Space Station Express Rack Flying On STS-83 Mission Puts Science Customers On Fast Track Into Space

When the space shuttle Columbia blasts off from Kennedy Space Center, Fla., on the STS-83 mission scheduled for April 3, on-board will be an International Space Station rack that promises to allow scientists quicker, easier and more affordable access for getting their experiments into space.

The EXPRESS Rack on-board Columbia is designed to provide multiple smaller payloads with quick, simple integration thanks to standardized hardware interfaces and a streamlined approach. This "plug-in and go" rack, built by Boeing, will allow experiments to easily transfer from the shuttle to the International Space Station.

EXPRESS stands for "EXpedite the PRocessing of Experiments to the Space Station." The EXPRESS Rack will allow researchers to have experiments operating on-board the space station in just 11 months or less after signing a single integration agreement. In the past, researchers have had to wait three years or more to get their experiments into space.

"The EXPRESS Rack provides a set of standard payload interfaces and we are matching that with a quick and simple integration process," said Annette Sledd, NASA EXPRESS project manager. "The goal is to provide the maximum science in the shortest time for minimum cost, and we have done that with the EXPRESS Rack."

The "EXPRESS" science payload system was developed by NASA Marshall Space Flight Center's (MSFC) Payload Projects Office, with the EXPRESS Rack built by Boeing in Huntsville, Ala. It is designed to greatly reduce the time, complexity and expense that is historically associated with orbital research. Experiments may be controlled by the crew on-board from the experiment or the rack laptop computer, or operated via uplink from the ground from the U.S. operations center or a remote customer facility.

"This pathfinder rack was developed in just two years with a small, multi-disciplined team," said Ted Davis, Boeing EXPRESS Rack manager. "One of our biggest challenges was being the first to take a piece of space station-developed hardware off the production line, and integrating it with the Spacelab interfaces and requirements. Our team did a great job meeting that challenge."

The EXPRESS rack on STS-83 mission is located within the Spacelab resting inside the shuttle's cargo bay. Made of graphite composite, its total weight is almost 570 pounds (without payloads). The EXPRESS Rack has eight single middeck lockers and two standard interface rack (SIR) drawers.

Included in the subsystems of the EXPRESS Rack are an avionics air assembly that will cool payloads for the space station. Also included is a system providing power distribution and protection to subsystems and payloads in the rack. Another system provides a communication link between payloads, the Spacelab data system and ground controllers. On the STS-83 mission, this system will simulate the command and control link for the International Space Station.

Two experiments will reside in the EXPRESS rack on the STS-83 mission. One is the Physics of Hard Spheres Experiment (PHaSE), developed by NASA's Lewis Research Center. PHaSE, located in four of the rack's middeck lockers and one standard interface drawer locations, will improve the fundamental understanding of the transition from liquid to solid phases by investigating behavior and physical properties of hard spheres.

The second EXPRESS Rack experiment on STS-83 is the Astro/Plant Generic Bioprocessing Apparatus (Astro/PGBA). This experiment, developed by the University of Colorado, Boulder, is located in the orbiter middeck for launch but will be relocated to the EXPRESS Rack for operations once on-orbit, just like late access payloads will be handled on the Space Station. The Astro/PGBA experiment will support commercial research and development of higher plant systems in spaceflight. Primary focus is on the production of secondary metabolites used as pharmaceuticals, lignin-based structural elements, and alterations in sugars and starches in vegetable plants. By studying how plants adapt to spaceflight, it may be possible to learn how to manipulate the same species on Earth, deriving significant commercial benefits.

The two EXPRESS Rack experiments on the STS-83 mission will be activated 14 hours into the flight and run almost the entire time, being turned off on day 15.

After the STS-83 shuttle mission, the "pathfinder" EXPRESS Rack's performance will be evaluated. A total of eight EXPRESS Racks will be built for the space station.

Boeing, NASA's prime contractor for the International Space Station, is building four flight modules at MSFC in Huntsville. Included is node 1, the first U.S. module scheduled to be launched for the space station. Boeing also is building the U.S. habitat, or living quarters module, the laboratory module, and an airlock. The major structural manufacturing of these modules has been completed. Additional assembly work is under way, including mechanical installation.

Fifteen countries are involved in the International Space Station -- the U.S., Russia, Japan, Canada, Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland and United Kingdom of Great Britain and

Northern Ireland.

The International Space Station will be the largest and most complex structure ever placed in orbit, sprawling across an area nearly the size of two football fields and visible to the naked eye as it passes overhead.

Once assembled, the International Space Station will have a mass of nearly one million pounds and provide more than 46,000 cubic feet of pressurized living and working space for astronauts and scientists.

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