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

- External Thermal Blanket
- Internal Scuff Barrier
- Windows: 2 Places
- Kevlar Restraint Layer
- Redundant Bladders
- MOD Shielding
Subsystems Packaged in Core

- Avionics Packages
- Life Support Systems
- Area for Packaged Consumables and Outfitting Systems
- Longerons
- Core Panel Shelves
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 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

Nadir

Zenith

MECHANICAL ROOM

CQ #1

CQ #2

CQ #3

CQ #4

CQ #5

CQ #6

Passage to Galley

Open to Ward-Room Below

Open to Ward-Room Below

Open to Ward-Room Below

Open to Ward-Room Below

Open to Ward-Room Below

42"

Door

Door

Door

Door

Air Duct

Water Tank

Floor strut

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

Nadir

Zenith
Level 3

- Leave floor open for return air to mechanical room
- Integrated floor strut into fabric flooring
- Movable Partition
- ISS Rack
- Full Body Cleanser
- Private Medical Area
- Movable Partition
- Movable Partition
- Movable Partition
- ISS Rack
- ChECS #1
- ISS Rack
- ChECS #2
- TREADMILL
- ERGOMETER
- EXERCISE AREA
- Passage to Crew Quarters
- Zenith
- Nadir
- Aft
- Forward

LEVEL 3

Window
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

Crew Personal Unit:
Entertainment and Work Substation Unit:
Light weight frame and fabric that packages into a box

4" (10 cm) I-beam longerons
Shear panel with water tank
Sleeping Restraint
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
- Tunnel Airlock

Short Development Unit

- Restraint 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

- MMOD
- Tunnel Fairing
- Core Structure
- Restraint Layer
- Core Fairing
- Support Stands
- Triple Redundant Bladder
- Tunnel Fairing and Support Spacer
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