



Pressurized Mating Adapter 3 Payload Bay

Overview

Pressurized Mating Adaptor (PMA) 3 will provide a place for an orbiter to dock with the U.S. segment of the International Space Station (ISS). PMA-3 includes mechanical interfaces, spacewalk hardware and thermal control equipment, electrical power subsystem (EPS) and command and data handling (C&DH) passthroughs. PMA-3 will not be used for docking until Mission 4A.

Command and Data Handling

PMA-3 provides a hard-line 1553 data bus connection between the orbiter and Unity via X-connectors on the PMA-3 androgynous peripheral attachment system (APAS), which interfaces with the orbiter docking system (ODS). Umbilical connections between Unity and PMA-3 complete this hard-line path. This path allows the orbiter interface units (OIUs) and orbiter portable computer system machines to talk on the ISS orbiter buses.

Extravehicular Activity (EVA) Support

The PMA-3 segment is equipped with the following spacewalk aids: A portable foot restraint (PFR) top-mounted worksite interface (WIF) fixture, two flight-releasable grapple fixtures (FRGFs), camera and laser targets, a number of Space Vision System (SVS) targets, handholds, and handrails.

The PFR WIF fixtures are used to attach the PFR workstation stanchions.

The FRGF provides the standard mechanical interface between the shuttle's robotic arm or remote manipulator system (SRMS) and payloads. It is compatible with all large ISS manipulator systems. The FRGF can be released during an EVA by rotating two release rods that allow the fixture's grapple shaft to be removed. A spare shaft can be installed on orbit, enabling the interface to be restored to a capture configuration for retrieving payloads.

Camera and laser targets consist of a camera target on the APAS hatch, a hemispherical laser target on PMA-3, and planar laser reflectors on the side of the APAS.

Handholds and handrails help EVA crew members move about. They have been placed in preplanned paths in and around worksites.

Motion Control System

PMA-3 has two sets of four red light-emitting diodes (LEDs) that tell the orbiter crew with the status of the ISS attitude control system. The crew can see the LEDs through the overhead window on the aft flight deck. Each set of four LEDs is controlled by a separate Node 1 MDM for one-fault tolerance during arrival or departure. Free drift is indicated when the two sets of LEDs alternately flash on and off at a 5-hertz rate. Every other state of the MCS is indicated by a steady on.

Structures and Mechanisms

The PMA-3 is a truncated conical shell with a 24-inch axial offset in the diameters between the end rings. It is a ring-stiffened shell structure machined from 2219 aluminum alloy roll ring forgings welded together. PMA-3 mechanical interfaces include a passive common berthing mechanism and a Russian APAS.

Thermal Control System

PMA-3 has ten 60-watt passive thermal control system heaters, temperature instrumentation, and multilayer insulation (MLI).

The PMA-3 shell's temperature is maintained above the minimum level by electrical resistance heater circuits, which are controlled by RPCM N1-RS2-B. Each heater has a resistive thermal device, which provides temperature data to the Node 1 MDMs. The ground or crew can control the shell heater states by altering the setpoints of the heaters.

Radiative heat loss and excessive radiative heating from the space environment are minimized by MLI blankets between a micrometeorite/orbital debris shield and the PMA's primary structure.

[Section Index](#) | [Main Index](#) | [Search](#) | [Contacts](#)

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