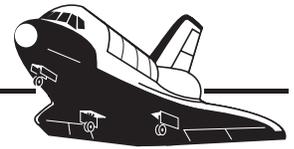


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Mission Highlights STS-96



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Discovery's Crew Makes First Station Visit

The Shuttle *Discovery's* international crew of seven became the first visitors to a new star in orbit with mission STS-96. The crew prepared the International Space Station for the arrival of its early living quarters, the Zvezda Module and laid out a welcome mat for the first station crew.

Discovery spent six days linked to the new outpost as the crew transferred and installed gear that could not be launched aboard the Zarya and Unity modules due to weight limitations. The shuttle carried more than 3,600 pounds of supplies to store aboard the station, ranging from clothes for the first crew to spare parts, laptop computers, a printer and cameras.



NASA Photo STS096-715-042

Discovery's international crew, the first to visit the new outpost, provided this view of the International Space Station during a "flyaround."

Mission Events

The Shuttle *Discovery* rose from launch pad 39B at Kennedy Space Center at 5:50 a.m. CDT on May 27, the first shuttle mission of 1999.

Commander Kent Rominger eased the shuttle to a textbook linkup with the new orbital facility during a flawless rendezvous. The *Discovery* successfully docked with the International Space Station at 11:24 p.m. CDT on May 29 as the two craft flew over the Russian-Kazakh border.

Space Shuttle *Discovery*

May 27 – June 6, 1999

Commander:	Kent Rominger
Pilot:	Rick Husband
Mission Specialists:	Tamara Jernigan Ellen Ochoa Daniel Barry Julie Payette Valery Tokarev



STS096-357-013

Mission Commander Kent Rominger participates in the move of supplies from *Discovery* to the International Space Station.

Astronauts Tamara Jernigan and Daniel Barry completed the second longest space walk in shuttle history, lasting seven hours and fifty-five minutes.

Jernigan and Barry attached a United States-built space walkers' "crane" and parts of a Russian-built crane to the exterior of the station for use on future missions.

They also installed two new portable foot restraints that will fit both American and Russian space boots, and attached three bags filled with tools and handrails that will be used during future assembly operations.

While docked, the crew also conducted maintenance on station components. Tasks completed included replacing battery recharge controllers, installing acoustic installation around Zarya's fans to reduce noise levels and installing shelving racks already present in Unity.

With all of their transfer activities complete, the *Discovery* crew closed the final hatch to the International Space Station on June 3, at 3:44 a.m. CDT after spending 79 hours and 30 minutes inside the station.

From the aft flight deck, Pilot Rick Husband manually controlled

Discovery within a tight corridor as he separated from the ISS, essentially the reverse of the task performed by Commander Kent Rominger when *Discovery* docked.

Discovery moved away to a distance of about 450 feet, where Husband began the close flyaround of the station, first crossing a point directly behind, then directly underneath and then

again above the station. *Discovery* circled the station two and half times as the crew recorded views of the exterior with still photography and video. The crew of STS-96 ended their docking mission with a 1:03 a.m. CDT landing at Kennedy Space Center on June 6.

PAYLOADS

SPACEHAB

The SPACEHAB double module (DM) is a pressurized, mixed-cargo carrier. It augmented the orbiter mid deck by providing a total cargo capacity of up to 10,000 pounds with the ability to accommodate powered payloads. Most of the gear for the station was housed inside the Spacehab module in *Discovery*'s payload bay.

This double module also contained systems necessary to support the habitat for the astronauts, such as ventilation, lighting and limited power.

The flight crew performed a number of duties in the SPACEHAB during the mission, such as activation/ deactivation, monitoring, and in-flight maintenance of SPACEHAB subsystems.

Volatile Removal Assembly (VRA)

The Volatile Removal Assembly tested the operation of equipment



STS096-707-039

The Student-Tracked Atmospheric Research Statllite for Heuristic International Networking Experiment (STARSHINE) Satellite leaves the cargo bay of the Space Shuttle *Discovery*.

that will be used to help recycle station wastewater.

Integrated Cargo Carrier The Integrated Cargo Carrier (ICC), a pallet in the shuttle's payload bay, carried a number of cargo items transferred to the station, including STRELA, an external Russian cargo crane, the Spacehab Oceanering Space System Box (SHOSS), a logistics items carrier, and the ORU Transfer Device (OTD), a U.S.-built crane that was stowed on Unity for use during future ISS assembly missions.

The Student Tracked Atmospheric Research Satellite for Heuristic International Networking Equipment (STARSHINE) was a Rocky Mountain NASA Space Grant Consortium/Utah State University sponsored ejectable satellite. The STARSHINE satellite is a 19-inch hollow sphere covered by over 800 polished aluminum mirrors. International student volunteer observers will visually track this optically reflective spacecraft during morning and evening twilight intervals for several months, calculate its orbit from shared observations, and derive atmospheric density from drag-induced changes in its orbit over time.

Shuttle Vibration Forces Experiment The Shuttle Vibration Forces (SVF) Experiment provided flight measurements of the vibratory forces acting between an aerospace payload and its mounting structure.

This was accomplished using commercially available triaxial force transducers and three Wide-band Standalone Acceleration Measurement Devices (WBSAAMD) that were built by Johnson Space Center and funded by the Jet Propulsion Laboratory for this application.

Integrated Vehicle Health Monitoring HEDS Technology Demonstration 2. This was the second of two flights of the IVHM HTD, an experiment designed to evaluate the feasibility of using

modern commercial sensors to monitor the health of space shuttle systems during flight in order to reduce ground processing of NASA's fleet of orbiters. IVHM HTD-1 was first flown on STS-95.

On STS-96, the experiment was activated during prelaunch cryogenic propellant servicing. The pilot deactivated the HTD about one hour after launch. The crew activated the experiment for one hour each day during the mission.

CREW BIOGRAPHIES

Commander: Kent Rominger (Commander, USN). Rominger, 42, was born in Del Norte, CO. He received a bachelor of science degree in civil engineering from Colorado State University and a master of science degree in aeronautical engineering from the U.S. Naval Postgraduate School.

Rominger became an astronaut in 1993, and has logged more than 1,325 hours in space. He served as pilot on STS-73, STS-80 and STS-85.

STS-73 was the second United States Microgravity Laboratory mission.

The mission focused on materials science, biotechnology, combustion science, the physics of fluids, and numerous scientific experiments housed in the pressurized Spacelab module.

STS-80 was a 17-day mission during which the crew deployed and retrieved the Wake Shield Facility (WSF) and the Orbiting Retrievable Far and Extreme Ultraviolet Spectrometer (ORFEUS) satellites.

STS-85 was a 12-day mission during which the crew deployed and retrieved the CRISTA-SPAS satellite, operated the Japanese Manipulator Flight Demonstration robotic arm, studied changes in the Earth's atmosphere and tested technology destined for use on the future International Space Station.

STS-96 was a 10-day mission consisting of 235 hours and 13 minutes. The crew was the first to dock with the International Space Station. They delivered two tons of logistics and supplies to the station in preparation for the arrival of the first crew to live on the station early next year. During STS-96, Commander Rominger had onboard responsibility for the vehicle, crew, mission success and safety of flight.

Pilot: Rick Husband (Lt. Col., USAF). Husband, 41, was born in Amarillo, TX. He received a bachelor of science degree in mechanical engineering from Texas Tech University, and a master of science degree in mechanical engineering from California State University, Fresno. Husband was named the Astronaut Office representative for Advanced Projects at Johnson Space Center, working on



Astronaut Daniel Barry participated in the May 30th space walk during which he and astronaut Tamara Jernigan performed external tasks on the International Space Station.

Space Shuttle Upgrades, the Crew Return Vehicle and studies to return to the Moon and travel to Mars.

Husband became an astronaut in 1996. Husband now has logged more than 235 hours in space.

As STS-96 pilot, Husband assisted Commander Rominger in controlling and operating the Shuttle. He was the lead crew member for in-flight maintenance on the orbiter and performed maintenance on the station communications system with Daniel Barry. In addition he made adjustments to the Unity hatches with Tamara Jernigan. He also served as a back up EVA crew member.

Mission Specialist:

Tamara Jernigan (Ph.D.).

Jernigan, 40, was born in Chattanooga, TN. She received a bachelor of science degree in physics and a master of science degree in engineering science from Stanford University. She received a master of science degree in astronomy from the University of California-Berkeley, and a doctorate in space physics and astronomy from Rice University.

Jernigan became an astronaut in July 1986. She was a mission specialist on STS-40 and STS-52. She was the payload commander on STS-67 and again served as a mission specialist on STS-80. Jernigan has logged over 1,512 hours in space.

STS-40 Spacelab Life Sciences (SLS-1) was a dedicated space and life sciences mission. During the nine-day flight, crew members performed experiments which explored how humans, animals and cells respond to microgravity and readapt to Earth's gravity on return. Other payloads included experiments designed to investigate materials science, plant biology and cosmic radiation.

construction. In addition, the crew performed numerous other experiments encompassing the areas of geophysics, materials science, biological research and applied research for the Space Station.

STS-67 Astro-2 mission was the second flight of the Astro Observatory, a unique complement of three telescopes. During this record-setting 16-day mission, the crew conducted

observations around the clock to study the far ultraviolet spectra of faint astronomical objects and the polarization of ultraviolet light coming from hot stars and distant galaxies.

STS-80 was a 17-day mission during which the crew deployed and retrieved the Wake Shield Facility and the Orbiting Retrievable Far and Extreme Ultraviolet Spectrometer satellites.

On STS-96 Jernigan served as the prime space walking crew member. She performed a seven hour, fifty-five minute space walk. Jernigan and Tokarev were the first crew members to enter the

International Space Station the day after she conducted her space walk. She also served as the lead operator of the docking system.

Mission Specialist: Ellen Ochoa

(Ph.D.). Ochoa, 41, was born in Los Angeles, CA. She received a bachelor of science degree in physics from San Diego State University, a master of science and doctorate degrees in electrical engineering from Stanford University.



STS096-380-019

In-flight portrait from bottom: left to right, Daniel Barry, Julie Payette and Ellen Ochoa. Top, Valery Tokarev, along with Tamara Jernigan and Kent Rominger. Rick Husband is between Rominger and Ochoa.

STS-52 was a ten-day flight in which the crew deployed the Italian Laser Geodynamic Satellite, which will be used to measure movement of the Earth's crust, and operated the U.S. Microgravity Payload 1. Also, the crew using a small target assembly, which was released from the remote manipulator system, tested the Space Vision System developed by the Canadian Space Agency, which will be used for Space Station

Ochoa became an astronaut in July 1991. Ochoa has logged over 719 hours in space during her flights.

STS-56 ATLAS-2 was a 9-day mission during which the crew conducted atmospheric and solar studies in an effort to better understand the effect of solar activity on the Earth's climate and environment. Ochoa used the Remote Manipulator System (RMS) to deploy and capture the Spartan satellite, which studied the solar corona.

On the STS-66 Atmospheric Laboratory for Applications and Science-3 (ATLAS-3) mission Ochoa was the payload commander. Ochoa used the RMS to retrieve the CRISTA-SPAS atmospheric research satellite at the end of its 8-day free flight.

On STS-96 Ochoa served as the prime robot arm operator. She used the arm to maneuver Tamara Jernigan and Daniel Barry for certain tasks during their space walk. Ochoa was also the prime crew member in charge of the tools to be used in *Discovery's* rendezvous with the International Space Station and was responsible for activating and deactivating the systems of the double Spacehab module in the cargo bay.

Additionally, Ochoa was the so-called "loadmaster" during the flight, responsible for the transfer of thousands of pounds of hardware and logistical items from *Discovery* to the International Space Station for future use. She was also the flight engineer for STS-96.

Mission Specialist: Daniel Barry (M.D., Ph.D.). Barry, 45, was born in Norwalk, CT. He received a bachelor of science degree in electrical engineering from Cornell University, masters of engineering and arts degrees in electrical engineering/ computer science, and a doctorate in electrical engineering /computer science from Princeton University and a doctorate in



STS096-E-5078

Pictured from left are astronauts Tamara Jernigan and Julie Payette, along with cosmonaut Valery Tokarev as they work in the Unity node. Payette represents the Canadian Space Agency and Tokarev, the Russian Space Agency.

medicine from the University of Miami.

Barry became an astronaut in 1993. He has logged over 449 hours in space, including two space walks totaling 14 hours and 8 minutes.

STS-72 was a 9-day flight during which the crew retrieved the Space Flyer Unit and also deployed and retrieved the OAST-Flyer.

On STS-96 Barry performed a seven hour, fifty-five minute space walk. He was also in charge of the operation of the various computers the crew members used and was one of three crew members responsible for the systems of the International Space Station during the docked phase of the flight, and participated in a number of secondary experiments and technology demonstrations.

Mission Specialist: Julie Payette (CSA). Payette, 35, was born in Montreal, Quebec. She received an International Baccalaureate at the United World International College of the Atlantic in South Wales, UK, a

bachelor of engineering degree from McGill University, Montreal and a master of applied science degree from the University of Toronto.

Payette was selected as an astronaut by the Canadian Space Agency (CSA) in 1992. After basic training, she worked as a technical advisor for the Mobile Servicing System, which is the Canadian contribution to the International Space Station.

Payette joined NASA in 1996 and completed initial astronaut training in 1998 and was assigned to work technical issues for the Astronaut Office EVA/Robotics Branch.

STS-96 was Payette's first space shuttle mission. Payette now has logged more than 235 hours in space. On STS-96 Payette was the prime crew member in charge of Unity's systems while *Discovery* was docked to the International Space Station and assisted Valery Tokarev in monitoring Zarya's systems during the docked phase of the mission. She was the lead crew member for in-flight maintenance of station

STS-96

Quick Look

Launch Date: May 27, 1999

Time: 5:50 a.m. CDT

Site: KSC Pad 39B

Orbiter: *Discovery*
OV-103 – 26th flight

Orbit/In.: 153 naut. miles
51.6 degrees

Mission Duration: 9 days, 19 hrs,
13 mns.

Landing Date: June 6, 1999

Time: 1:03 a.m. CDT

Site: Kennedy
Space Center

Crew: Kent Rominger (CDR)
Rick Husband (PLT)
Tamara Jernigan (MS1)
Ellen Ochoa (MS2)
Daniel Barry (MS3)
Julie Payette (MS4)
Valery Tokarev (PMS5)

Mission Events: First flight to dock with the International Space Station. *Discovery* spent six days linked to the new outpost as the crew transferred and installed gear. While docked the crew also conducted maintenance on station components. The crew conducted one EVA of seven hours and fifty-five minutes and delivered 4,000 pounds of supplies to the station.

Payloads:

Spacehab-Double Module (DM)
Integrated Cargo Carrier (ICC)
Student-Tracked Atmospheric
Research Satellite for Heuristic
International Networking
Experiment (Starshine)
Shuttle Vibration Force (SVF)
Human Exploration and Development
of Space Technology (HEDS)

systems or hardware, and joined Valery Tokarev for the swap-out of battery voltage regulators in Zarya.

She was also the prime choreographer for the space walk conducted by Tamara Jernigan and Daniel Barry. In addition, Payette was responsible for stowing equipment on the ISS and aboard *Discovery*, backup robot arm operator for a camera survey, and lead crew member responsible for photography and video equipment as well as Earth observation activities. Payette also was in charge of deploying the STARSHINE student science satellite.

Mission Specialist: Valery Tokarev (Col. Russian Air Force). Tokarev, 46, was born in Kap-Yar in the Astrakhan Region.

He received a master degree in state administration from the National Economy Academy affiliated with the Russian Federation Government in Moscow.

Tokarev was selected to join the cosmonaut corps to fly the Buran spacecraft in 1987. Since 1994, he has served as commander of a group of cosmonauts of aerospace systems and, since 1997, as a test cosmonaut for the Yuri A. Gagarin Cosmonaut Training Center.

STS-96 was Tokarev's first space flight as well as his first shuttle mission. He has now logged more than 235 hours in space. Tokarev and Jernigan were the first crew members to enter the International Space Station on the fifth day of the flight and were responsible for Zarya's systems during the docked phase of the flight. He and Payette swapped out battery voltage regulators aboard Zarya and were involved in the move of logistical items from *Discovery* to the ISS during the six days of docked operations.



STS-96 is the second Space Shuttle flight dedicated to the assembly of the International Space Station (ISS). The crew patch highlights the major themes of the Station Program: Earth-directed research, the advancement of human space exploration, and international cooperation. The Space Shuttle *Discovery* is depicted shortly after reaching orbit as the crew prepares to carry out the first docking with the new Station. At this early stage in its construction, ISS consists of two modules: Zarya and Unity, shown orbiting Earth.

The triangular shape of the patch represents building on the knowledge and experience of earlier missions, while the three vertical bars of the astronaut emblem point toward future human endeavors in space.

The five-pointed star that tops the astronaut emblem in this depiction is symbolic of the five space agencies participating in the development of ISS: NASA, the Russian Space Agency, the European Space Agency, the National Space Development Agency of Japan, and the Canadian Space Agency.

The blend of red, white, and blue is a tribute to the nationalities of the crew members who are from the United States, Canada, and Russia.