

An Overview of ISS Payloads

(6-3-02)

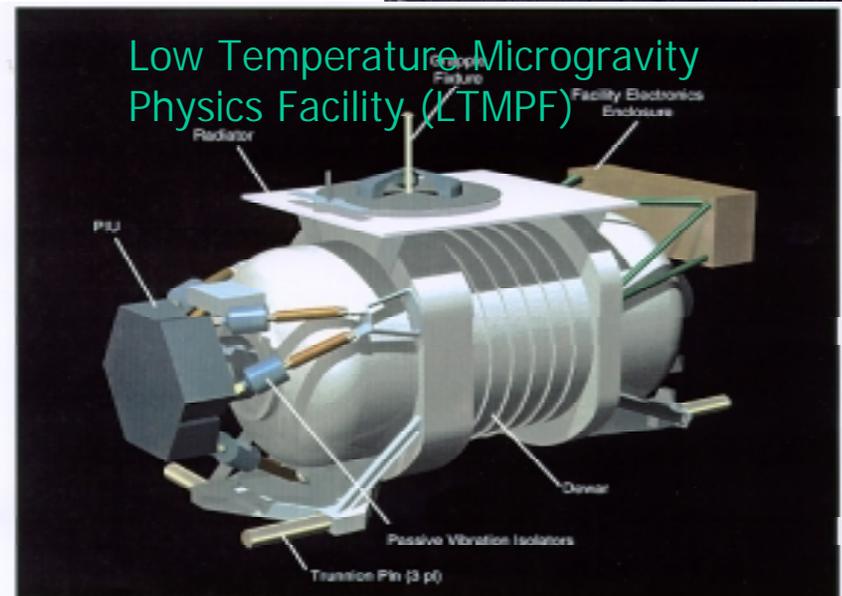
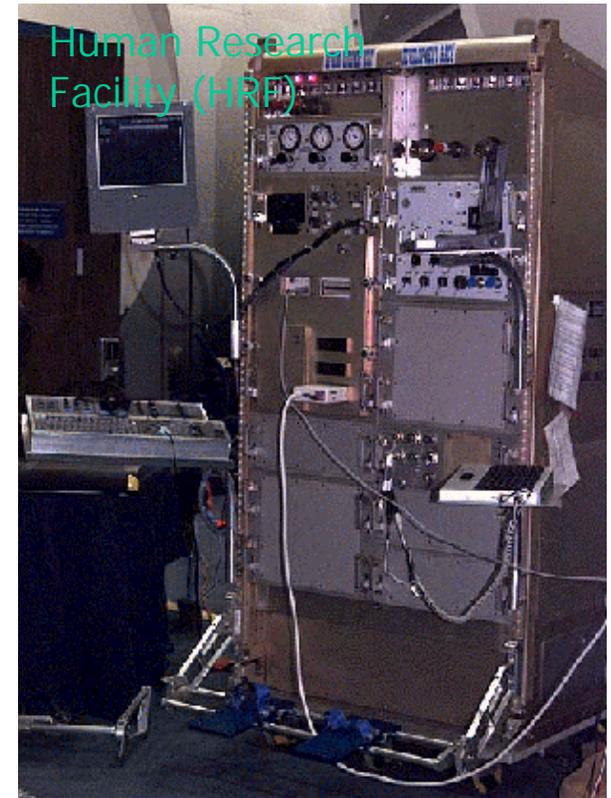


ISS Research Capability

- US Lab
 - 13 Rack Locations
- Japanese Experiment Module (JEM)
 - 10 Rack Locations
- JEM Exposed Facility
 - 10 Payloads
- Columbus Orbital Facility (COF)
 - 10 Rack Locations
- COF Exposed Facility
 - 4 Payloads
- Centrifuge Accommodation Module
 - Centrifuge
 - Life Science Glovebox
 - Habitat Holding Racks
- Russian Segment
 - 2 Research Modules
- Truss
 - 4 Attach Sites

What is an ISS Payload?

- The reason for the ISS!
 - Discipline Science Research, Technology Development, Commercial Programs.
 - Types of Payloads:
 - Located in racks:
 - Facility Class Payloads
 - EXPRESS Rack Payloads
 - Located on the attached payload truss site:
 - EXPRESS Pallet Payloads
 - Large single payloads (such as AMS)
 - Smaller payloads flying on the NASDA Lab Exposed Facility

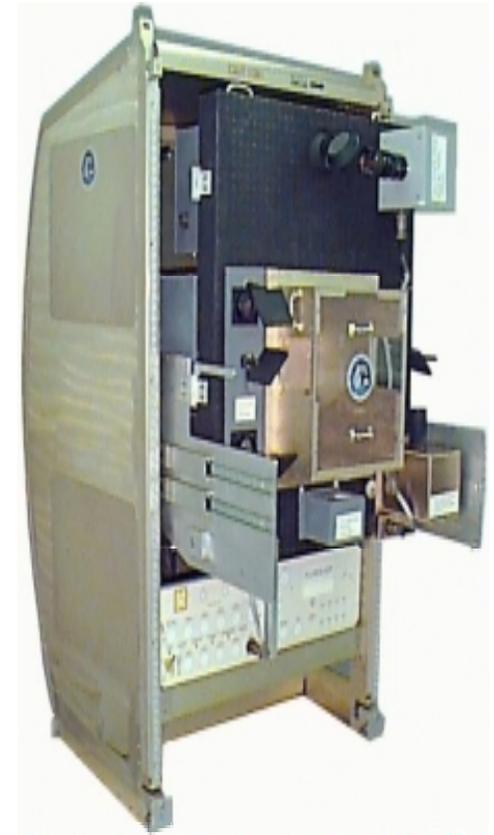


Facility Payloads

- Rack Facilities that will be placed on the ISS permanently in order to provide general capabilities for science research in a particular research discipline.
- The following Facilities are considered part of Core Complete:
 - Human Research Facility (HRF)
 - Delivered to ISS on 5A.1
 - Micro-Gravity Science Glovebox (MSG)
 - Scheduled for UF-2
 - Window Observational Research Facility (WORF)
 - Scheduled for ULF-1
 - Human Research Facility 2 (HRF2)
 - Scheduled for ULF-1
- Additional Facilities are in work beyond Core Complete such as:
 - Combustion Integrated Rack (CIR)
 - Currently planned for ULF-2



Combustion Integrated Rack (CIR) mockup



Fluids Integrated Rack (FIR) mockup

FCF is a three-rack facility which consists of a Combustion Integrated Rack, a Fluids Integrated Rack, and a Shared Accommodations Rack (not shown above).

EXPRESS Rack

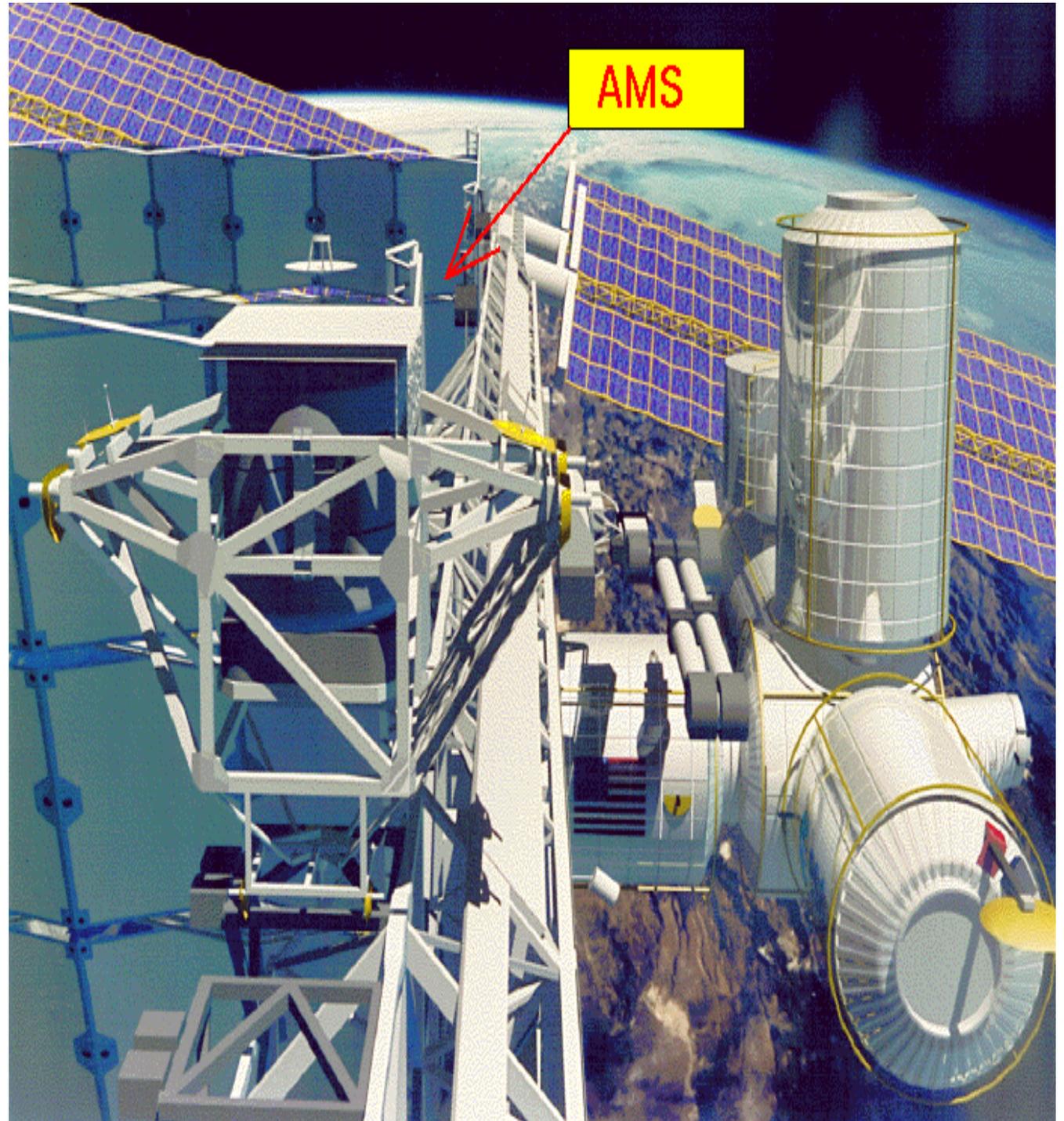
- EXPRESS stands for “EXpedite the PROcessing of Experiments to the Space Station”.
- The purpose of the EXPRESS Rack is to provide a rack structure and subsystems for smaller, less complex “sub-rack” payloads to interface with the ISS, allowing for quicker sub-rack integration, test, and deintegration.
- Flight EXPRESS Racks will be flown up to the ISS and remain there.
- EXPRESS Sub-rack payloads which require continuous power will fly in the middeck and be installed in the rack on-orbit.
- EXPRESS Sub-rack payloads can be easily changed out on-orbit.
- After all EXPRESS Racks are on orbit, sub-rack payloads will be tested on the ground against a rack simulator.



- First prototype EXPRESS Rack flew on a Spacelab mission, MSL-1/1R.
- EXPRESS Racks 1&2 were delivered to ISS on 6A.
- EXPRESS Racks 4&5 were delivered to ISS on 7A.1.
- EXPRESS Rack 3 is scheduled for delivery on UF-2
- EXPRESS Racks 6 through 8 are in work for post-Core Complete

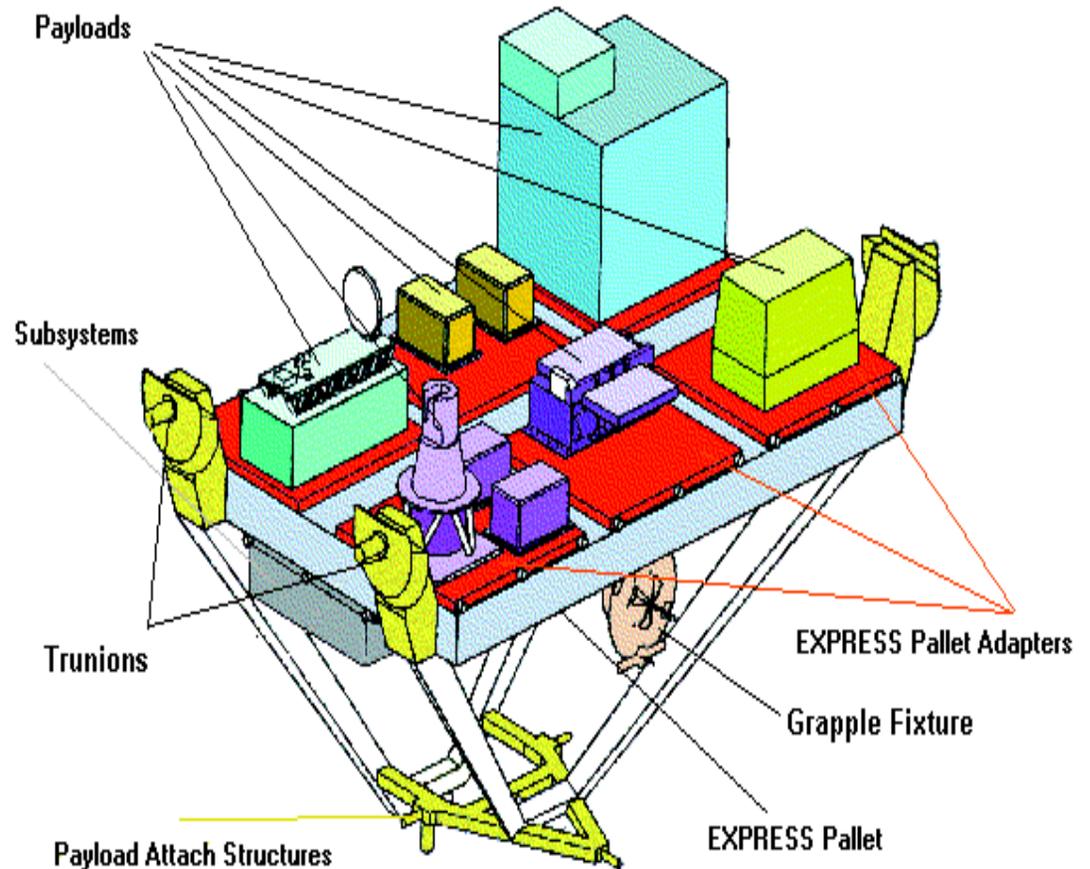
Attached Payloads on ISS Truss

- As in the Shuttle Program, there will be a number of scientific experiments that will require exposure to the space environment.
- Many of these payloads will be small and be attached to a carrier, such as the EXPRESS Pallet, the NASDA Lab Exposed Facility, or the ESA Lab "Porch".
- Some will be large enough to use a payload attach point on the truss. A prime example is the Alpha Magnetic Spectrometer (AMS).



EXPRESS Pallet

- Like the EXPRESS Rack, the EXPRESS Pallet applies the same concept of providing a common interface for exterior mounted payloads to interface with the ISS.
- Current plans are for the EXPRESS Pallet to be designed and built by the Brazilian Space Agency. Due to financial considerations, the design and implementation is not yet finalized.
- The EXPRESS pallet will fly up in the shuttle payload bay.
- Each EXPRESS payload is mounted on a pallet adapter that allows for easy installation and removal on-orbit.

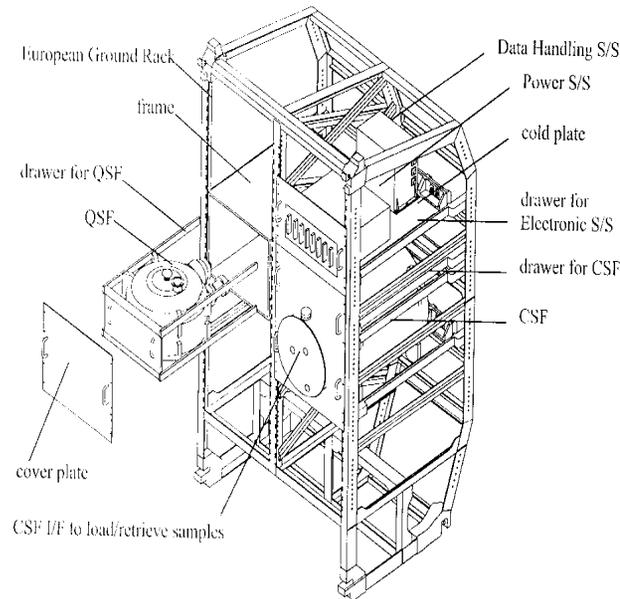
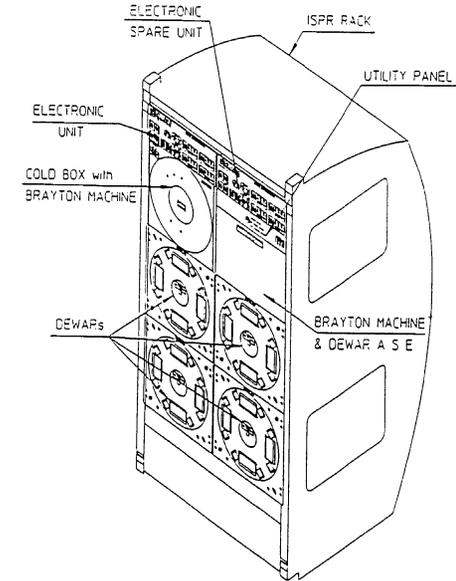


Early design of EXPRESS Pallet shown with payloads.

Freezers

- ISS Payloads Office has authorized development of two freezers to be used on-orbit and launch and return on the Space Shuttle for conditioned cargo samples (e.g. biospecimens):
 - Minus Eighty Degree Freezer for ISS (MELFI)
 - CRYOSYSTEM (183 degree) Freezer
- Both freezers are being developed by the European Space Agency (ESA) for NASA.
- These Freezers will be flown in the MPLM or in a Spacehab.

The MELFI provides four dewars with a total cold-storage capacity of 300 liters. The temperature in each dewar can be independently set from -80 degrees Celsius to +4 degrees Celsius.



The cryosystem will provide ultra-rapid freezing to -180 degrees Celsius, and storage capacity of 35 liters of research specimens at that temperature.

Payload Discipline Areas

- US Payloads flying on the ISS fall into the following disciplines areas as defined by Research Programs at the following Lead Centers:
 - Microgravity Research and Space Product Development (MSFC)
 - Human Space Life Science Program Office (JSC)
 - Fundamental Biology (ARC)
 - Earth and Space Sciences (GSFC)
- International Partners (IP) provide payloads that fly in the US Lab or other modules:
 - e.g. MELFI, Cryosystem, Life Science Glovebox, Microgravity Science Glovebox

•Earth Science

- Atmospheric Observations
- Earth Surface Observations
- Magnetospheric and Ionospheric Physics
- Meteorological Observations

•Engineering & Technology Development

- Advanced Life Support
- Communications
- Instrument Systems
- Materials Exposure
- Power Generation and Storage
- Propulsion
- Robotics and Remote Operations

•Life and Microgravity Science

- Biomedical Science
- Biotechnology
- Fluid Physics
- Combustion Science
- Gravitational Biology
- Materials Science
- Microgravity Physics

•Space Science

- High Energy Astrophysics
- Solar Observations
- Solar System Planetary Studies

•Commercial Applications