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STS-111/Endeavour

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Mobile Base System, Expedition 5 Crew to be delivered to ISS

The fourth crew rotation, repair of the International Space Station's (ISS) robotic arm and delivery of the second component of the Canadian-built Mobile Servicing System, the Mobile Base System (MBS), will mark the beginning of Phase Three of Space Shuttle ISS missions.

Mission STS-111 is the 14th Space Shuttle flight to the ISS and is designated Utilization Flight 2 (UF-2). It is the 18th mission of Endeavour and the 110th Space Shuttle flight.

Expedition Five crew members (two Russian and one American) and several scientific experiments will also make the journey to the Station aboard Space Shuttle Endeavour. The Expedition Four crew members currently on the Station will return to Earth on Endeavour after spending more than 130 days in space.

Mission STS-111 payloads include the MBS, an Orbital Replacement Unit (ORU) for the Station's robotic arm and a multi-purpose logistics module (MPLM) containing racks of supplies, equipment, hardware and scientific experiments.

During Mission STS-111 crew members will transfer the MBS from Endeavour's payload bay using the Shuttle's robotic arm and perform spacewalks to attach it to the Mobile Servicing Structure (mobile transporter) located on the Station's S0 truss. Mission specialists will remove thermal blankets from the MBS after it has been grappled and supplied with power by the Station's robotic arm. The MBS is an aluminum structure measuring about 43 feet (13.1 meters) long and weighing 3,197 pounds (1,450 kilograms). The structure can support up to 46,077 pounds (20,900 kilograms).

The MBS is equipped with four Power Data Grapple Fixtures and a Latching End Effector to hold payloads. Once attached to the MSS, the MBS will provide a Common Attach System to accommodate payload transportation and servicing. It will also provide structural and electrical interfaces.

Mission specialists will transfer the Station's robotic arm from the U.S. Destiny Lab and attach it to the MBS atop the mobile transporter. This transfer will allow the

robotic arm's reach to be enhanced as the transporter moves the MBS along the S0 truss. The MBS, with the robotic arm attached, will travel along the orbiting laboratory's truss as needed to aid in future Station assembly missions.

During mission STS-111, mission specialists will also perform a spacewalk to repair the Station's robotic arm, also known as the Canadarm 2. A new ORU, or wrist/roll joint, will be installed at the end of the arm, next to the Latching End Effector. The wrist/roll joint is one of seven joints on the robotic arm. It is composed primarily of aluminum and weighs approximately 219 pounds (99.3 kilograms). The old wrist/roll joint will be removed and secured in the shuttle's payload bay for return to Earth.

The crew of Endeavour will attach the MPLM to the Station's Node 1 Unity module using the Shuttle's robotic arm. The contents of eight resupply stowage racks containing new equipment, supplies and hardware will be transferred from the MPLM to the Station and used racks will be transferred to the MPLM. Five resupply stowage platforms and two scientific racks will be transferred from the MPLM and attached inside the Destiny Lab.

Several science experiments will travel to the ISS aboard Endeavour on Mission STS-111.

The Microgravity Science Glovebox (MSG) will ride to the Station secured on a storage rack inside the MPLM. The MSG contains several experiments including the Pore Formation and Mobility Investigation (PFMI). The MSG is an isolation chamber that contains several smaller sealed experiment containers in order to achieve a pure environment isolated from contamination. Mission specialists will use specially-designed gloves accessible from the outside of the MSG in order to work on the experiments without direct contact.

The PFMI investigation will be one of the first materials science experiments on the Station and the first flight for this study. This investigation will allow scientists to gain insights that will improve solidification processing in a microgravity environment.

The EXPRESS Rack 3 will ride to the Station secured in the mid-deck of the Shuttle. The EXPRESS Rack is one of eight racks that will stay on the Station (four racks are already installed in the Station's Destiny Lab). The EXPRESS Rack has eight locker locations and two drawers to accommodate different experiments.

Experiments in EXPRESS Rack 3 include the Dynamically Controlled Protein Crystal Growth (DCPCG) study and an Advanced Astroculture (ADVASC) experiment.

The primary objective of the DCPCG experiment is to manufacture large, high quality, structurally well ordered protein crystals for x-ray analyses that could lead to development of new drugs. The findings will assist biological and physical science research for various applications in medicine, agriculture and manufacturing.

The ADVASC experiment, the first soybean seed-to-seed experiment in space, will study the growth of soybean plants inside the ADVANCED ASTROCULTURE™ plant growth unit on the Station for 75 days. The growth chamber will control temperature, humidity, light, atmospheric conditions and delivery of nutrients to the plants using a hydroponic nutrient delivery system. The plants and seeds will be returned to Earth on Mission STS-112.

The Crew

Kenneth D. Cockrell, a veteran of four space flights, will serve as commander on Mission STS-111. He served as a mission specialist on STS-56 in April 1993; as pilot on STS-69 in September 1995; and was the mission commander on STS-80 in November 1996 and STS-98 in February 2001. During Mission STS-98, the crew of Atlantis delivered the U.S. Laboratory module Destiny, spent seven days docked to the International Space Station, and performed three spacewalks to complete assembly. Cockrell was born in Austin, Texas, is married and has two children.

Paul S. Lockhart will serve as pilot on Mission STS-111, his first Space Shuttle mission. He was born in Amarillo, Texas. Lockhart served as a Second Lieutenant in the United States Air Force and has logged more than 4,000 hours in more than 30 different aircraft. He was selected as an astronaut by NASA in 1996 and was assigned technical duties in the Astronaut Office Spacecraft Systems/Operations Branch prior to his selection for Mission STS-111.

Franklin R. Chang-Diaz (Ph.D.) will serve as a mission specialist on his seventh Space Shuttle mission. During Mission STS-111, Chang-Diaz will perform three spacewalks to install the MBS and repair the Station's robotic arm. Chang-Diaz has logged more than 1,269 hours in space. His recent missions include STS-75 in February 1996, that carried the reflight of the Tethered Satellite System and the third flight of the U.S. Microgravity Payload; and STS-91 in June 1998, the ninth and final Shuttle-Mir docking mission. Chang-Diaz was born in San Jose, Costa Rica.

Phillippe Perrin will make his first space flight aboard Endeavour on Mission STS-111. During the mission, Perrin will perform three spacewalks to install the MBS and repair the Station's robotic arm. Perrin was selected as an astronaut with the French Space Agency (CNES) in 1996 and attended NASA's Astronaut Candidate Training in Houston. Perrin was born in Meknes, Morocco, but considers Avignon, Provence, France to be his hometown. He is married and has two children.

Valeri Korzun, with the Russian Space Agency (RSA), will serve as commander of the Expedition 5 crew. Korzun was certified as a Test-Cosmonaut in 1989 and trained for flight onboard the spacecraft, Soyuz TM, as commander of the rescue vehicle. He completed a 197-day flight onboard the Mir Station August 1996 to March 1997 and performed two spacewalks totaling more than 12 hours.

Peggy Whitson (Ph.D.) will serve as a prime crew member of the Expedition 5 crew on her first space flight. She was born in Mount Ayr, Iowa, but considers her hometown to be Beaconsfield, Iowa. Whitson most recently served as Deputy Divison Chief of the Medical Sciences Division at Johnson Space Center and as Co-Chair of the U.S.-Russian Mission Science Working Group. During astronaut training, she served as the lead for the Crew Test Support Team in Russia from 1998-99.

Sergei Treschev, a cosmonaut with the RSA, will make his first space flight aboard Endeavour on Mission STS-111. He will serve as a prime crew member of the Expedition 5 crew on the ISS. He graduated from the Moscow Energy Institute in 1982. In June 1999, Treschev trained as a flight engineer for the Soyuz-TM backup ISS contingency crew. He is married and has two sons.