

Mission Overview

Mission Summary

October 2007 will be an important landmark in European space history. European Space Agency (ESA) astronaut Paolo Nespoli from Italy is scheduled to be launched to the ISS on 23 October 2007 on the European Esperia mission aboard STS-120 Space Shuttle Discovery, which will be transporting Node 2 as the first European-built module to become permanently attached to the International Space Station (ISS). The Esperia mission will be undertaken as an Italian Space Agency (ASI) flight opportunity, stemming from their agreement with NASA for the provision of 3 MPLMs. The cooperation with ESA led to the assignment of Paolo Nespoli to this flight opportunity and an additional agreement between ESA and ASI was signed to this effect.



ESA astronaut Paolo Nespoli prior to the start of a post insertion/de-orbit training session at the Johnson Space Center on 7 February 2007 (Image: NASA)

A majority of Nespoli's tasks on the Esperia mission will be tasks as part of the ISS 10A assembly mission. Nespoli will play a key role as the intravehicular activity or IVA astronaut for four of the five spacewalks including the installation of Node 2. The IVA astronaut is the key astronaut inside the ISS during spacewalks, in direct contact

with the spacewalking astronauts, coordinating their activities, as well as being involved in the preparations for the spacewalks including configuring and testing EVA spacesuits and tools, helping spacewalking astronauts with suiting up, and airlock depressurisation and repressurisation. The 14-day mission will also be used to relocate the ISS P6 truss section and deploy its solar arrays and heat dispersal radiator; to deploy the heat dispersal radiators on the S1 truss; to bring important supplies to the ISS; rotate one of the ISS Expedition crewmembers, and test a new method of repairing damage to the Shuttle's thermal protection system. As part of the Esperia mission Nespoli will also be undertaking some important experiments for the European scientific community as well as a number of educational activities.

Node 2 Installation

Nodes are interconnecting elements between the various pressurised modules on the International Space Station, allowing the passage of astronauts and equipment and providing important resources to the other modules attached such as distribution of electrical power and thermal and environmental



Node 2 moving towards a payload canister in the Space Station Processing Facility in February 2005 (Image: NASA)

Mission Overview

control. Node 2 or 'Harmony' as it has now been named was developed for NASA under an ASI contract with European industry, with Thales Alenia Space as the prime contractor. Responsibility for Node 2 development was assigned to the Italian Space Agency, ASI. The structural design is based on that of the European-built Multi-Purpose Logistics Modules (MPLMs) and the European Columbus laboratory.

The launch of Node 2 heralds the cornerstone of European involvement in the ISS with the launch of the Columbus laboratory following in December. Node 2 will be attached to the American laboratory 'Destiny'. It will also act as the attachment point of Columbus and the Japanese 'Kibo' laboratory. MPLMs will be attached to Node 2, and the Shuttle and the Japanese HTV will also be able to dock to Node 2.

P6 Truss Relocation

The ISS truss, which is made up of 11 sections in its complete configuration is used primarily to support the ISS solar arrays for power generation. The P6 truss (and solar arrays) was the first truss section launched to the Station for generation of electricity in the Station's early configuration. This truss section will be moved from its current (temporary) location to the end of the main truss



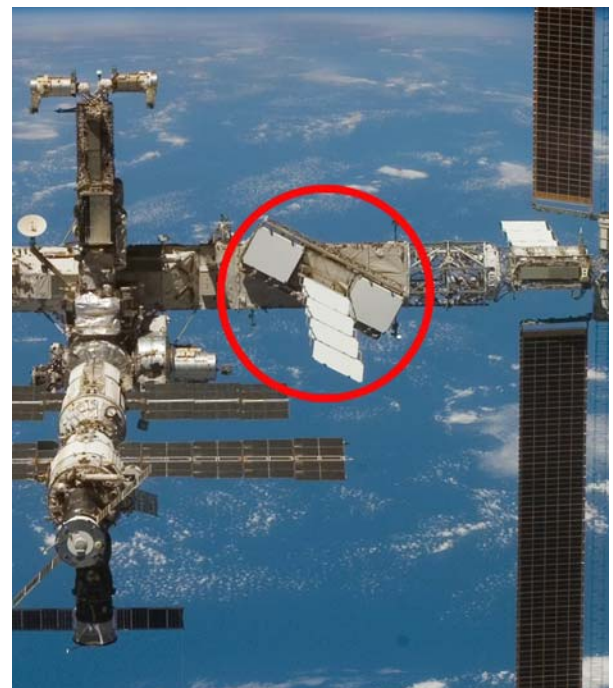
ISS pictured after undocking of STS-121 Shuttle Discovery on 15 July 2006. The P6 solar arrays (top of ISS) are shown fully extended. The P6 truss and solar arrays will be relocated during the Esperia mission. (Image: NASA)

on the left-hand or port side, being attached to the P5 truss section, which was attached to the ISS on the STS-116 mission in December during an EVA involving ESA astronaut Christer Fuglesang. Solar arrays on the main truss can rotate in more directions. Moving P6 onto the main truss will

have the effect of providing a more stable and improved weightless environment on the ISS, which is helpful for experimentation purposes.

S1 radiator deployment

With the capacity and power demands of the ISS set to increase over the next few months with the arrival of Node 2, the Columbus laboratory and the Japanese Kibo laboratory, the requirements for removing excess heat from systems and equipment on the ISS has also increased.



Close up of ISS on 19 June 2007 during the STS-117 mission. The central heat dispersal radiator on the back of the S1 truss is shown extended (circled). The two radiators on either side will also be extended during the Esperia mission. P6 is also shown with solar arrays retracted (top left) (Image: NASA)

Heat dispersal radiators will be deployed on the back of the S1 truss section. Currently only the central one of the three radiators is deployed. Similar radiators on the P1 (left-hand or port side) truss will be deployed after the Shuttle has undocked. Preparations for deployment of the radiators on the back of the P1 truss will also take place during the mission.

Thermal Protection Repair Test

On Flight Day 10 a spacewalk will take place to test out a new method of repairing damage to the Shuttle's thermal protection system whilst on orbit. The spacewalking astronauts will test a new tile filling material and a new dispenser of this filling material.

Mission Overview

Undertake a European experiment programme:

During his mission, Paolo Nespoli will be undertaking a number of European experiments for the European scientific community in the area of human physiology and biology. Some experiments will be carried out on behalf of the European Space Agency and some will be sponsored by the Italian Space Agency, ASI. Nespoli will also carry out a number of educational activities during the mission.



ESA astronaut Thomas Reiter pictured during experiment procedures in October 2006 on the ISS as part of the European long-term Astrolab mission (Image: NASA)

Exchange one member of the ISS permanent crew: NASA astronaut Dan Tani will fly to the ISS on the Discovery STS-120 flight. He will remain on the ISS becoming an Expedition 16 Flight Engineer. He will replace Expedition 15/16 Flight Engineer Clayton Anderson who arrived at the ISS on 10 June 2007 on board the STS-117 Shuttle Atlantis. Anderson will come back with the STS-120 crew on the return flight.



NASA astronauts Dan Tani (left) and Clayton Anderson during a press conference in December 2006 (Image: NASA)

Delivery of Supplies/Equipment

As well as bringing some standard logistics supplies for the Shuttle and ISS Expedition Crews, the mission will also bring equipment to the ISS, which will be used, for example, to outfit Node 2 (inside and outside) as well as additional equipment that will be installed during spacewalks.



A view inside the European-built Node 2 (Image: NASA)

The Crew

Including the Expedition crewmember Dan Tani, ESA astronaut and Mission Specialist Paolo Nespoli from Italy forms part of a seven-member Shuttle crew along with NASA astronauts Pamela Melroy (Shuttle commander), George Zamka (pilot) and mission specialists Scott Parazynski, Douglas Wheelock, and Stephanie Wilson.



ESA astronaut Paolo Nespoli (far right) together with the other members of the STS-120 flight to the ISS: (from left) NASA astronauts Scott Parazynski, Douglas Wheelock, Stephanie Wilson, George Zamka (pilot), Pamela Melroy (commander) and Dan Tani. (Image: NASA)

Mission Overview

Key Mission Data

SHUTTLE CREW:

Shuttle Commander:	Pamela Melroy (NASA)
Shuttle Pilot:	George Zamka (NASA)
Mission Specialist:	Paolo Nespoli (ESA)
Mission Specialist:	Scott Parazynski (NASA)
Mission Specialist:	Douglas Wheelock (NASA)
Mission Specialist:	Stephanie Wilson (NASA)
ISS Flight Engineer (Ascent)	Dan Tani (NASA)
ISS Flight Engineer (Descent)	Clayton Anderson (NASA)

SPACECRAFT:

Shuttle Orbiter:	Discovery
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MISSION:

European Mission Name:	Esperia
Shuttle Mission Designation:	STS-120
ISS Assembly Flight Designation:	10A
Primary Payload	Node 2

LAUNCH and LANDING SITES:

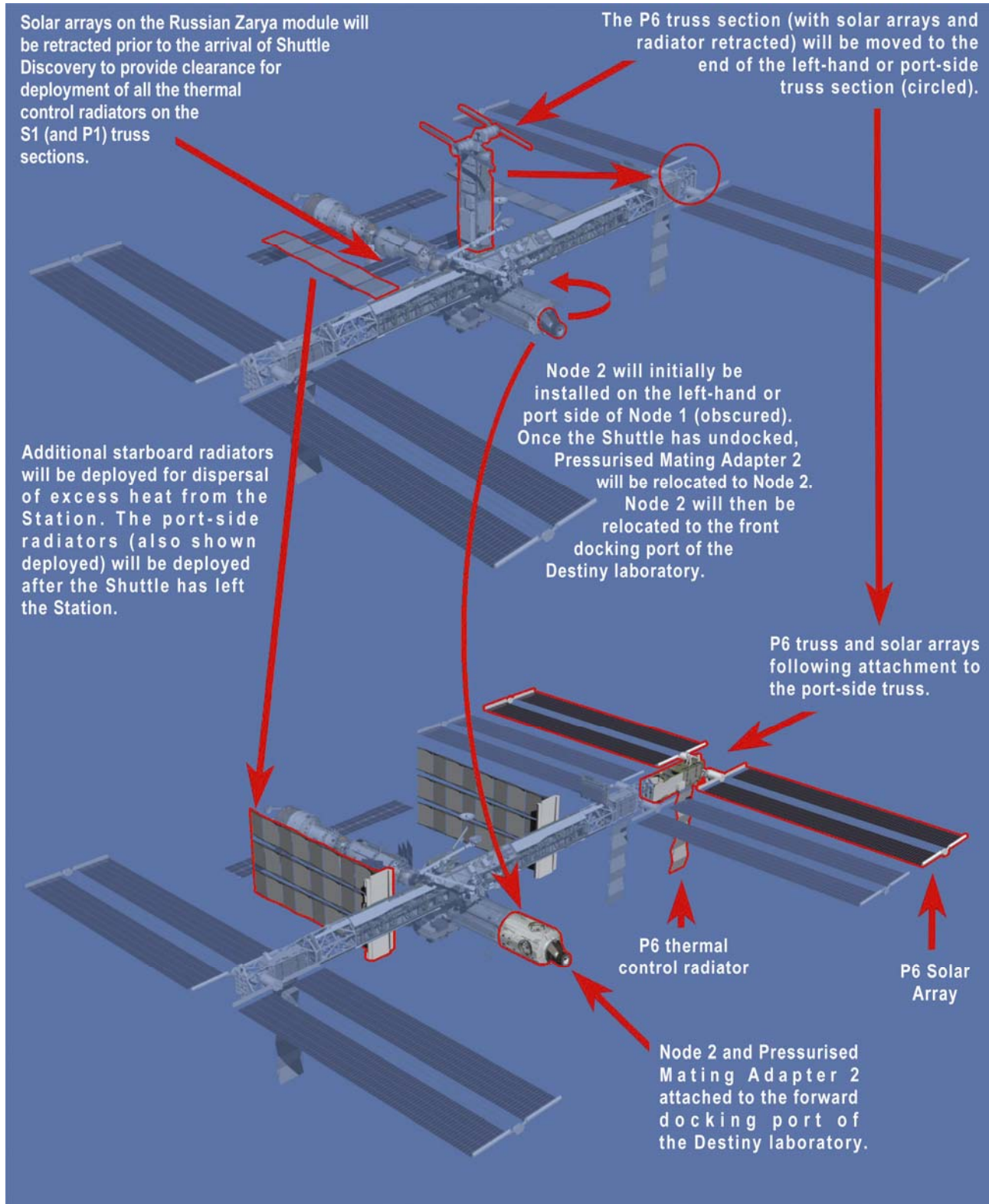
Launch Site:	Launch Pad 39A, Kennedy Space Center Florida, USA.
Primary Landing Site:	Kennedy Space Center, Florida, USA
Secondary Landing Sites:	Edwards Air Force Base, California, USA White Sands Space Harbor, New Mexico, USA

MISSION PARAMETERS:

Scheduled Launch Date:	23 October 2007
Launch Window:	10 minutes
Altitude (In orbit):	226 kilometres
ISS Altitude:	~400 kilometres
Inclination:	51.6°
Mission Duration:	14 days (Flight Day 1 and Flight Day 15 are partial days)

Mission Overview

Changes to ISS Configuration



Artist's impression of changes to ISS configuration during (and directly after) Esperia mission. (Top) ISS following STS-118/ISS assembly mission 13A.1. (Bottom) ISS following STS-120/ISS assembly mission 10A and including relocation of Node 2 and deployment of port-side radiators, which occurs following undocking of the Shuttle (Image: NASA)

Mission Overview

Mission Name and Logo



Esperia mission logo

The European mission has been dubbed *Esperia* from the Ancient Greek name for the Italian peninsula. The chosen name reflects how Nespoli's Shuttle mission to the International Space Station is a showcase of Italian technology with the delivery of the Italian-built Node 2, and suggests Italy's long-term commitment to space exploration.

It also reflects how this flight opportunity stems from a visionary involvement of ASI and Italian industry in providing and developing three pressurised cargo containers for NASA (the Multi-Purpose Logistic Modules or MPLMs) under a bi-lateral agreement within which this flight opportunity falls.

The creation of the mission logo was entrusted to world famous designer Giorgetto Giugiaro and

Italdesign SpA under a sponsorship agreement with the Italian Space Agency (ASI). The logo depicts how the *Esperia* mission is key in the completion of the ISS, which is shown at the top of the image. The logo also depicts this mission as a stepping stone to further exploration with the moon (in white) and Mars (in red) depicted close to the ISS.

The key role of Italy and ASI in Europe and in the international arena, not only for this mission but for future exploration is depicted by the presence of the red, white and green Italian flag colours to the bottom right of the logo and the fact that the colour composite of the yellow flight path to the ISS combined with the blue-coloured Earth also provides green, which together with the colours of the Moon and Mars also provide the colours of the Italian flag.

Mission Overview

Shuttle Mission Patch



Shuttle Mission Patch (Image: NASA)

The STS-120 patch reflects the role of the mission in the future of the space programme. Node 2, the doorway to the future international laboratory elements, is shown in the shuttle payload bay.

On the left of the shuttle the star represents the International Space Station with the red-coloured points representing the current location of the P6 truss with the solar arrays folded away and awaiting relocation when the crew arrives. During

the mission, the crew will move P6 to its final home at the end of the port-side truss. The gold points represent the P6 truss in its new location, unfolded and producing power for science and life support.

On the right, the moon and Mars, with the constellation Orion rising in the background symbolises the vision of the future with the emphasis on exploration.