

What is Node 2?

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The European-built Node 2 being lifted from its work stand in the Space Station Processing Facility at the Kennedy Space Center in the United States. The module was being transferred in order to undergo an element leak test. This image shows a clear view of the aft docking mechanism where Node 2 will ultimately be attached to the ISS at the US Destiny laboratory. (Image: NASA)

The European-built Node 2 is one of the three International Space Station Nodes. The Nodes are the interconnecting elements between the various pressurised modules on the ISS. They provide a shirtsleeve environment to allow the passage of astronauts and equipment through to other Station elements and provide vital functions and resources for the astronauts and equipment, both inside Node 2 itself and inside the laboratories and modules attached to it. The on-orbit resources that Node 2 will provide include the distribution of electrical power and thermal and environmental control. Node 2 also provides a working base point for the Space Station's robotic arm.

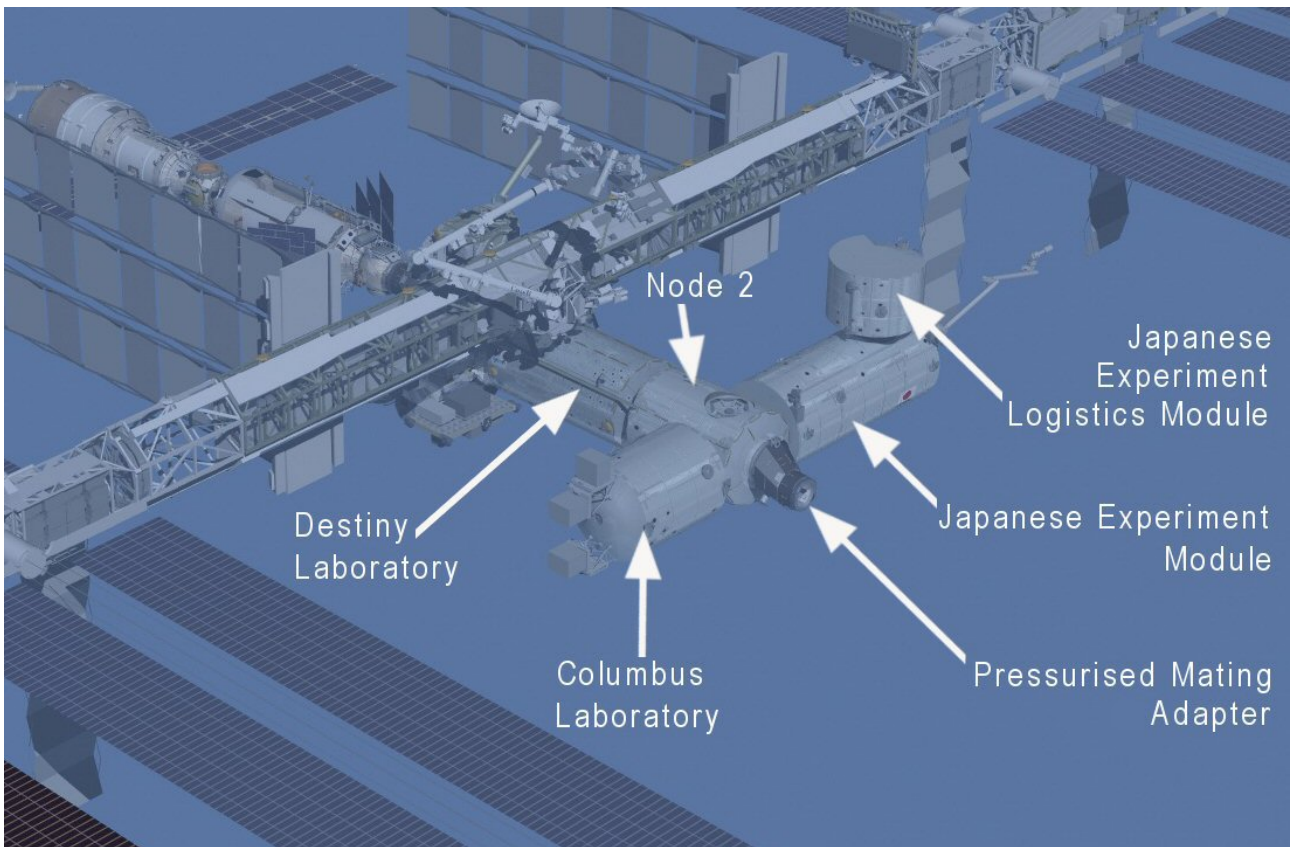
Node 2 consists of a pressurised cylindrical hull 4.6 metres in diameter with a shallow conical section enclosing each end. It is just over 7 metres long and weighs around 14 tonnes at launch. The pressurised shell of Node 2 is constructed from aluminium alloys. This is covered with a multi-layer

insulation blanket for thermal stability and a further 98 sections of panelling to act as a protective shield against bombardment from space debris. This panelling is also constructed of an aluminium alloy together with a layer of Kevlar and Nextel. Heat exchangers between the external panels and the pressurised shell of Node 2 help to disperse excess heat from its internal equipment and attached modules.

Node 2 can be considered in two halves. One half, with a single docking port where Node 2 docks with the ISS accommodates eight standard-sized racks, four of which will house relevant systems, the other four of which can be used for either stowage or crew quarters.

The other half consists of an additional five docking ports one located on the other end section or cone and four arranged around the circumference of the cylindrical main body of Node 2. The docking

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Artist's impression of Node 2 attached to the ISS with additional modules and elements attached. This includes the European Columbus laboratory, which is due for launch in December 2007. (Image: NASA)

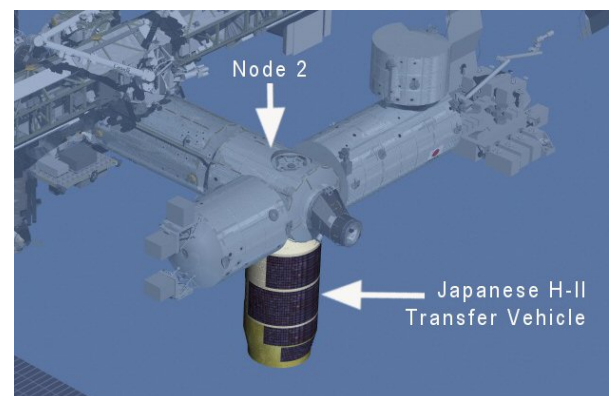
mechanism on the end section will have a pressurised mating adaptor attached to it to act as the principal docking port for the Space Shuttle.



European Columbus laboratory being lowered onto a work stand at the Kennedy Space Center. Columbus is due for launch and attachment to Node 2 in December 2007. (Image: NASA)

On the cylindrical main section of Node 2, two of the docking ports will be used to accommodate the attachment of two permanent laboratories: the European Columbus laboratory, which is due for launch in December 2007 on the STS-122

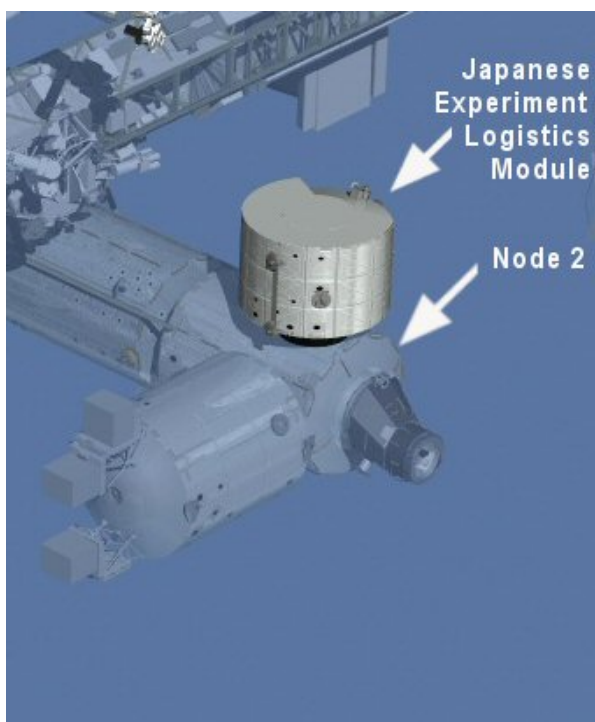
mission with ESA astronauts Hans Schlegel and Léopold Eyharts; and the Japanese Experiment Module 'Kibo' due for launch in April 2008. A third port will accommodate one of either the European-built Multi-Purpose Logistics Modules (MPLMs), logistics modules, which travel in the Shuttle's cargo bay, or the Japanese H-II Transfer Vehicle (HTV) a logistic supply craft similar to the European Automated Transfer Vehicle (ATV).



Artist's impression of Japanese H-II Transfer Vehicle docked to the ISS. This will use the same docking port as the European-built MPLMs used for transfer of pressurised equipment to the ISS. (Image: NASA)

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The fourth docking port on the main body of Node 2 has no permanent assignment though can be used as a backup port since the docking mechanism on a majority of the ports is the same. This port will be used on ISS assembly flight 1J/A (STS-123) in February 2008 for temporarily docking the Japanese Experiment Logistics Module (Pressurised Section) to Node 2. This will be relocated on the Japanese Kibo laboratory when it is docked to Node 2 on ISS flight 1J (STS-124) in April 2008.



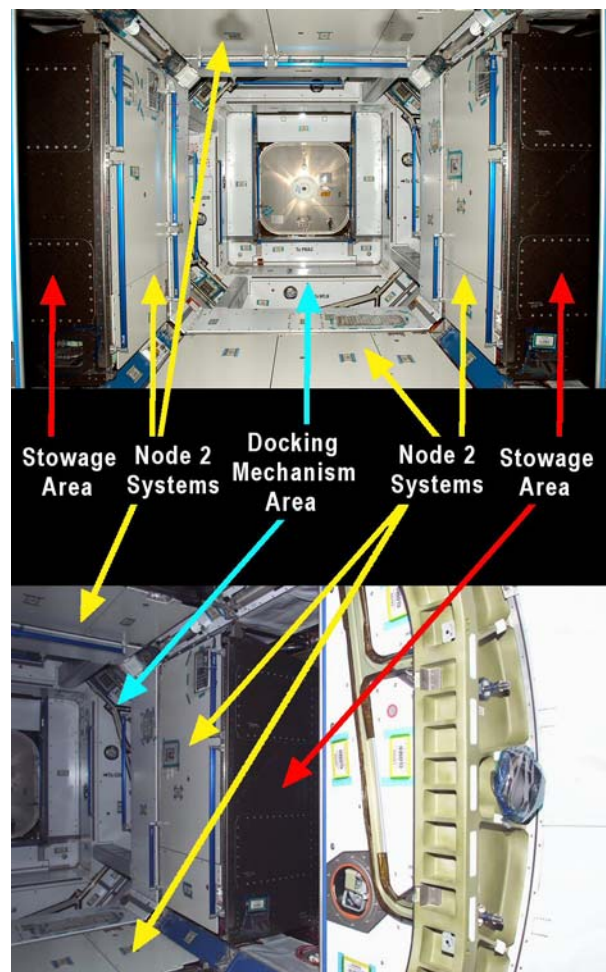
Artist's impression showing the temporary location of the Japanese Experiment Logistics Module on Node 2 prior to the arrival of the Japanese Experiment Module 'Kibo'. (Image: NASA)

Node 2 has systems, which provide many different functions and resources to the attached laboratories and modules, and to itself, for maintaining a safe and ideal working and living environment onboard the ISS. These systems manage:

- Distribution and control of electrical power;
- thermal control for removal of excess heat from equipment;
- environmental control (temperature regulation, ventilation and humidity)
- pressure regulation and signalling depressurisation;

- detection and extinguishing of fire;
- sampling of the atmosphere, and treatment of the Station's condensed and recycled water;
- data handling
- audio/video distribution

Node 2 also has support equipment for internal and spacewalk operations.



A look into Node 2 from the docking port where it will attach to the ISS: (Top) looking straight on, (bottom) looking to the right. The yellow arrows point towards the four system racks, the blue arrows towards the area with the five docking ports, with a clear view of the Shuttle docking port, and the red arrows point towards the stowage areas (not all visible). (Image: NASA)

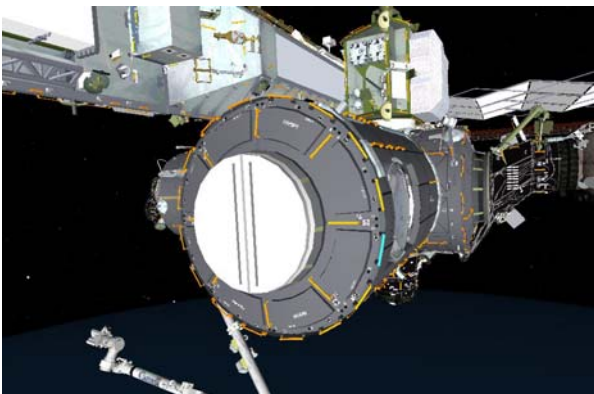
Two of the three ISS Nodes (Node 2 and Node 3) were made under a contract in Europe, while Node 1, which has been in orbit since December 1998 was made under a NASA contract in the USA (See Organisations and Industry).

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Node 1 (top) and Zvezda (bottom) the first two ISS modules. Photographed from Shuttle Endeavour after undocking of the STS-88 mission, which brought Node 1 into orbit. Photo taken on 13 December 1998. (Image: NASA)

Nodes 2 and 3 are an evolution of Node 1. ASI and prime contractor Thales Alenia Space put forward a design for Nodes 2 and 3, deriving from the experience with the MPLMs, that took into account new habitability requirements, making possible permanent crew quarters for four astronauts with the capability to treat and recycle water, cater for personal hygiene and waste, jettison carbon dioxide and generate oxygen.



Artist's impression of Node 2 located temporarily on the port side docking mechanism of Node 1. (image: NASA)

Node 2 will be launched to the ISS in the cargo bay of the Space Shuttle. It will be temporarily docked to Node 1's port side as the Shuttle will be docked to the forward port of the Destiny laboratory, the final location of Node 2. After the Shuttle undocks the mating adaptor on Destiny can be relocated to the forward port of Node 2 and Node 2 can then be relocated to the forward port of the Destiny laboratory.



Multi-Purpose Logistics Module Leonardo in the Space Shuttle cargo bay on 10 March 2001 during the STS-102 mission to the ISS. Node 2 shares its basic structure with the Multi-Purpose Logistics Modules and will travel to the ISS in a similar fashion. (Image: NASA)