Node 3 Description

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The Node 3 is intended to be a building block to connect other ISS elements. It provides a pressurized passageway between berthed habitable volumes, and accommodates the items necessary for the distribution of commands and data, audio, video, electrical power, atmosphere, water and thermal energy to adjacent elements. In addition dedicated utilities are foreseen to interface six (6) special racks supporting crew habitability functions at Station level. They are:

- Atmosphere Revitalization System (ARS) - ECLSS
- Oxygen Generation System (OGS) - ECLSS
- Water Recovery System (WRS #1 and #2) – ECLSS
- Waste & Hygiene Compartment (W&HC #1 and #2) – Flight Crew System

The Node 3 architecture includes 6 ports - four radial and two axial. The four radial ports and the nadir axial port are provided with Active Common Berthing Mechanisms (ACBM), whereas the zenith port presents a Passive Common Berthing Mechanism (PCBM).

The core of the primary structure is a shell made of 2 cylindrical sections, zenith and nadir cones, reinforcement rings and bulkheads. Internal and external secondary structures are utilized to support the installation of equipment, piping and harness.

The atmosphere of the internal pressurized volume is controlled in terms of air pressure, temperature, humidity, velocity, particulate and microbial concentrations. Intra-module air circulation is based on an air loop composed by fan, condensing heat exchanger, water separator, filters, ducts, diffusers and grids. Inter-module ventilation with attached elements is obtained through dedicated ducting, valves and fans. Distribution of fuel cells water between PMA3 and Node 1 and waste water between Node 1, N3 racks and the other modules is performed via dedicated piping. Additional lines are implemented to support distribution of potable water and process water. Pre-treated urine is transferred from W&HC to WRS#2 rack. Special lines and sectioning devices are adopted to distribute Oxygen and Nitrogen.

Node 3 Description

Fire detection is supported by two cabin smoke sensors and monitoring of the electrical equipment. Other smoke sensors are utilized within the ECLSS/FCS racks. Fire suppression within predefined internal enclosures relies on the use of a portable fire extinguisher.

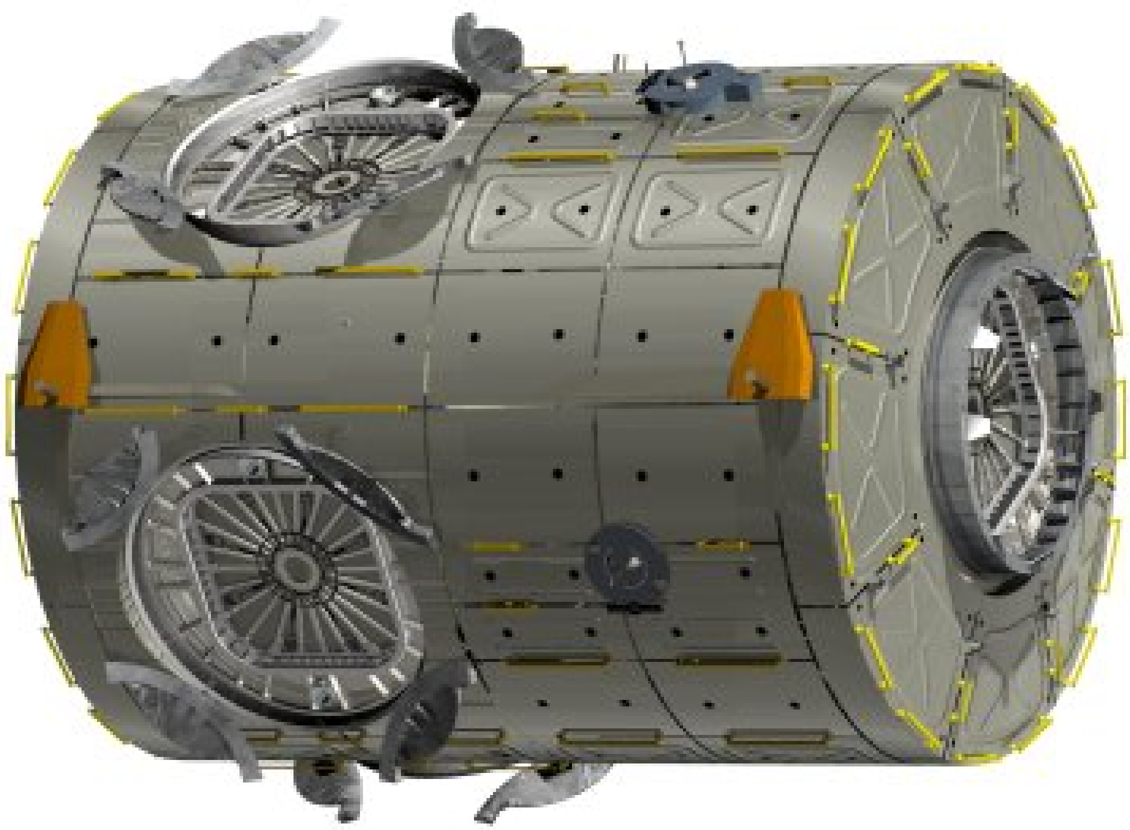
A set of avionics provides the conversion and distribution of the electrical power (converters and remote controllers) from S0 umbilicals to the internal users and the attached modules. These electronic units, together with those related to command & data handling (multiplexers/demultiplexers) and to audio & video functions, are installed within two equipment racks. A limited number of electronic units (ATUs and VTRs) are accommodated outside these racks, on secondary structures. Power harness and data harness (1553 busses, MRDL) are routed from the bulkheads and gore panels connectors to the equipment. Fiber optics are widely adopted for the Node wiring. Command and control functions, as well as fault detection isolation and recovery algorithms, are supported by processing capabilities implemented in Node 3 MDMs: two Computer Software Configuration Items run on two Standard MDMs (tier III MDMs in the ISS Command and Data Handling Architecture Hierarchy) and one CSCI runs on two cold redundant Enhanced MDMs (tier II).

Two water loops (respectively Low Temperature and Moderate Temperature Loop) endowed with pump assemblies and flow control system, refrigerate the avionics by means of dedicated cold plates. They receive heat loads also from the air loop (crew metabolism, fan, environment), from the water loops of interfacing elements (Node1, MPLM, HAB) and from the ECLSS/FCS racks.

Connections are adopted at the Zenith and Forward bulkheads to provide relatively high temperature water (and hence thermal energy) for the control of Cupolas (to prevent internal condensation in those volumes). All thermal power internally released or conveyed to the Node is transferred to the ISS ammonia busses by means of two heat exchangers mounted on the external side of the Zenith cone.

Multilayer insulation blankets and heaters are utilized to prevent effects of internal condensation or risk of water freezing on the external lines. To reduce the probability of shell penetration, a meteoroids and debris shielding system is adopted, mainly based on a set of panels with single or double bumpers.

Node 3

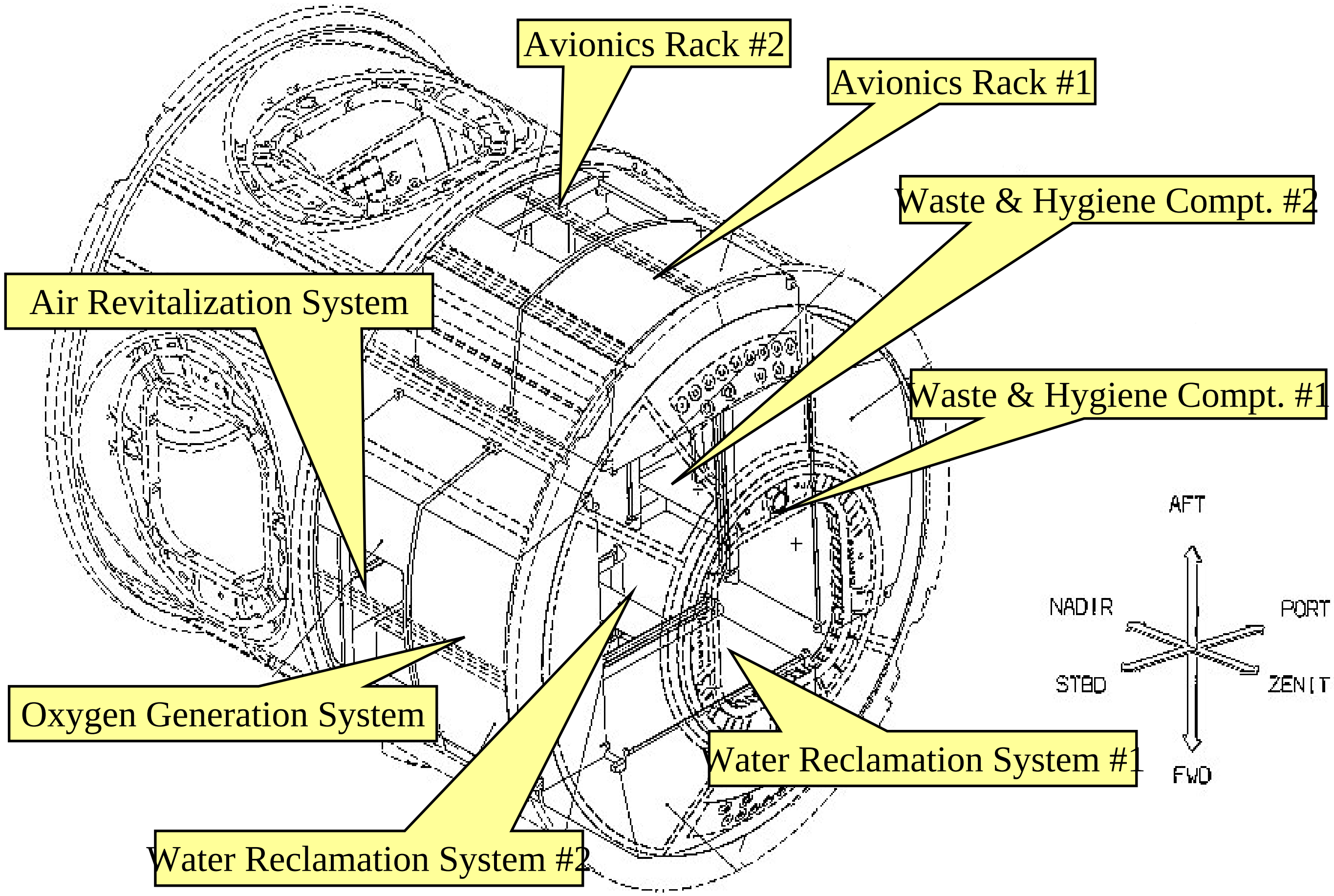


Node 3

- The Node 3 is 278 inches long, 174 inches in diameter, weighs 31550 pounds at launch and 41000 pounds fully outfitted. When docked to the Node 1 Nadir port, the Node 3 will provide resources to attached elements, according to the following table.
- Port LocationAttached ElementZenithNode 1PortHabStarboardCRVForwardCupola (MPLM Back-up) Aft Cupola parking
- Schedule Milestones:
  - Node 3 delivery to KSC: December 2006
  - Node 3 launch: October 2008

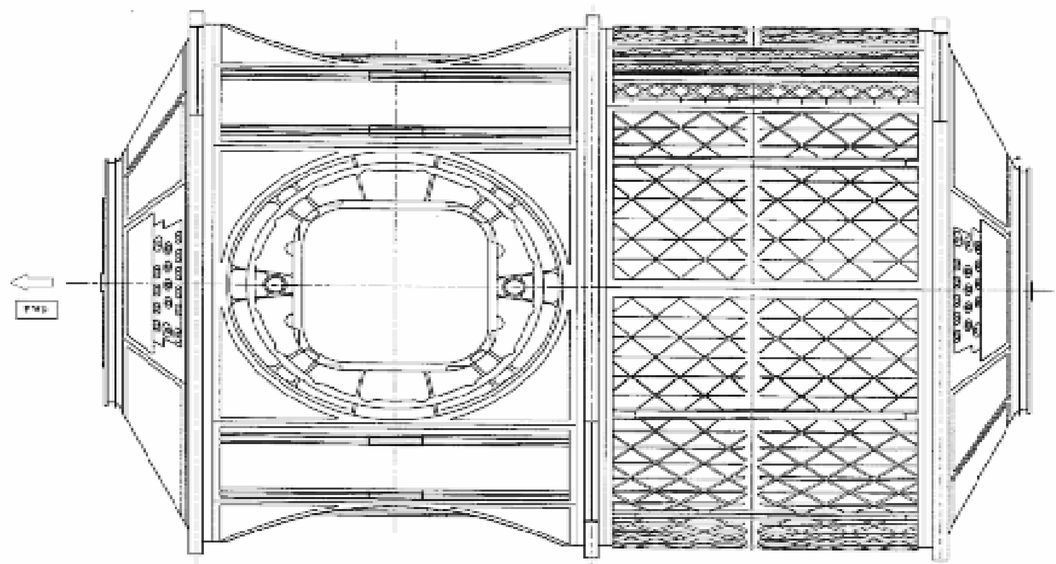
Node 3 Configuration

Topology of Racks



Structures and Mechanisms Subsystem Description

- **Primary/Secondary Structure**
  - -Meteoroid Debris Structure
  - -Standoffs/Alcoves/Midbay
  - -Component Mounts
  - -End Cone Structure
  - -EVA Accomodations
  - -Primary Struct. Identical to Node 2



Tab. 4.19.1-1 - Primary Structure (side view)

- **Mechanisms (GFE)**
  - -CBM's (5 active/1 Passive)
  - -Hatches (6 Axial/Radial)
  - -Grapple Fixtures (1-FRGF)

- **Integrated Racks (Avionics/ECLSS/FCS)**

Node 3 Primary Structure