

ISS Inflatable Hab Overview

What is the Inflatable Hab?

- The Inflatable Hab is a light weight inflatable habitation module for space applications
- Original concept for light weight module as transit module for future exploration
- Proposed to the International Space Station (ISS) Program as a replacement for the current Hab Module



ISS Inflatable Hab



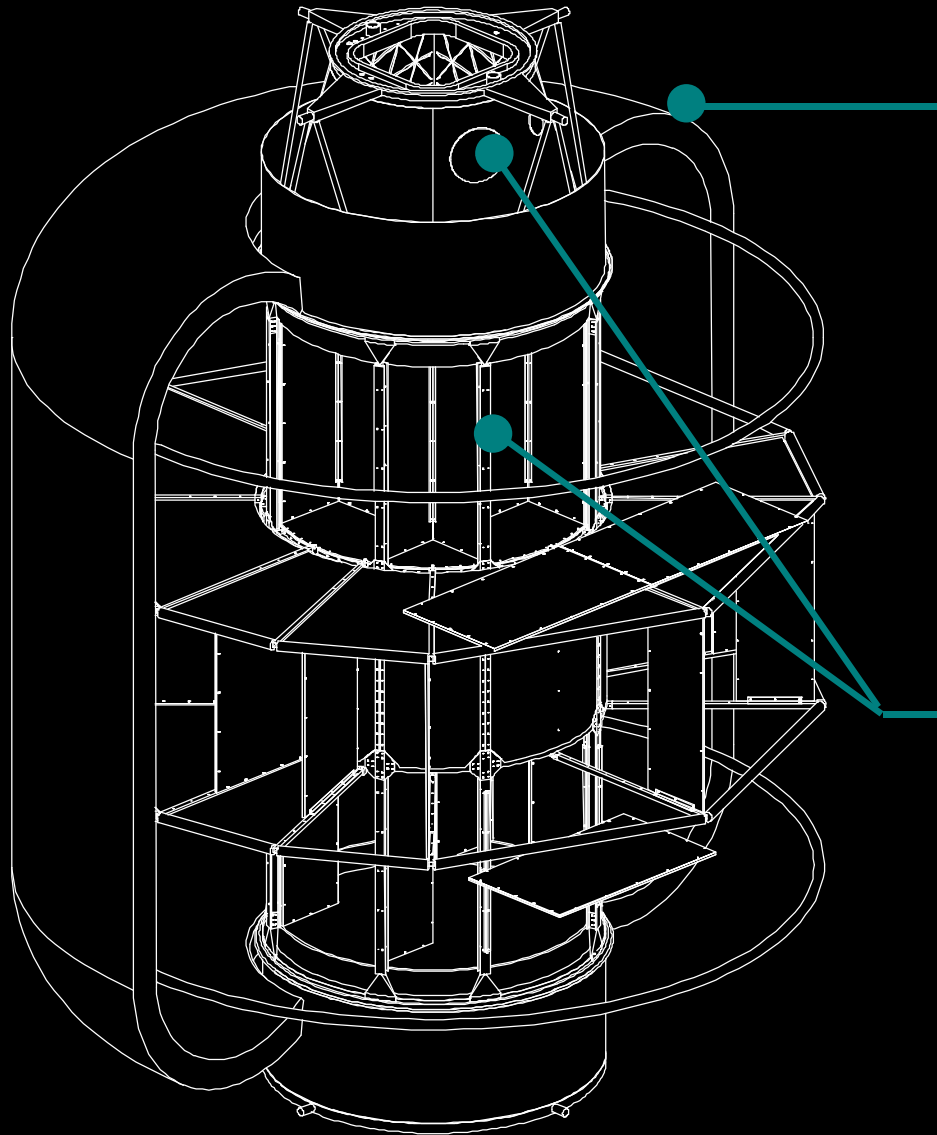
Level 4: Pressurized Tunnel

Level 3: Crew Health Care

Level 2: Crew Quarters and
Mechanical Room

Level 1: Galley and Wardroom

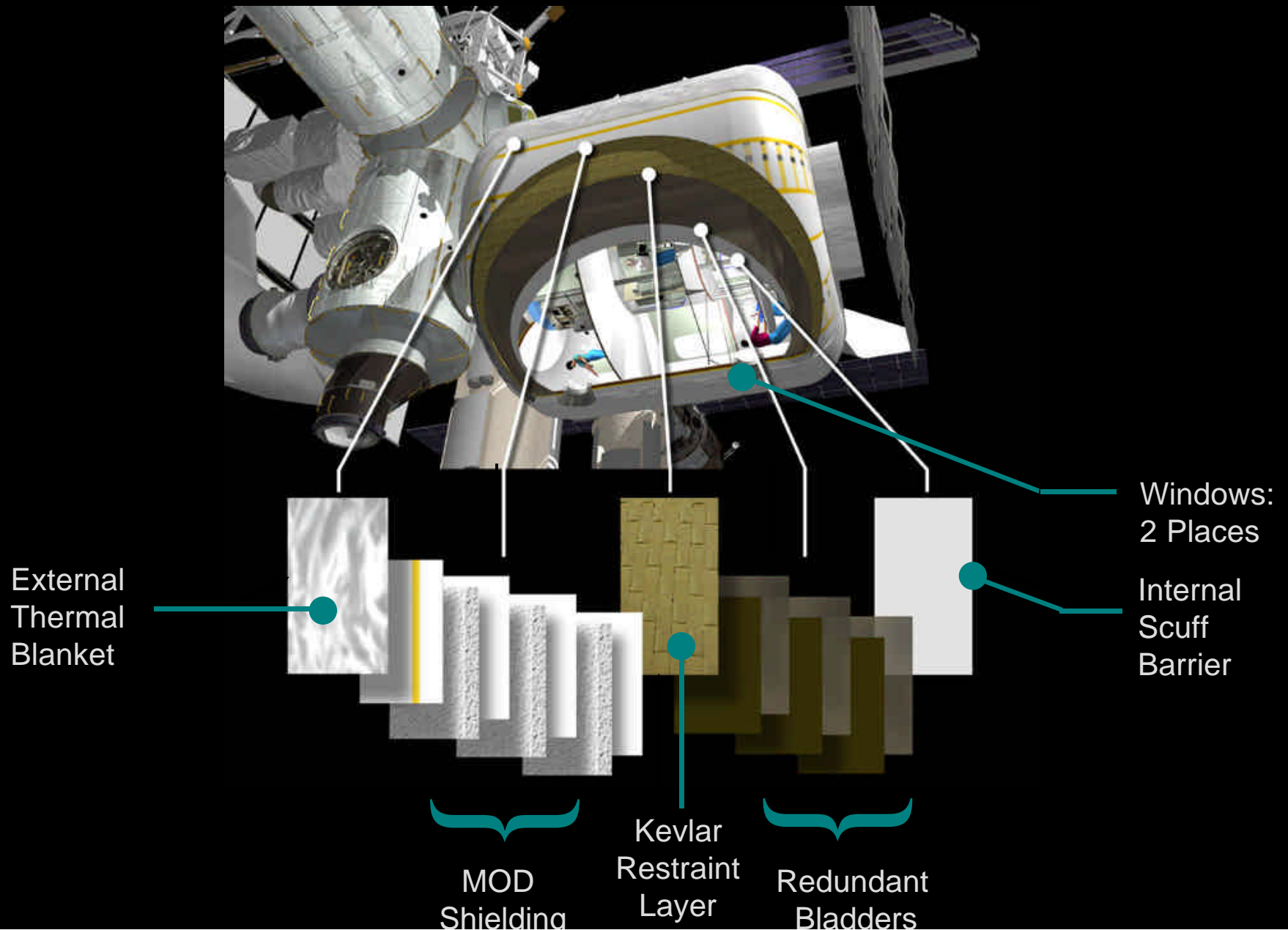
ISS Inflatable Hab Overview



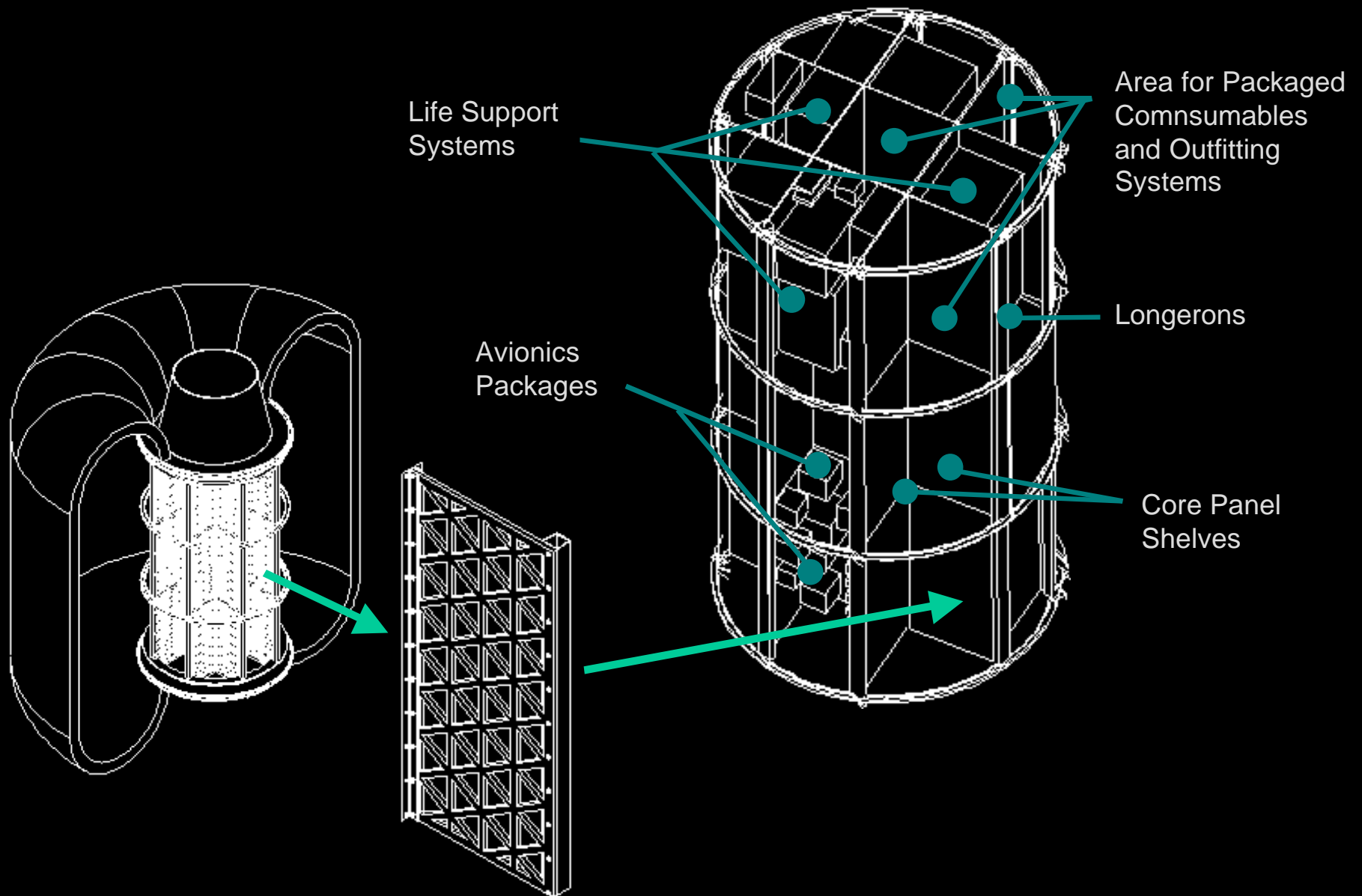
Multi-Layer Inflatable Shell

Central Structural Core

Multi-Layer Inflatable Shell Overview



Subsystems Packaged in Core

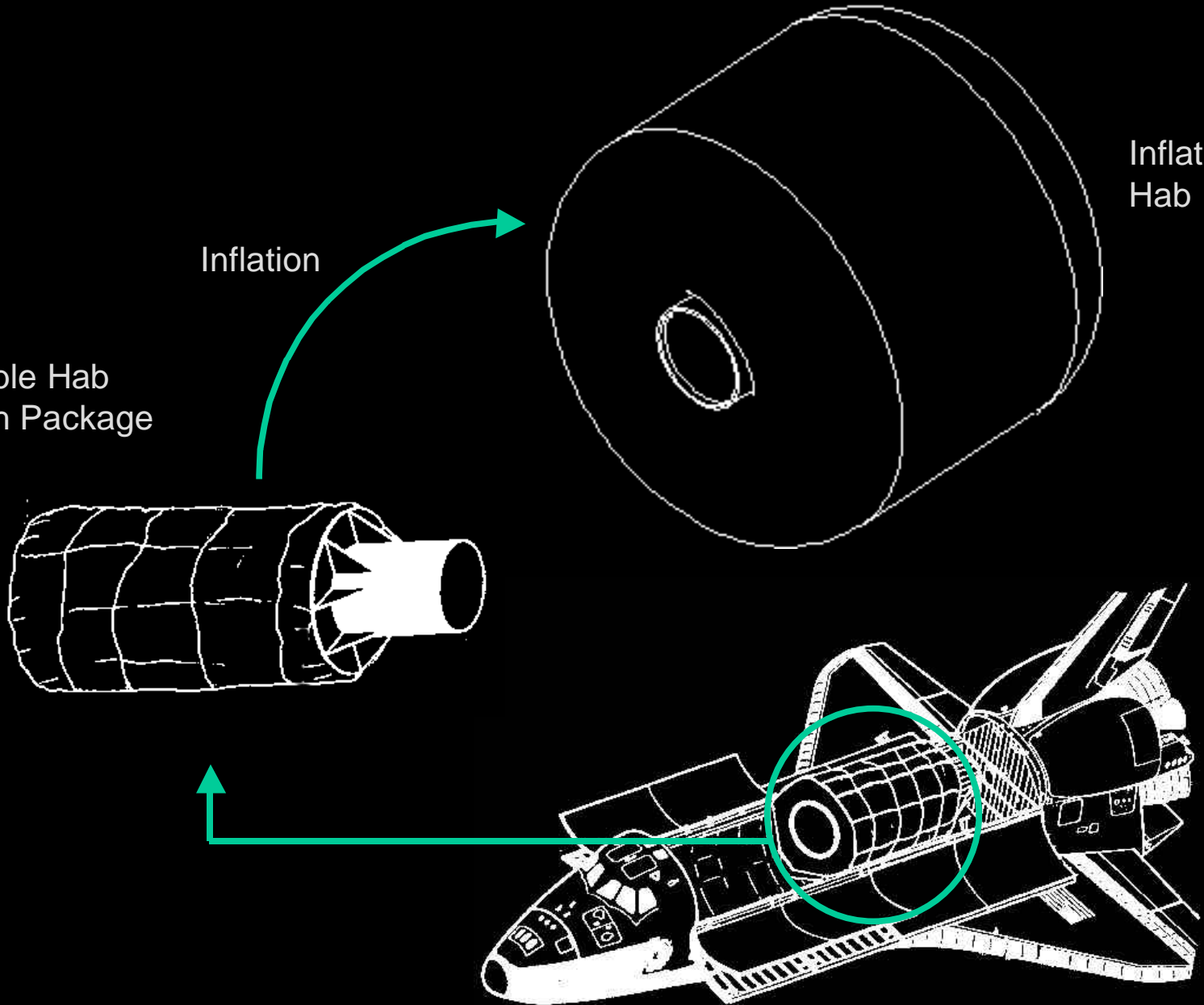


Hab Inflation

Inflatable Hab
Launch Package

Inflation

Inflated
Hab



ISS Inflatable Hab

Hatch Door

Inflatable Shell

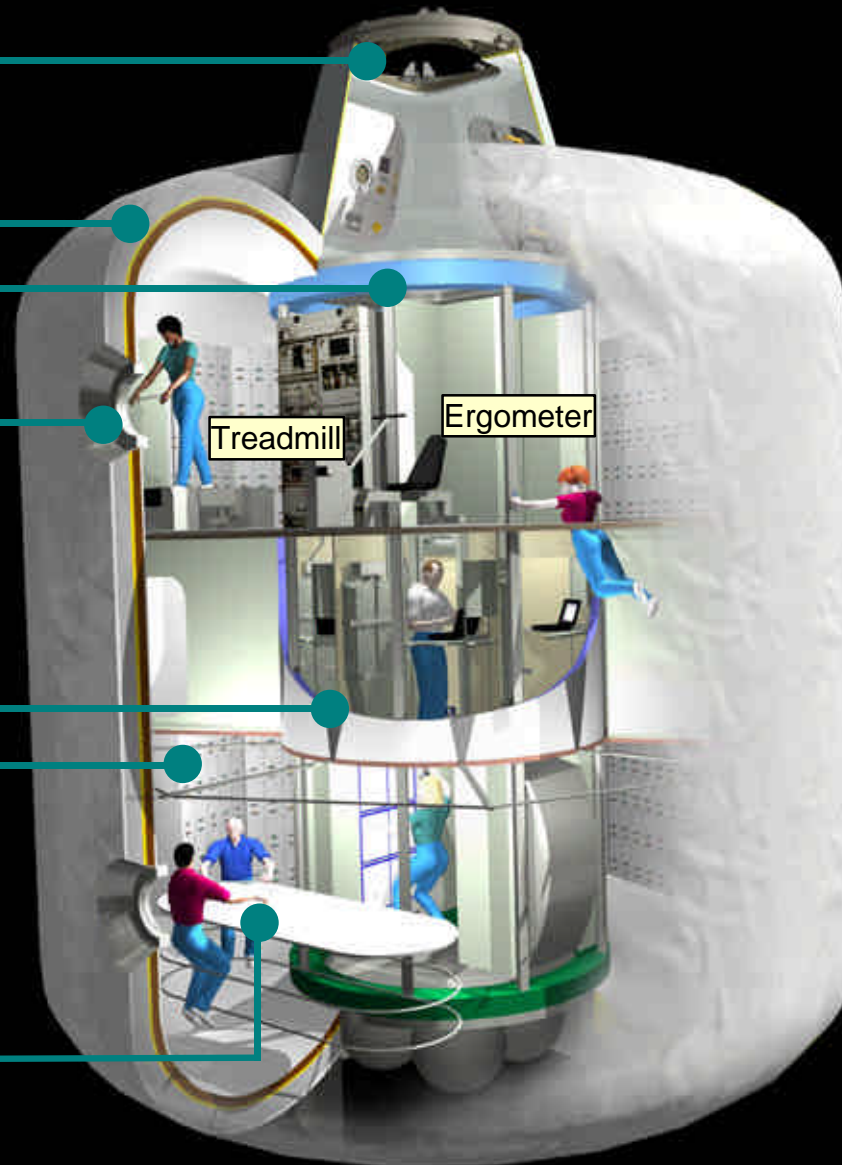
Central Structural Core

20" Window (2)

Integrated Water Tank

Soft Stowage Array

Wardroom Table



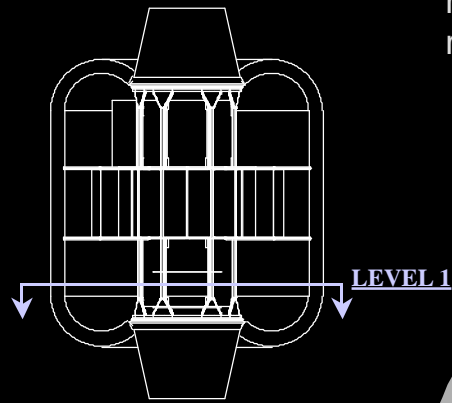
Level 4: Pressurized Tunnel

Level 3: Crew Health Care

Level 2: Crew Quarters and Mechanical Room

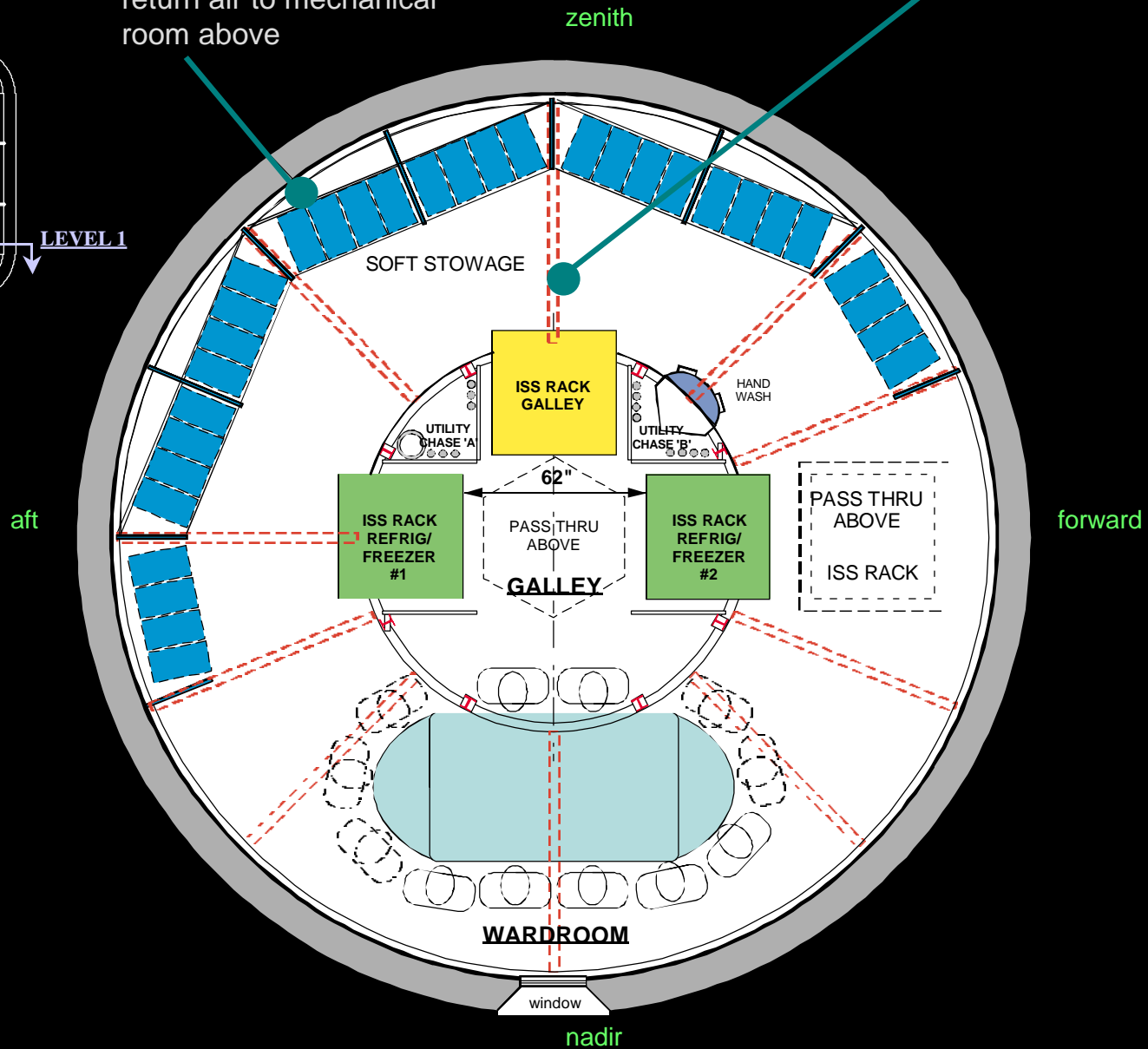
Level 1: Galley and Wardroom

Level 1

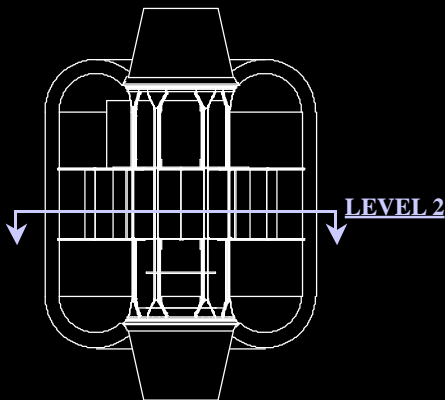


Leave floor open for return air to mechanical room above

Integrated floor strut into fabric floor above

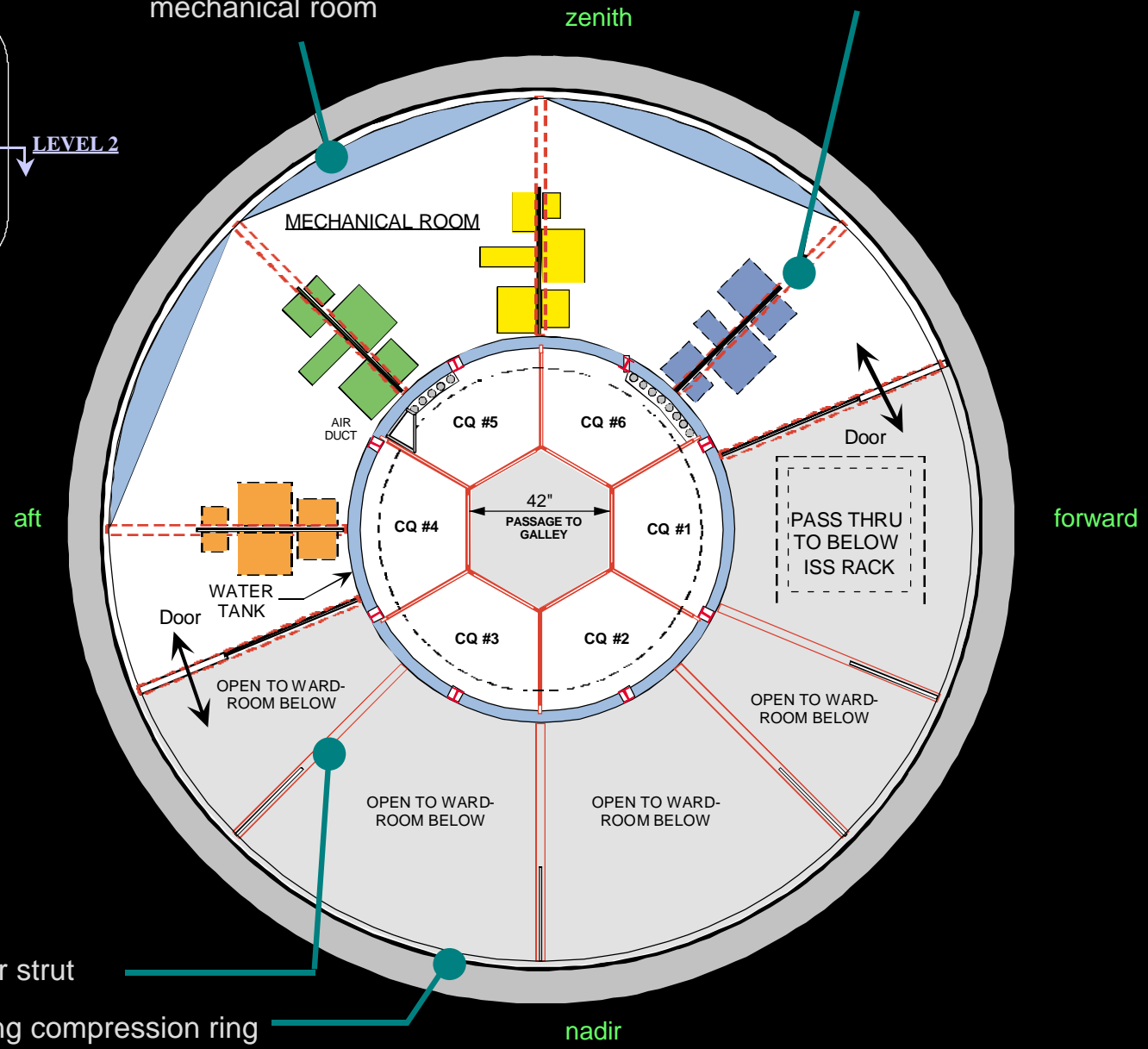


Level 2



Leave floor and clg. open for return air to mechanical room

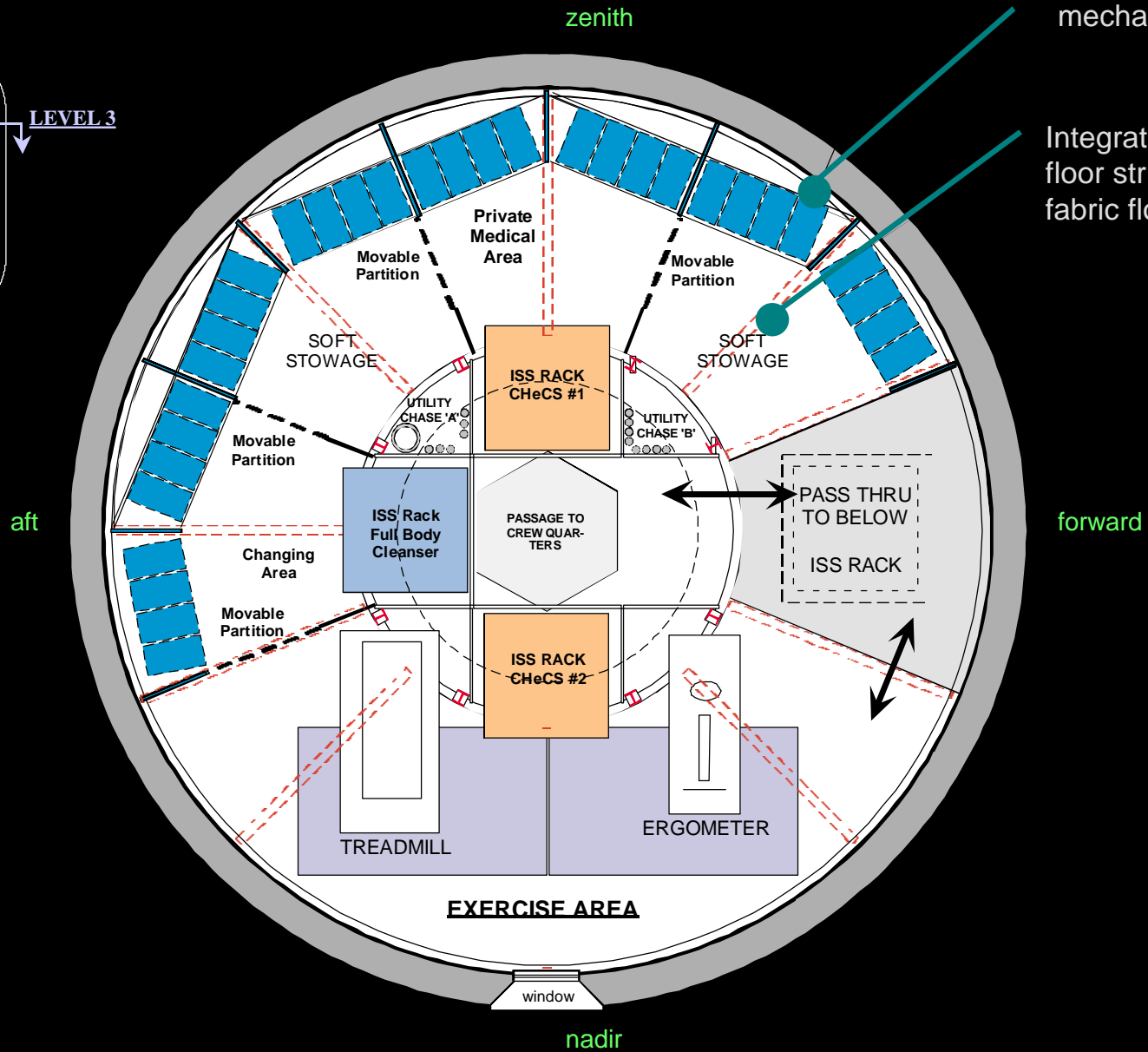
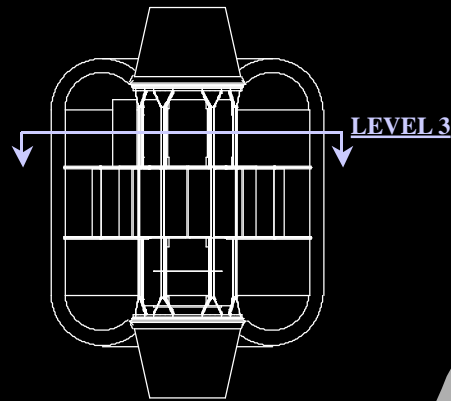
Integrated floor strut into fabric floor above



Floor strut

Inflatable outfitting compression ring

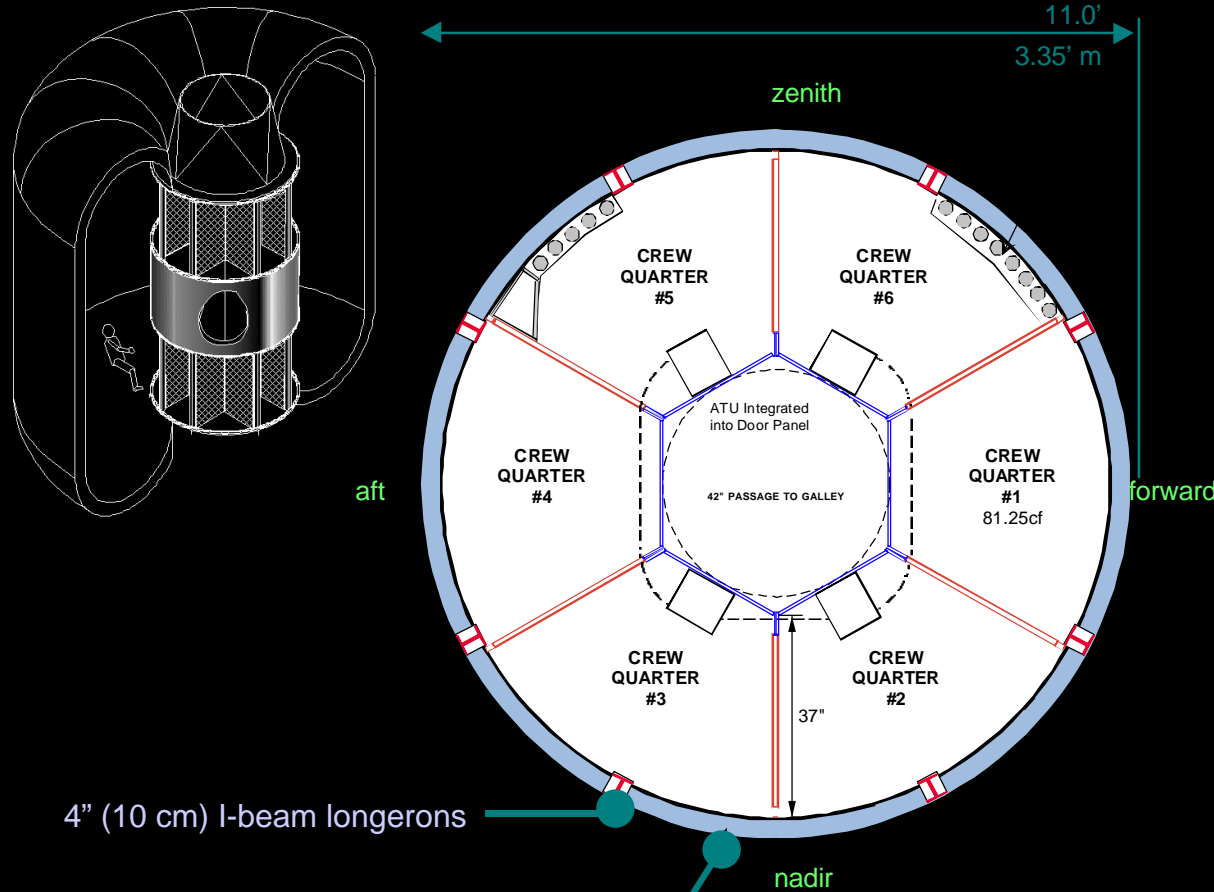
Level 3



Leave floor open for return air to mechanical room

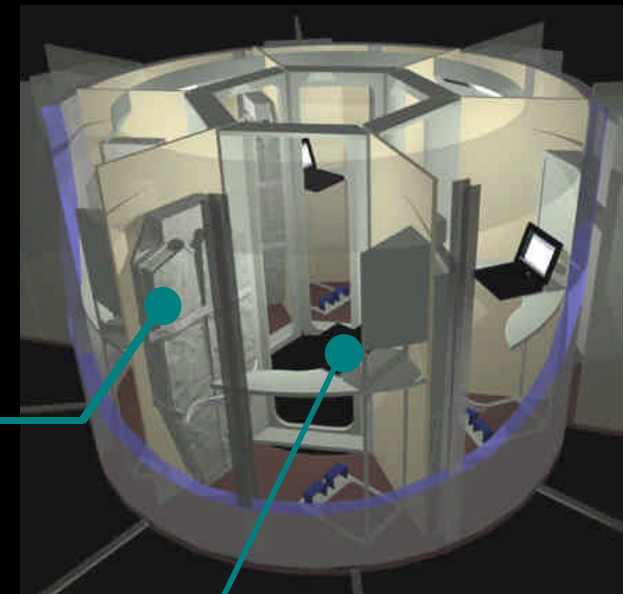
Integrated floor strut into fabric flooring

Crew Quarters



Provides: (design for 0g)

- 6 Crew Quarters (Outfit 4)
- **81.25 ft³ of Volume:**
 - **27% Larger than ISS Rack**
 - **ISS Rack Crew Quarter = 64 ft³ +/- (without bump out)**
- Private Space
- Quiet Space
- Sleep Area
- Personal Stowage Area
- Radiation Protection



4" (10 cm) I-beam longerons

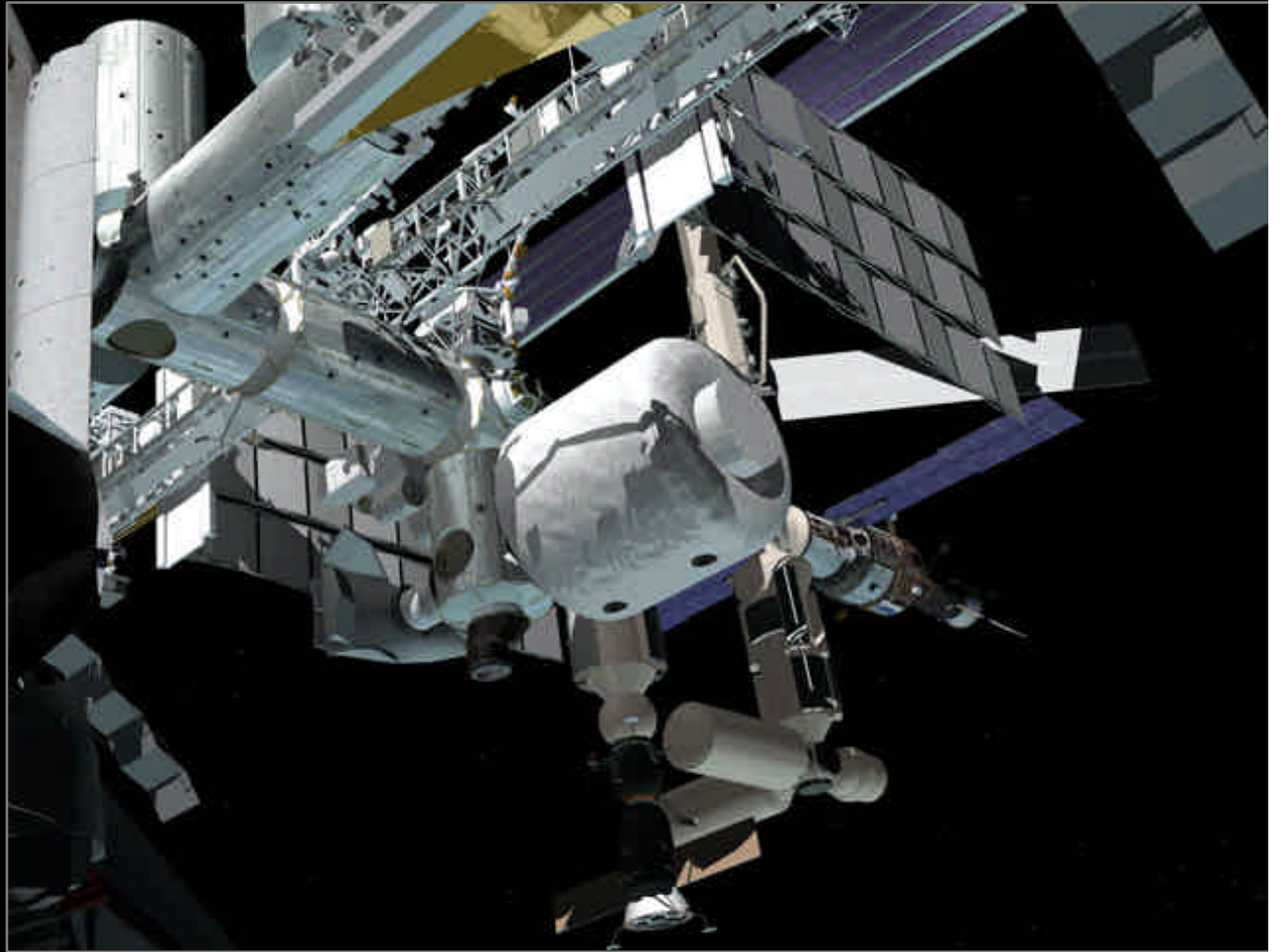
Shear panel with water tank

Sleeping Restraint

Crew Personal Unit:

Entertainment and Work Substation Unit:

Light weight frame and fabric that packages into a box



Inflatable Hab
Proof-of-Concept Test Program

Challenges

- Demonstrate the inflatable technology
- Build a full size inflatable module
- Develop the ISS Inflatable Hab architecture and verify Inflatable Hab integration to space station



Inflatable Shell '98 Development Plan

- **Verify by test structural integrity of the load bearing restraint layer**

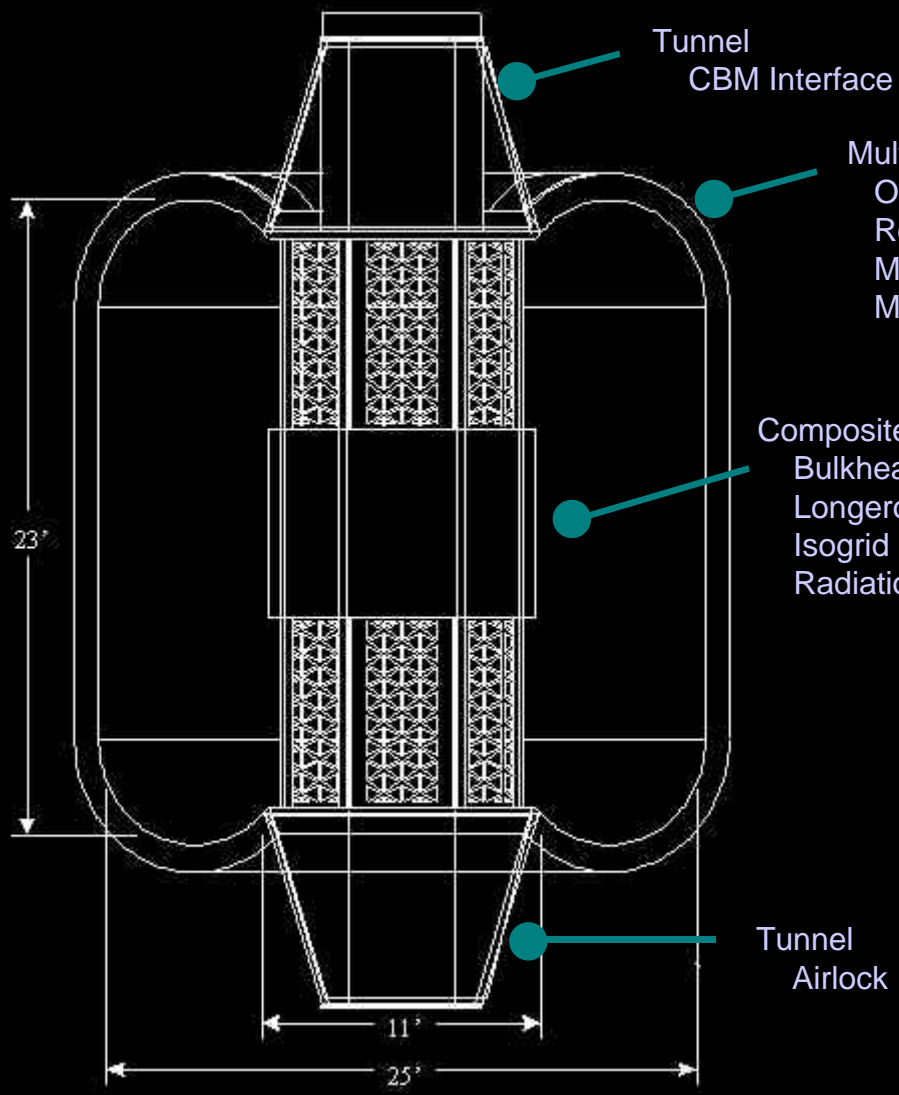
Two structural development articles tested in the Sonny Carter Neutral Buoyancy Laboratory pool

Demonstrated structural layer to 4 atmospheres (4 times the operating pressure) in September 1998 (vs. 2 atmospheres for typical aluminum module)

- **Verify by test the folding, packaging, and deployment of the inflatable shell in a space environment**

Built full scale development unit with multi-layer shell and folded and packaged the unit as if for flight

Demonstrated deployment in space simulated environment (in JSC's thermal vacuum Chamber A) in December 1998

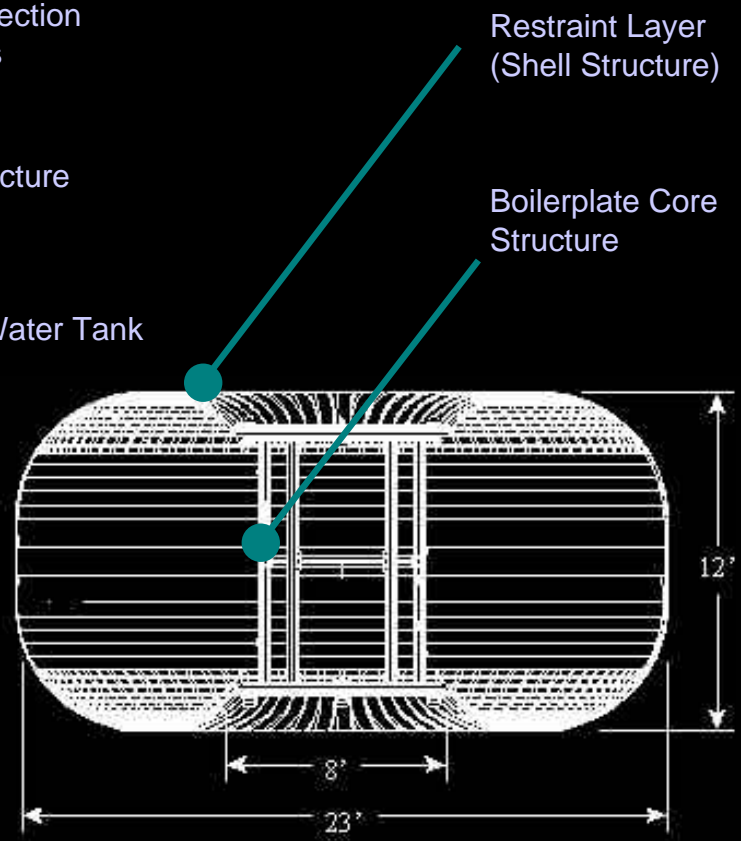


***Flight Vehicle
Primary Structure***

Tunnel
CBM Interface

Multilayer Shell
Optimized Restraint Layer
Redundant Bladder
MM/OD Protection
MLI Blankets

Composite Core Structure
Bulkheads
Longerons
Isogrid Shelves
Radiation Shield Water Tank

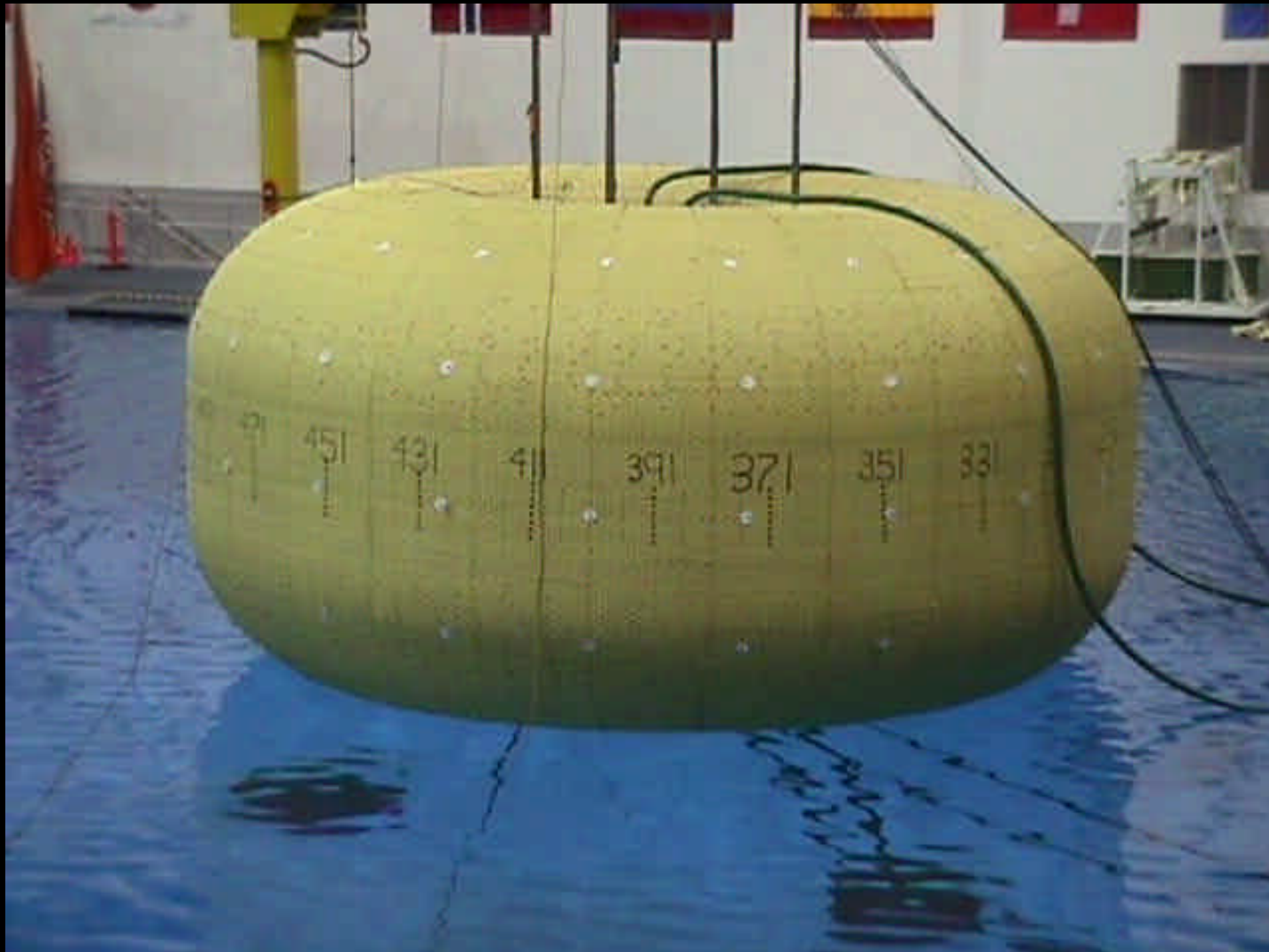


***Short
Development Unit***

Restrainer Layer
(Shell Structure)

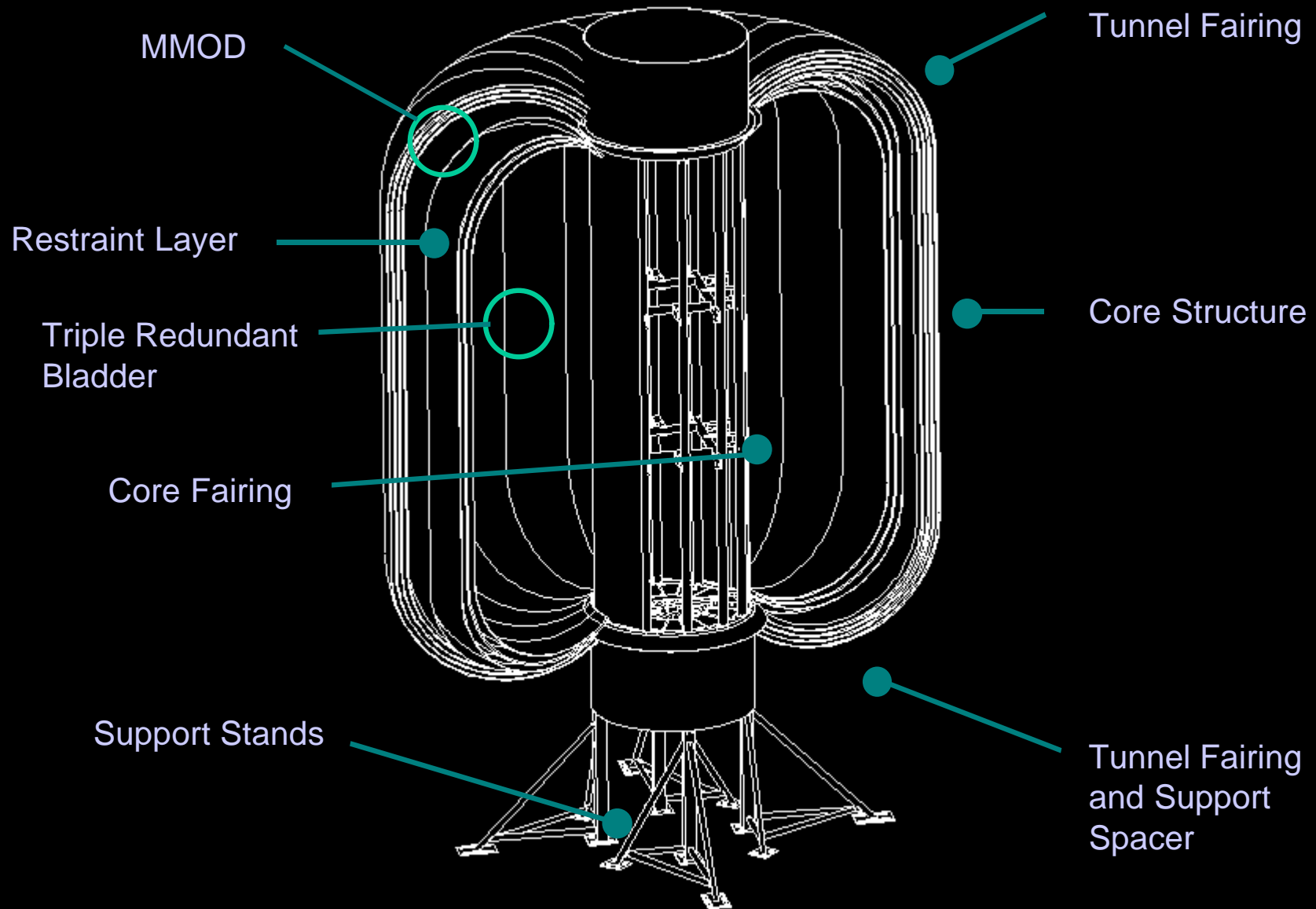
Boilerplate Core
Structure

TransHab Shell Development Unit 2

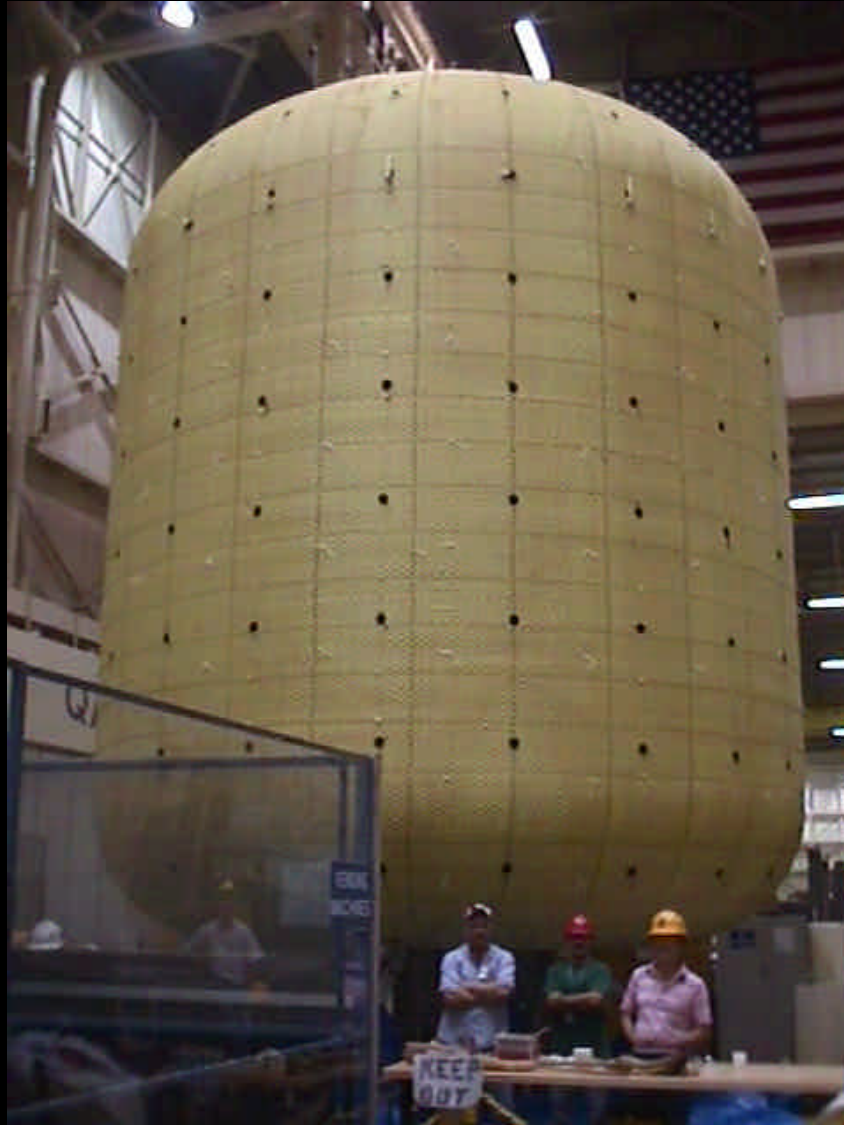


9-12-98 Structural Integrity Verified to a Factor of Safety of 4.0

Full Scale Development Unit

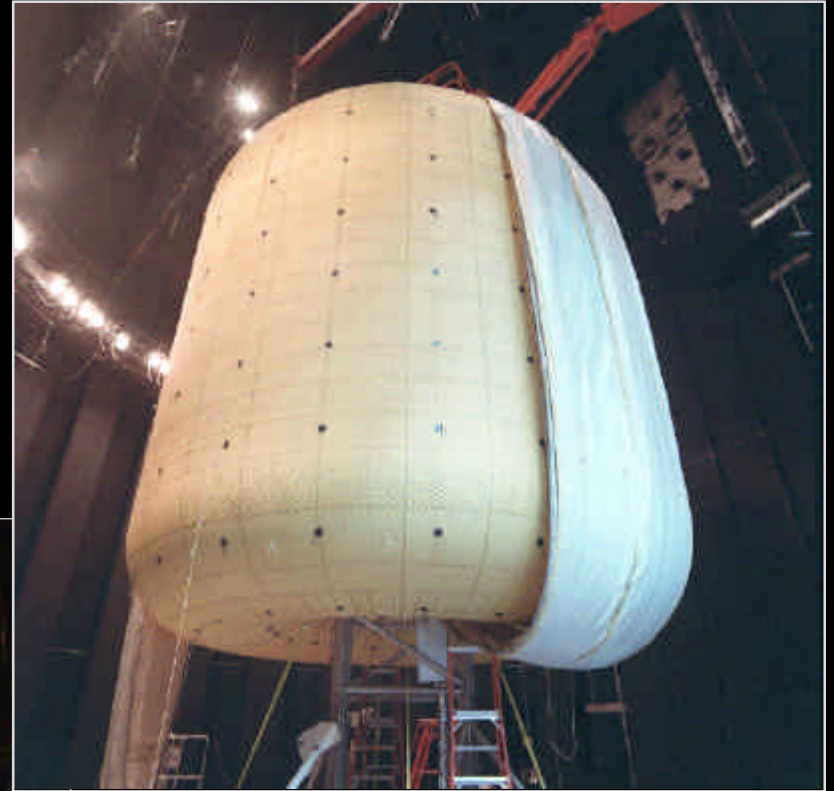


TransHab Full Scale Shell Development Unit (SDU-3)

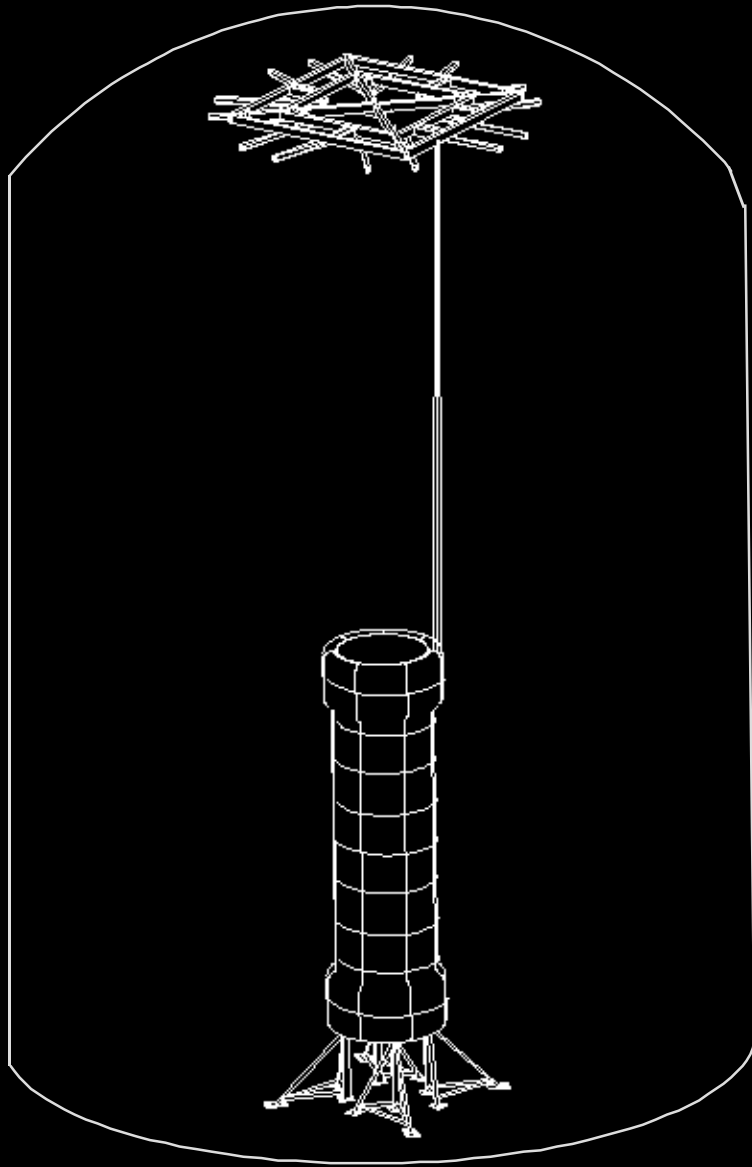


First Inflation: November 17, 1998

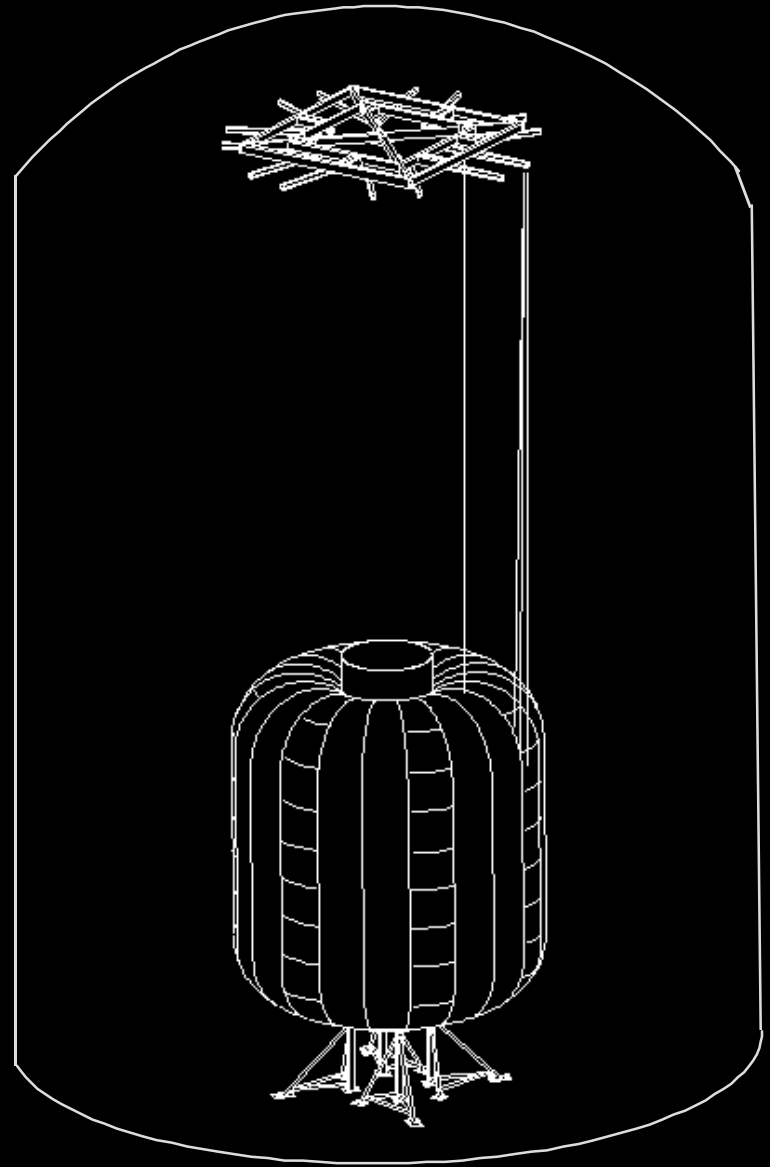
SDU-3 Installation of M/OD Gores



Chamber Layout

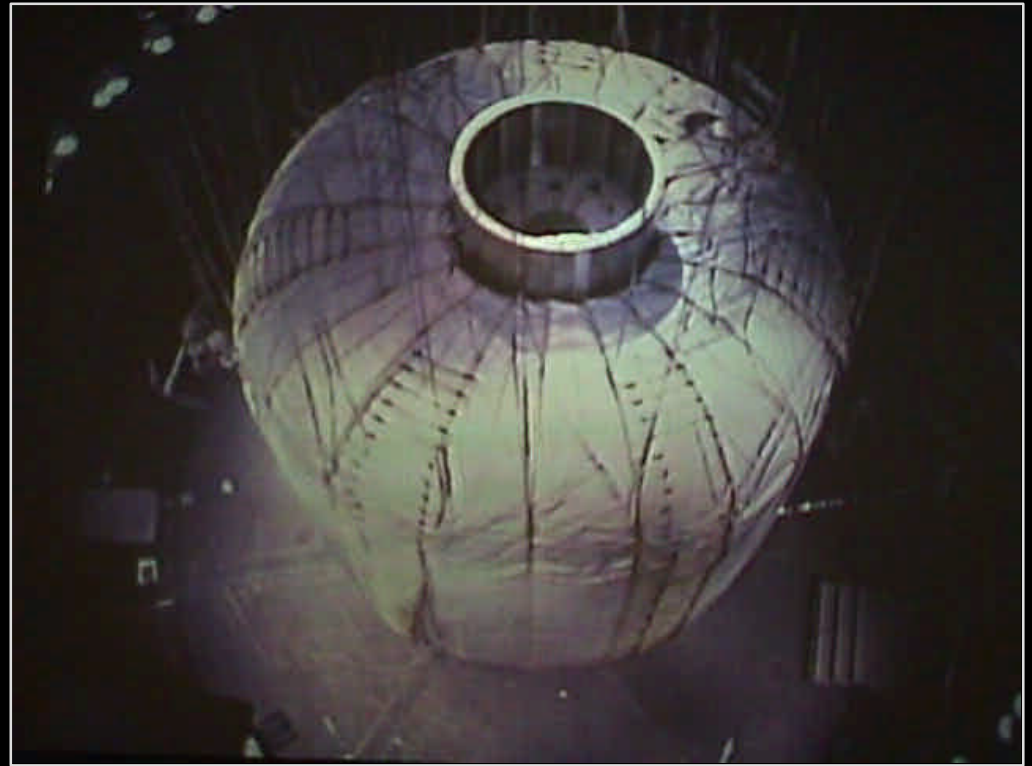


TransHAB Folded



TransHAB Inflated

TransHab Full Scale Shell Development Unit (SDU-3)



Vacuum Deployment Test: December 21, 1998