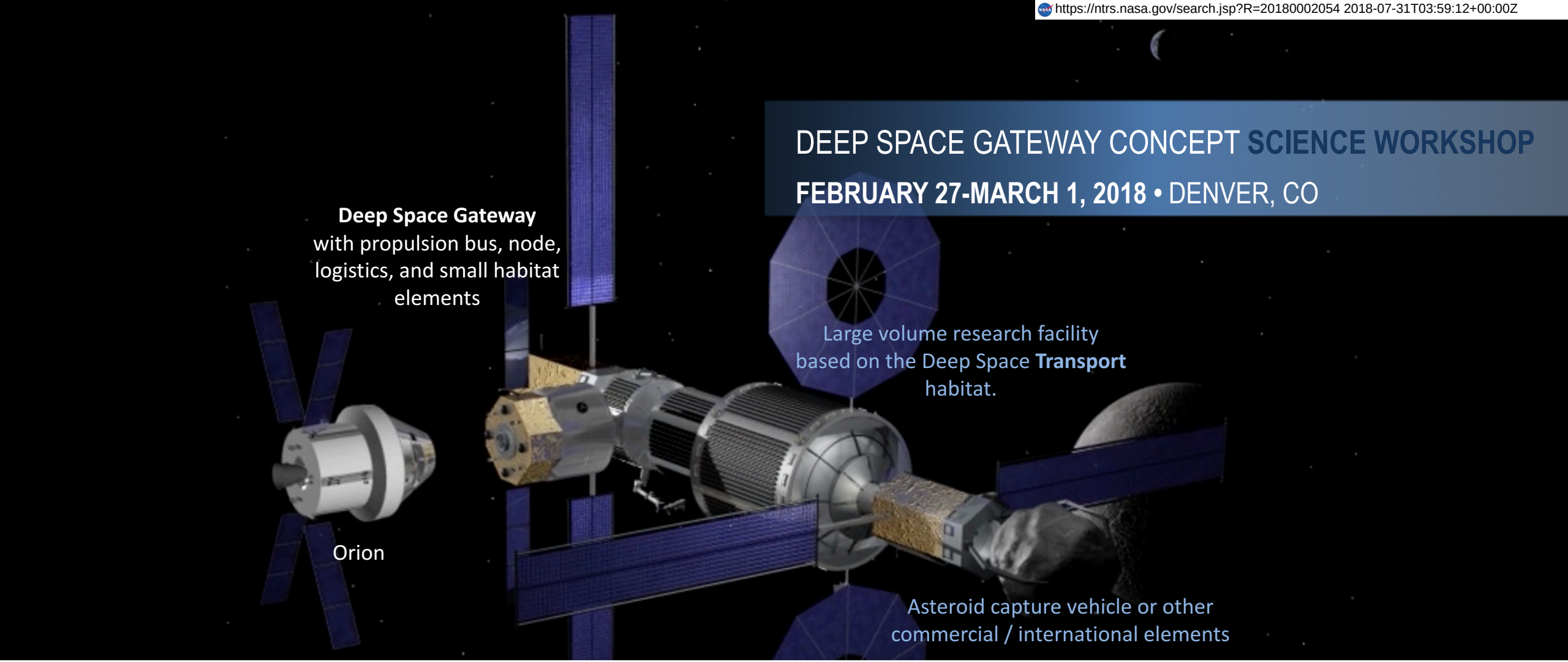

Research Possibilities Beyond Deep Space Gateway

February 28, 2018

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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

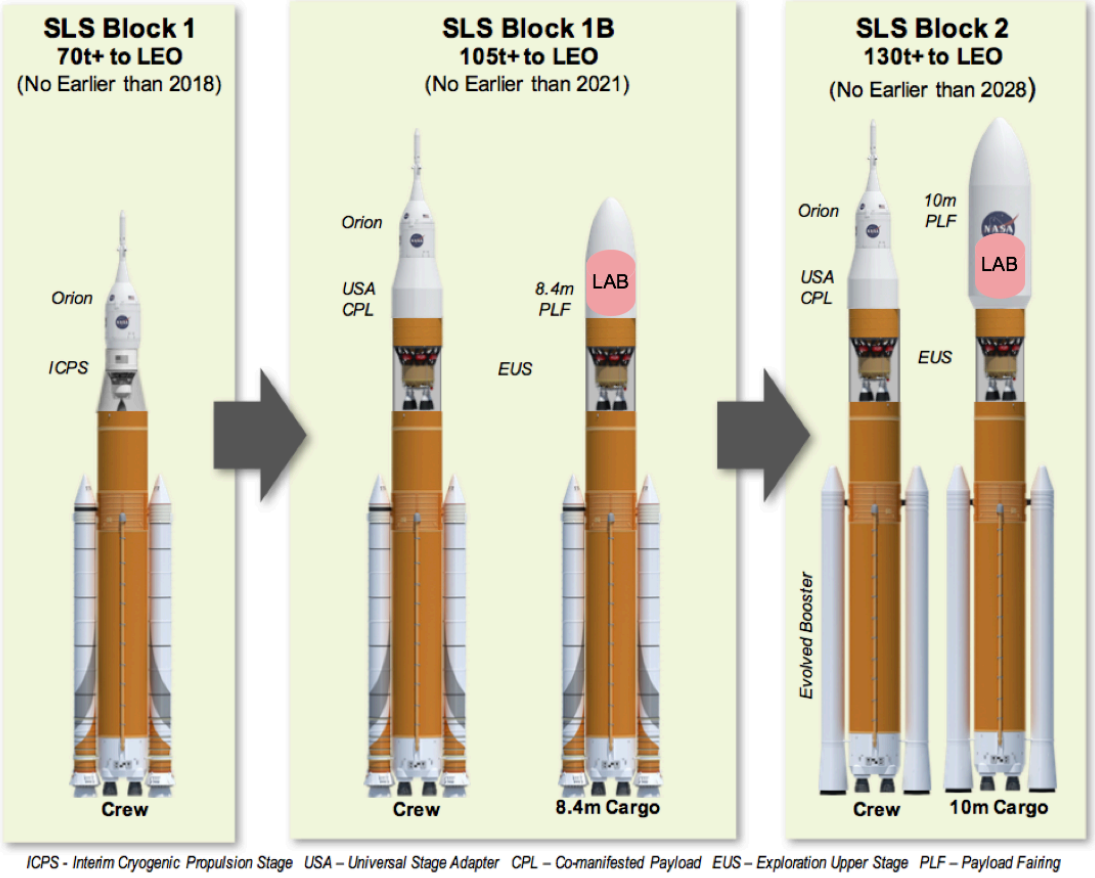
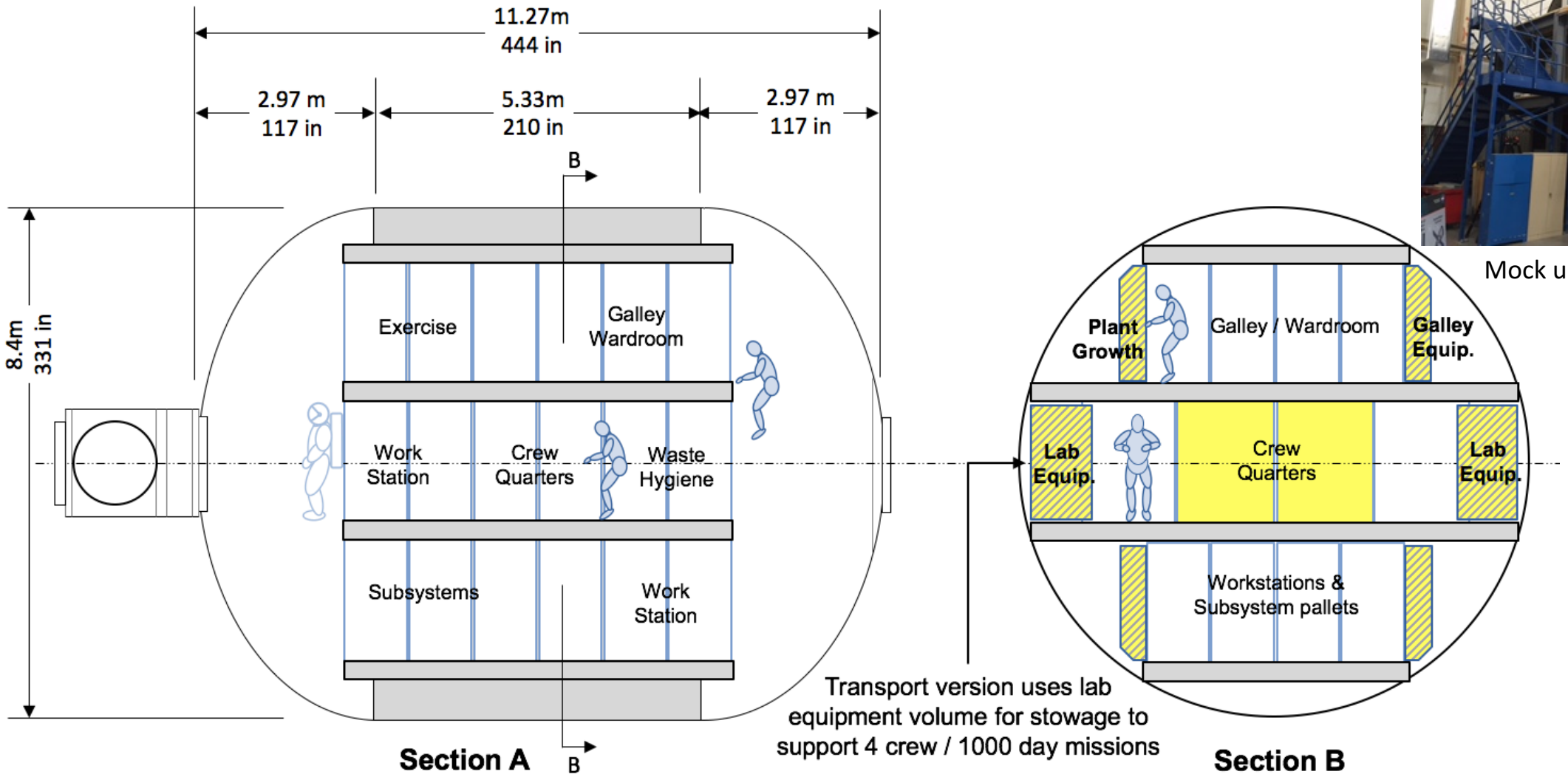


Figure 3-2. SLS Block Configurations

SLS Derived Module

Fabrication utilizes SLS propellant tank tooling for pressure vessel

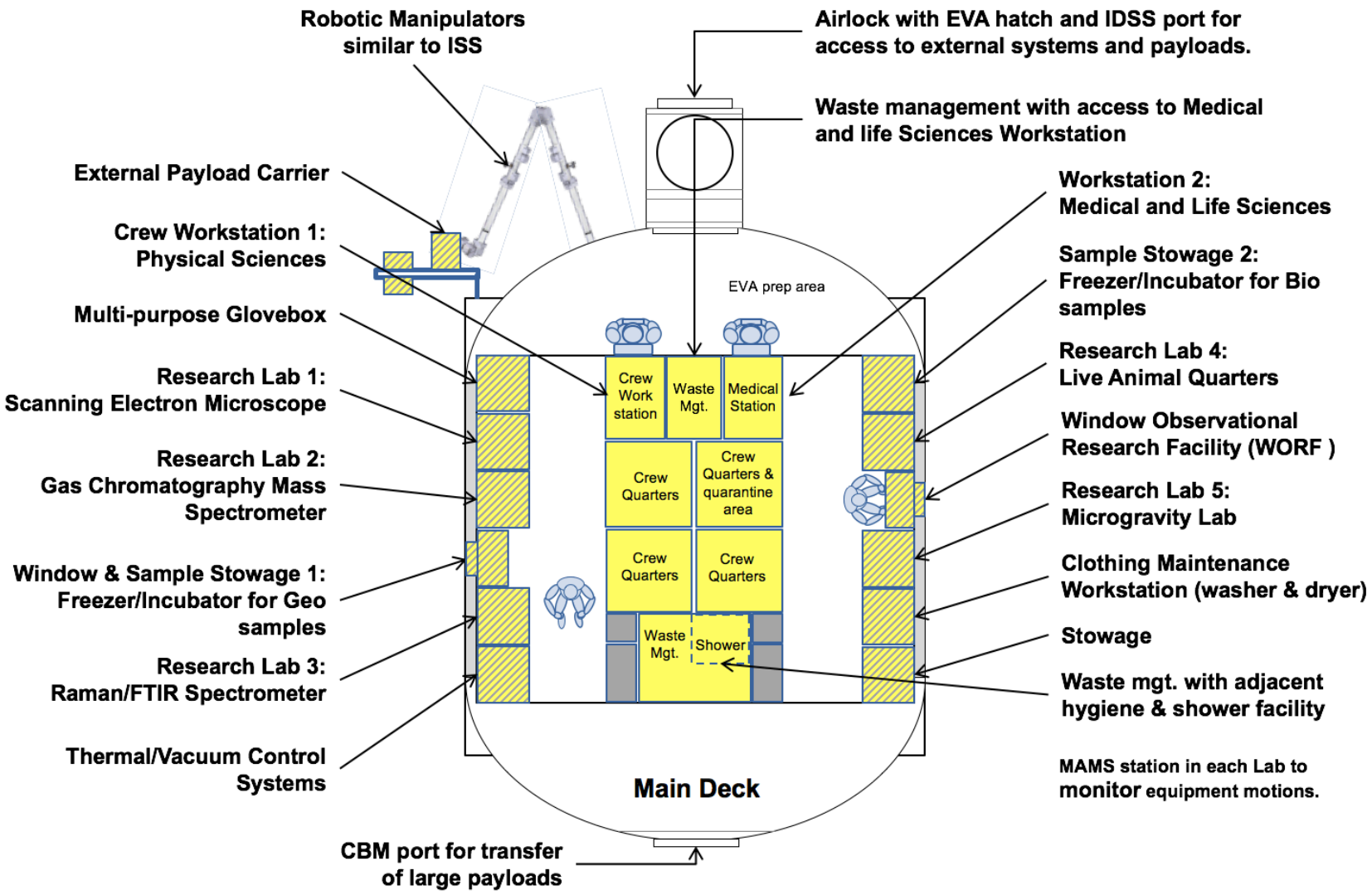
Mock up in MSFC's bldg. 4649



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

Research Laboratory Layout

Main Deck

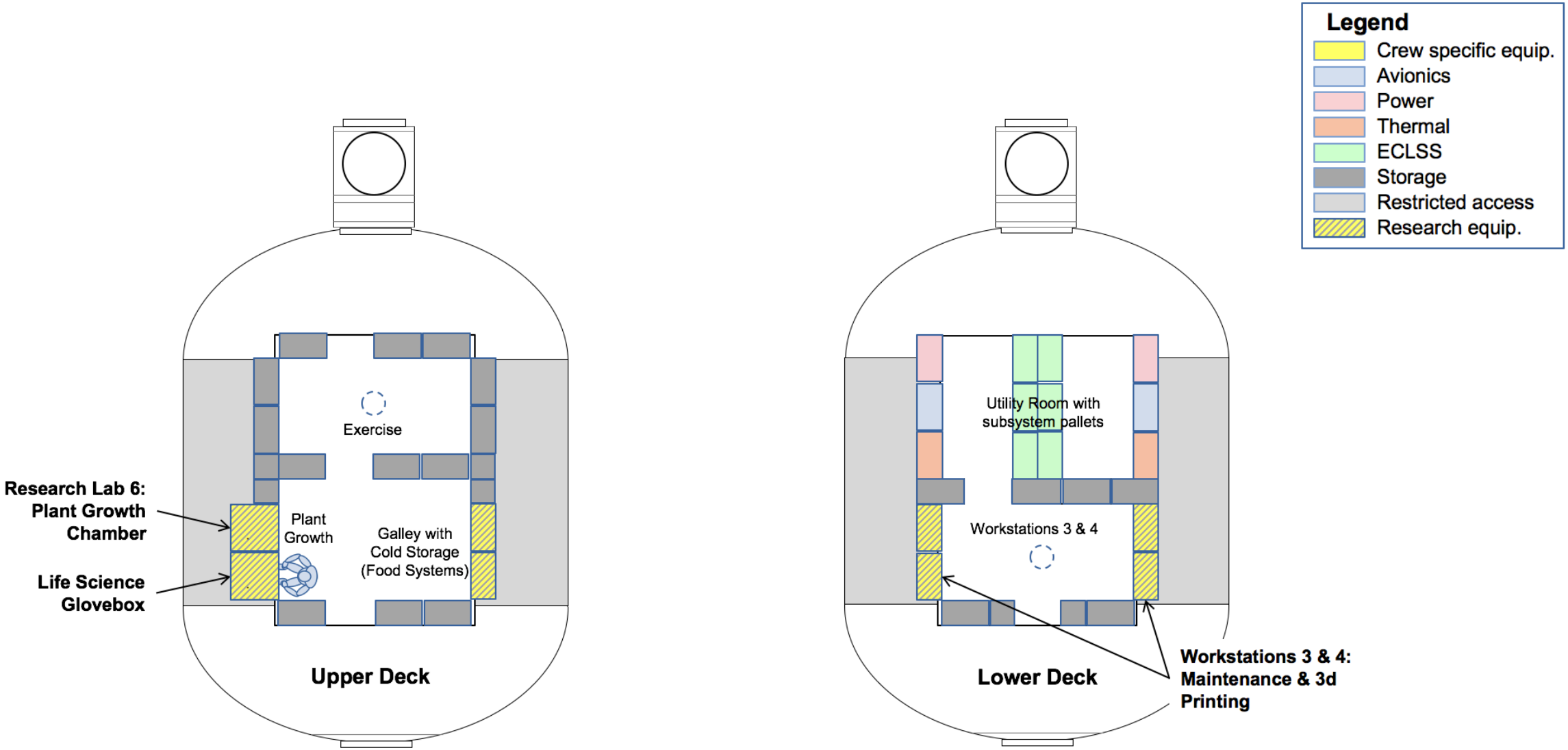


Legend

- Crew specific equip.
- Avionics
- Power
- Thermal
- ECLSS
- Storage
- Restricted access
- Research equip.

Research Laboratory Layout

Upper & Lower Decks



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