A NEW ERA OF ENDEAVOUR

STS-88

SPACE SHUTTLE PRESSKIT

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Updated November 20, 1998

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STS-88 Launches New Era of Space Exploration

Space Shuttle mission STS-88, the 13th flight of the Space Shuttle Endeavour, will begin the largest international cooperative space venture in history as it attaches together in orbit the first two modules of the International Space Station.

Endeavour will carry the Unity connecting module, the first U.S.-built station module, into orbit, launching from Kennedy Space Center's Launch Pad 39B at 3:59 a.m. EST Dec. 3. Endeavour’s launch will follow the launch of the first element of the station – the Zarya control module – scheduled for Nov. 20, 1998.

Zarya will be boosted into orbit by a Russian Proton rocket from the Baikonur Cosmodrome in Kazakstan. Funded by the U.S. but built in Russia, Zarya will act as a type of space tugboat for the early station, providing propulsion, power, communications and the capability to perform an automated rendezvous and docking with the third module, the Russian-provided Service Module, an early living quarters. After Zarya achieves orbit, it will await the arrival of Endeavour and Unity. Unity will serve as the main connecting point for later U.S. station modules and components.

Astronaut Robert D. (Bob) Cabana (Col., USMC) will command STS-88. Joining Cabana on the flight deck of Endeavour will be pilot Frederick "Rick" Sturckow (Major, USMC). Rounding out the crew are Mission Specialists Nancy Currie (Lt. Col., USA), Jerry Ross (Col., USAF), Jim Newman, Ph.D., and Sergei Krikalev, a Russian cosmonaut. Ross and Newman also are designated extravehicular activity (EVA) crewmembers and will perform three spacewalks during the mission.

STS-88 marks Cabana's fourth flight in space. He served as chief of the Astronaut Office at JSC from 1994 until his selection for the STS-88 crew. Currie and Newman each will be making their third flight into space. Ross will be making his sixth space flight. Sturckow will be making his first space flight. Krikalev has flown in space three times, twice on the Mir space station and once on the Shuttle. Krikalev also is a member of the first crew that will live aboard the new station in mid-1999.

Cabana will fly Endeavour to a rendezvous with Zarya, and Currie will use the Shuttle's robotic arm to capture the Russian-built spacecraft and attach it to the Unity module in the Shuttle cargo bay. Zarya will be the most massive object ever moved with the Shuttle's mechanical arm. On later days of the flight, Ross and Newman will conduct three spacewalks to finalize the connections between Zarya and Unity, beginning five years of orbital assembly work that will construct the new space station.

After its assembly work is completed and it has undocked from the station, Endeavour will release two small science satellites. After almost 12 days in space that begin a new era of exploration and research in orbit, Endeavour will land at the Kennedy Space Center.

Endeavour OV105

Launch: Thursday, December 03, 1998
3:59 AM (eastern time)

Mission Objectives

The **STS-88 "Unity"** mission is the first manned **International Space Station** assembly flight. The primary mission objective is to rendezvous with the already launched **Zarya** control module and successfully attach the **Unity** connecting module, providing the foundation for future ISS components.

Crew

Commander:	Robert D. Cabana
Pilot:	Frederick (Rick) W. Sturckow
Mission Specialist 1:	Jerry L. Ross
Mission Specialist 2:	Nancy J. Currie
Mission Specialist 3:	James H. Newman
Mission Specialist 4:	Sergei Krikalev

Launch

Orbiter	Endeavour OV105
Launch Site:	Pad 39-A Kennedy Space Center
Launch Window:	10 minutes
Altitude:	173 nm (210 nm for rendezvous)
Inclination:	51.6 degrees
Duration:	11 Days 19 Hrs. 49 Min.
Shuttle Liftoff Weight:	4,518,390 lbs; Orbiter alone is 263,927 lbs.
Software Version:	OI-26B

Super Light Weight Tank

Space Shuttle Main Engine

SSME 1: SN-2043 **SSME 2:** SN-2044 **SSME 3:** SN-2045

Landing

Landing Date:	12/14/98
Landing Time:	11:48 PM (eastern time)
Primary Landing Site:	Shuttle Landing Facility, KSC; ALTERNATE: Edwards Air Force Base, CA
Orbiter/Payload Weight at Landing:	200,296 lbs.

Abort Landing Sites:

RTLS: Shuttle Landing Facility, KSC
TAL: Zaragoza, Spain; ALTERNATES: Ben Guerir, Morocco; Moron, Spain
AOA: Shuttle Landing Facility, KSC; ALTERNATES: White Sands Space Harbor, NM

Payloads

Cargo Bay

UNITY Connecting Module
IMAX Cargo Bay Camera (ICBC)
MightySat 1
Satelite de Aplicaciones/Cientifico-A (SAC-A)
Getaway Special G-093
Space Experiment Module (SEM-07)

Updated: 11/19/1998

Crew Profile Menu

Commander: Robert D. Cabana

Cabana's first flew as pilot of STS-41 in October 1990, deploying the Ulysses probe to study the Sun's polar regions. He flew as pilot of STS-53 in December 1992, a classified mission, and he commanded STS-65 in July 1994, a lab flight with 80 experiments from 15 countries. He has logged over 353 hours in space and over 5,000 flying hours in 33 types of aircraft.

Pilot: Frederick (Rick) W. Sturckow

Sturckow will be making his first space flight

Mission Specialist 1: Nancy J. Currie

Currie first flew on STS-57 in June 1993, a mission that retrieved the EURECA satellite. She next flew on STS-70 in July 1995, a mission that deployed a NASA communications satellite. Currie has logged over 454 hours in space.

Mission Specialist 2: Jerry L. Ross

Ross flew as a mission specialist on STS 61-B in December 1985; STS-27 in December 1988; STS-37 in April 1991; STS-55 in April 1993; and STS-74 in November 1995. He has logged over 850 hours in space, including 23 hours on four spacewalks.

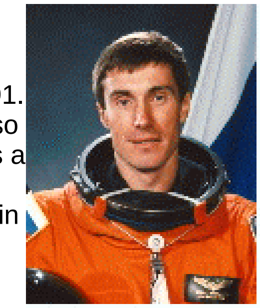
EV1

Mission Specialist 3: James H. Newman

Newman served as a mission specialist on STS-51 in September 1993 and on STS-69 in September 1995. He has logged more than 496 hours in space, including 7 hours on one spacewalk.

EV2

Mission Specialist 4: Sergei Krikalev



Krikalev has flown twice on the Mir space station, in 1988 and in 1991. He has flown once on the Space Shuttle - the first cosmonaut to do so - on STS-60 in 1994, the first Shuttle rendezvous with Mir. He also is a member of the first crew set for launch to the International Space Station in July 1999. He has logged more than 1 year and 3 months in space, including seven spacewalks.

Updated: 11/13/1998

Crew Profile

Robert D. Cabana

NAME: Robert D. Cabana (Colonel, USMC)
NASA Astronaut

PERSONAL DATA:
Born January 23, 1949, in Minneapolis, Minnesota, where his parents still reside. Married to the former Nancy Joan Shimer of Cortland, New York. Three children, Jeffrey, Christopher and Sarah. He enjoys jogging, cycling, softball, sailing, and woodworking.

EDUCATION:
Graduated from Washburn High School, Minneapolis, Minnesota, in 1967; received a bachelor of science degree in mathematics from the United States Naval Academy in 1971.

ORGANIZATIONS:
Member of the Society of Experimental Test Pilots, the Association of Space Explorers, the Naval Academy Alumni Association, and Sigma Pi Sigma.

SPECIAL HONORS:
Recipient of The Daughters of the American Revolution Award for the top Marine to complete naval flight training in 1976. Distinguished Graduate, U.S. Naval Test Pilot School. Awarded the De La Vaulx medal by the Federation Aeronautique Internationale in 1994. Personal decorations include the Defense Superior Service Medal, the Distinguished Flying Cross, the Defense Meritorious Service Medal, the Meritorious Service Medal, the National Intelligence Medal of Achievement, the NASA Medal for Outstanding Leadership, two NASA Exceptional Service Medals, and three NASA Space Flight Medals.

EXPERIENCE:
After graduation from the Naval Academy, Cabana attended the Basic School in Quantico, Virginia, and completed naval flight officer training in Pensacola, Florida, in 1972. He served as an A-6 bombardier/navigator with Marine Air Wings in Cherry Point, North Carolina, and Iwakuni, Japan. He returned to Pensacola in 1975 for pilot training and was designated a naval aviator in September 1976. He was then assigned to the 2nd Marine Aircraft Wing in Cherry Point, North Carolina, where he flew A-6 Intruders. He graduated from the U.S. Naval Test Pilot School in 1981, and served at the Naval Air Test Center in Patuxent River, Maryland, as the A-6 program manager, X-29 advanced technology demonstrator project officer, and as a test pilot for flight systems and ordnance separation testing on A-6 and A-4 series aircraft. Prior to his selection as an astronaut candidate he was serving as the Assistant Operations Officer of Marine Aircraft Group Twelve in Iwakuni, Japan.
He has logged over 5,000 hours in 33 different kinds of aircraft.

NASA EXPERIENCE:
Selected by NASA in June 1985, Cabana completed initial astronaut training in July 1986, qualifying for assignment as a pilot on future Space Shuttle flight crews. His initial assignment was as the Astronaut Office Space Shuttle flight software coordinator until November 1986. At that time he was assigned as the Deputy Chief of Aircraft Operations for the Johnson Space Center where he served for 2-1/2 years. He then served as the lead astronaut in the Shuttle Avionics Integration Laboratory (SAIL) where the Orbiter's flight software is tested prior to flight. Cabana has served as a spacecraft communicator (CAPCOM) in Mission Control during Space Shuttle missions, has served as Chief of Astronaut Appearances, and Chief of the Astronaut Office. A veteran of three space flights, Cabana has logged over 627 hours in space. He served as pilot on STS-41 (October 6-10, 1990) and STS-53 (December 2-9, 1992), and was mission commander on STS-65 (July 8-23, 1994). Cabana will command the crew of STS-88, the first Space Shuttle mission to carry hardware to space for the assembly of the International Space Station. The 7-day mission is targeted for launch in December 1998.

SPACEFLIGHT EXPERIENCE:
STS-41Discovery launched on October 6, 1990 from the Kennedy Space Center, Florida, and landed at Edwards Air Force Base, California, on October 10, 1990. During 66 orbits of the Earth, the five-man crew successfully deployed the Ulysses spacecraft, starting the interplanetary probe on its four-year journey, via Jupiter, to investigate the polar regions of the Sun; operated the Shuttle Solar Backscatter Ultraviolet instrument (SSBUV) to map atmospheric ozone levels; activated a controlled "fire in space" experiment (the Solid Surface Combustion Experiment [SSCE]); and conducted numerous other middeck experiments involving radiation measurements, polymer membrane production, and microgravity effects on plants.
STS-53 Discovery launched from the Kennedy Space Center, Florida, on December 2, 1992. The crew of five deployed the classified Department of Defense payload DOD-1 and then performed several Military-Man-in-Space and NASA experiments. After completing 115 orbits of the Earth in 175 hours, Discovery landed at Edwards Air Force Base, California, on December 9, 1992.

STS-65 Columbia launched from the Kennedy Space Center, Florida, on July 8, 1994, returning to Florida on July 23, 1994. The STS-65 crew conducted the second International Microgravity Laboratory (IML-2) mission utilizing the long spacelab module in the payload bay. The flight consisted of 82 experiments from 15 countries and six space agencies from around the world. During the record setting 15-day flight, the crew conducted experiments which focused on materials and life sciences research in a microgravity environment paving the way for future operations and cooperation aboard International Space Station. The mission was accomplished in 236 orbits of the Earth in 353 hours and 55 minutes.

AUGUST 1998

Crew Profile

Frederick (Rick) W. Sturckow

NAME: Frederick W. "Rick" Sturckow (Major, USMC)
NASA Astronaut

PERSONAL DATA:
Born August 11, 1961, in La Mesa, California but considers Lakeside, California to be his hometown. Married to the former Michele A. Street of Great Mills, Maryland. He enjoys flying and physical training (PT). His father, Karl H. Sturckow, resides in Lakeside and his mother, Janette R. Sturckow, resides in La Mesa.

EDUCATION:
Graduated from Grossmont High School, La Mesa, California, in 1978. Bachelor of science degree in mechanical engineering from California Polytechnic State University, 1984.

ORGANIZATIONS:
Member of Society of Experimental Test Pilots (SETP), Marine Corps Association (MCA).

SPECIAL HONORS:
Single Mission Air Medal with Combat "V", Strike/Flight Air Medals (4), Navy and Marine Corps Commendation Medal, Navy and Marine Corps Achievement Medal.

EXPERIENCE:
Sturckow was commissioned in December, 1984. An Honor Graduate of The Basic School, he earned his wings in April, 1987. Following initial F/A-18 training at VFA-125, he reported to VMFA-333, MCAS Beaufort, South Carolina. While assigned to VMFA-333 he made an overseas deployment to Japan, Korea, and the Philipines and was then selected to attend the Navy Fighter Weapons School (TOPGUN) in March, 1990. In August of 1990 he deployed to Sheik Isa Air Base, Bahrain for a period of eight months. Sturckow flew a total of forty-one combat missions during Operation Desert Storm and served as overall mission commander for 30-plane airstrikes into Iraq and Kuwait. In January, 1992 he attended the United States Air Force Test Pilot School at Edwards AFB, California. In 1993 he reported to the Naval Air Warfare Center- Aircraft Division, Patuxent River, Maryland for duty as the F/A-18 E/F Project Pilot. Sturckow also flew a wide variety of projects and classified programs as an F/A-18 test pilot.
He has logged approximately 2,500 flight hours and has flown over 40 different aircraft.

NASA EXPERIENCE:
Selected by NASA in December 1994, Sturckow reported to the Johnson Space Center in March 1995. He completed a year of training and

Systems and Operations Branch of the Astronaut Office.

CURRENT ASSIGNMENT:
Sturckow will serve as pilot on the crew of STS-88, the first Space Shuttle mission to carry hardware to space for the assembly of the International Space Station. Launch is targeted for December 1998.
JULY 1998

Updated: 11/13/1998

Crew Profile

Jerry L. Ross

NAME: Jerry L. Ross (Colonel, USAF)
NASA Astronaut

PERSONAL DATA:
Born January 20, 1948, in Crown Point, Indiana. Married to the former Karen S. Pearson of Sheridan, Indiana. They have two children. He enjoys softball, racquetball, woodworking, photography, model rocketry, and flying. His mother, Mrs. Phyllis E. Ross, resides in Crown Point. His father, Donald J. Ross, is deceased. Her parents, Mr. and Mrs. Morris D. Pearson, reside in Sheridan, Indiana.

EDUCATION:
Graduated from Crown Point High School, Crown Point, Indiana, in 1966; received bachelor of science and master of science degrees in Mechanical Engineering from Purdue University in 1970 and 1972, respectively.

ORGANIZATIONS:
Member of the Association of Space Explorers, the Air Force Association, Pi Tau Sigma; and a lifetime member of the Purdue Alumni Association.

SPECIAL HONORS:
Awarded the Defense Superior Service Medal, the Defense Meritorious Service Medal with 2 Oak Leaf Clusters, the Air Force Meritorious Service Medal with 1 Oak Leaf Cluster; named a Distinguished Graduate of the USAF Test Pilot School and recipient of the Outstanding Flight Test Engineer Award, Class 75B. Recipient of 5 NASA Space Flight Medals. Awarded the American Astronautical Society, Victor A. Prather Award (1985 and 1990), and Flight Achievement Award (1992 and 1996).

EXPERIENCE:
Ross, an Air Force ROTC student at Purdue University, received his commission upon graduation in 1970. After receiving his master's degree from Purdue in 1972, he entered active duty with the Air Force and was assigned to the Ramjet Engine Division of Air Force Aero-Propulsion Laboratory at Wright-Patterson Air Force Base, Ohio. He conducted computer-aided design studies on ramjet propulsion systems, served as the project engineer for captive tests of a supersonic ramjet missile using a rocket sled track, and as the project manager for preliminary configuration development of the ASALM strategic air-launched missile. From June 1974 to July 1975, he was the Laboratory Executive Officer and Chief of the Management Operations Office. Ross graduated from the USAF Test Pilot School's Flight Test Engineer Course in 1976 and was subsequently assigned to the 6510th Test Wing at Edwards Air Force Base, California. While on assignment to the 6510th's Flight Test Engineering Directorate, he was project engineer on a limited flying qualities evaluation of the RC-135S aircraft and, as lead B-1 flying qualities flight test engineer, was responsible

the B-1 aircraft. He was also responsible, as chief B-1 flight test engineer, for training and supervising all Air Force B-1 flight test engineer crew members and for performing the mission planning for the B-1 offensive avionics test aircraft.

Ross has flown in 21 different types of aircraft, holds a private pilot's license, and has logged over 2,800 flying hours, the majority in military aircraft.

NASA EXPERIENCE:

In February 1979, Ross was assigned to the Payload Operations Division at the Lyndon B. Johnson Space Center as a payload officer/flight controller. In this capacity, he was responsible for the flight operations integration of payloads into the Space Shuttle.

Ross was selected as an astronaut in May 1980. His technical assignments since then have included: EVA, RMS, and chase team; support crewman for STS 41-B, 41-C and 51-A; spacecraft communicator (CAPCOM) during STS 41-B, 41-C, 41-D, 51-A and 51-D; Chief of the Mission Support Branch; member of the 1990 Astronaut Selection Board; and Acting Deputy Chief of the Astronaut Office. A veteran of five space flights, Ross has logged 850 hours in space, including nearly 23 hours on four spacewalks.

Ross was a mission specialist on the crew of STS 61-B which launched at night from Kennedy Space Center, Florida, on November 26, 1985. During the mission the crew deployed the MORELOS-B, AUSSAT II, and SATCOM Ku-2 communications satellites, conducted two 6-hour space walks to demonstrate Space Station construction techniques with the EASE/ACCESS experiments, and operated numerous other experiments. After completing 108 orbits of the Earth in 165 hours, STS 61-B Atlantis landed on Runway 22 at Edwards Air Force Base, California, on December 3, 1985.

Ross then flew as a mission specialist on the crew of STS-27, on board the Orbiter Atlantis, which launched from the Kennedy Space Center, Florida, on December 2, 1988. The mission carried a Department of Defense payload, as well as a number of secondary payloads. After 68 orbits of the earth in 105 hours, the mission concluded with a dry lakebed landing on Runway 17 at Edwards Air Force Base, California, on December 6, 1988.

Ross flew as a mission specialist on STS-37 aboard the Orbiter Atlantis. The mission launched from KSC on April 5, 1991, and deployed the 35,000 pound Gamma Ray Observatory. Ross performed two space walks totaling 10 hours and 49 minutes to manually deploy the stuck Gamma Ray Observatory antenna and to test prototype Space Station Freedom hardware. After 93 orbits of the Earth in 144 hours, the mission concluded with a landing on Runway 33, at Edwards Air Force Base, on April 11, 1991.

From April 26, 1993 through May 6, 1993, Ross flew as Payload Commander/Mission Specialist on STS-55 aboard the Orbiter Columbia. The mission launched from Kennedy Space Center and landed at Edwards Air Force Base, Runway 22, after 160 orbits of the Earth in 240 hours. Nearly 90 experiments were conducted during the German-sponsored Spacelab D-2 mission to investigate life sciences, material sciences, physics, robotics, astronomy, and the Earth and its atmosphere.

Space Shuttle mission to rendezvous and dock with the Russian Space Station Mir. STS-74 launched on November 12, 1995, and landed at Kennedy Space Center on November 20, 1995. During the 8 day flight the crew aboard Space Shuttle Atlantis attached a permanent docking module to Mir, conducted a number of secondary experiments, and transferred 1-1/2 tons of supplies and experiment equipment between Atlantis and the Mir station. The STS-74 mission was accomplished in 129 orbits of the Earth, traveling 3.4 million miles in 196 hours, 30 minutes, 44 seconds.

CURRENT ASSIGNMENT:
Colonel Ross will serve on the crew of STS-88, the first Space Shuttle mission to carry hardware to space for the assembly of the International Space Station. He is scheduled to conduct 3 space walks on this mission. Launch is targeted for July 1998.

JANUARY 1998

Updated: 11/13/1998

Crew Profile

Nancy J. Currie

NAME: Nancy Jane Currie, Ph.D. (Lieutenant Colonel, USA)
NASA Astronaut

PERSONAL DATA:
Born December 29, 1958, in Wilmington, Delaware, but considers Troy, Ohio, to be her hometown. Married to David W. Currie (CW5, USA) of Hookstown, Pennsylvania. One daughter. She enjoys running, swimming, triathlons, weight lifting, skiing, and scuba diving. Her parents, Warren & Shirley Decker, reside in Troy. His mother, Mrs. Delores Simmons, resides in Freedom, Pennsylvania. His father, Mr. Lee Currie, is deceased.

EDUCATION:
Graduated from Troy High School, Troy, Ohio, in 1977; received a bachelor of arts degree in biological science from Ohio State University, Columbus, Ohio, in 1980, a master of science degree in safety engineering from the University of Southern California in 1985, and a doctorate in industrial engineering from the University of Houston in 1997.

ORGANIZATIONS:
Member of Army Aviation Association of America, Phi Kappa Phi, Ohio State University and ROTC Alumni Associations, Institute of Industrial Engineers, and Human Factors and Ergonomics Society.

SPECIAL HONORS:
Arts and Sciences Award for Scholarship, Ohio State University (1980), Distinguished Graduate of the Army Air Defense Artillery Officer Basic Course (1981), Honor Graduate of the Army Rotary Wing Aviator Course (1982), Honor Graduate of the Army Aviation Officer Advanced Course (1986), NASA Flight Simulation Engineering Award (1988), NASA Space Flight Medal (1993, 1995), Defense Superior Service Medal (1993), Ohio Veteran's Hall of Fame (1994), Troy, Ohio Hall of Fame (1996), Silver Order of St. Michael, Army Aviation Award (1997), Ohio State University Army ROTC Hall of Fame (1996).

EXPERIENCE:
Following graduation, Nancy served as a neuropathology research assistant at the Ohio State University College of Medicine. She was commissioned as a second lieutenant in the U.S. Army in July 1981, and attended the Air Defense Officer Basic Course and the United States Army Aviation School. Following flight training she was assigned to Fort Rucker, Alabama as a helicopter instructor pilot. She also served as a section leader, platoon leader, and brigade flight standardization officer for all phases of rotary wing flight, including combat skills and night vision goggle operations. Prior to her assignment at NASA she completed the Aviation Officer Advanced Course, the Combined Arms Services Staff School, and the Fixed Wing Multi-Engine

hours in a variety of rotary wing and fixed wing aircraft.

NASA EXPERIENCE:
Assigned to NASA Johnson Space Center in September 1987 as a flight simulation engineer on the Shuttle Training Aircraft, a complex airborne simulator which models flight characteristics of the Orbiter. Selected by NASA in January 1990, she became an astronaut in July 1991. Nancy has held various technical assignments within the Astronaut Office including: flight crew representative for crew equipment; Shuttle Remote Manipulator System (RMS); spacecraft communicator (CAPCOM) providing a communications interface between ground controllers and flight crews. A veteran of two space flights, she has logged over 454 hours in space. She was a mission specialist on STS-57 in 1993, and STS-70 in 1995.
STS-57 launched from the Kennedy Space Center, Florida, on June 21, 1993, and returned there on July 1, 1993. The primary objective of this flight was the retrieval of the European Retrievable Carrier satellite (EURECA) using the RMS. Additionally, this mission featured the first flight of Spacehab, a commercially-provided middeck augmentation module for the conduct of microgravity experiments, as well as a spacewalk by two crew members, which also involved the use of the Shuttle's robotic arm. Spacehab carried 22 individual flight experiments in materials and life sciences research. STS-57 was accomplished in 155 orbits of the Earth in 239 hours.

STS-70 launched from the Kennedy Space Center, Florida, on July 13, 1995, and returned there July 22, 1995. The five-member crew aboard Space Shuttle Discovery deployed the final NASA Tracking and Data Relay Satellite to complete the constellation of NASA's orbiting communication satellite system. The crew also conducted a myriad of biomedical and remote sensing experiments. During this 8 day 22 hour mission, the crew completed 142 orbits of the Earth, traveling 3.7 million miles. STS-70 was the first mission controlled from NASA's new combined control center.

CURRENT ASSIGNMENT:
Nancy Currie will serve on the crew of STS-88, the first Space Shuttle mission to carry hardware to space for the assembly of the International Space Station. Launch is targeted for December 1998.

AUGUST 1998

Updated: 11/13/1998

Crew Profile

James H. Newman

NAME: James H. Newman (Ph.D)
NASA Astronaut

PERSONAL DATA:
Born October 16, 1956, in the Trust Territory of the Pacific Islands, but considers San Diego, California, to be his hometown. Married to Mary Lee Pieper. Two children. He enjoys hiking, soccer, softball, squash, and soaring. His mother, Ms. Ruth Hansen, and his father, Dr. William Newman, are both residents of San Diego. Her parents, Mr. & Mrs. Wylie Bernard Pieper, reside in Houston, Texas.

EDUCATION:
Graduated from La Jolla High School, San Diego, California in 1974; received a bachelor of arts degree in physics (graduated cum laude) from Dartmouth College in 1978, a master of arts degree and a doctorate in physics from Rice University in 1982 and 1984, respectively.

ORGANIZATIONS:
Member of the American Physical Society and Sigma Xi.

SPECIAL HONORS:
Awarded a Citation in Senior Thesis Research from Dartmouth College in 1978. Elected to Sigma Xi in 1980. Recipient of 1982-83 Texaco Fellowship, the Sigma Xi Graduate Merit Award in 1985, and 1988 NASA Superior Achievement Award. Selected by NASA JSC to attend the 1989 summer session of the International Space University in Strasbourg, France. 1996 NASA Exceptional Service Medal. Institute of Navigation 1995 Superior Achievement Award (1996).

EXPERIENCE:
After graduating from Rice University in 1984, Dr. Newman did an additional year of post-doctoral work at Rice. His research interests are in atomic and molecular physics, specifically medium to low energy collisions of atoms and molecules of aeronomic interest. His doctoral work at Rice University was in the design, construction, testing, and use of a new position-sensitive detection system for measuring differential cross sections of collisions of atoms and molecules. In 1985, Dr. Newman was appointed as adjunct professor in the Department of Space Physics and Astronomy at Rice University. That same year he came to work at NASA's Johnson Space Center, where his duties included responsibility for conducting flight crew and flight control team training for all mission phases in the areas of Orbiter propulsion, guidance, and control. He was working as a simulation supervisor when selected for the astronaut program. In that capacity, he was responsible for a team of instructors conducting flight controller training.

Selected by NASA in January 1990, Dr. Newman began a year of astronaut technical assignments since then include: Astronaut Office Mission Support Branch where he was part of a team responsible for crew ingress/strap-in prior to launch and crew egress after landing; Mission Development Branch working on the Shuttle on-board laptop computers; Chief of the Computer Support Branch in the Astronaut Office, responsible for crew involvement in the development and use of computers on the Space Shuttle and Space Station. A veteran of two space flights (STS-51 in 1993 and STS-69 in 1995), Newman has logged over 496 hours in space.

On his first flight, Newman was a mission specialist on STS-51, which launched on September 12, 1993. During the ten-day flight, the crew of five aboard the Shuttle Discovery deployed the Advanced Communications Technology Satellite (ACTS) and the Orbiting and Retrievable Far and Extreme Ultraviolet Spectrometer on the Shuttle Pallet Satellite (ORFEUS/SPAS). Newman was responsible for the operation of the SPAS, was the backup operator for the RMS, and on flight day five conducted a seven-hour spacewalk with Carl Walz. The extravehicular activity (EVA) tested tools and techniques for use on future missions. In addition to working with numerous secondary payloads and medical test objectives, the crew successfully tested a Global Positioning System (GPS) receiver to determine real-time Shuttle positions and velocities and completed a test routing Orbiter data to on-board laptop computers. After 158 orbits of the Earth in 236 hours, 11 minutes, the mission concluded on September 22, 1993, with the first night landing at the Kennedy Space Center, Florida.

Most recently, Newman was a mission specialist on STS-69 which launched on September 7, 1995. The crew successfully deployed and retrieved a SPARTAN satellite and the Wake Shield Facility (WSF). Also on board was the International Extreme Ultraviolet Hitchhiker payload, numerous secondary payloads, and medical experiments. Newman was responsible for the crew's science involvement with the WSF and was also the primary RMS operator on the flight, performing the WSF and EVA RMS operations. He also operated the on-orbit tests of the Ku-band Communications Adaptor, the Relative GPS experiment, and the RMS Manipulator Positioning Display. Endeavour landed at the Kennedy Space Center on September 18, 1995 after 171 orbits of the Earth in 260 hours, 29 minutes.

CURRENT ASSIGNMENT:
Newman will serve on the crew of STS-88, the first Space Shuttle mission to carry hardware to space for the assembly of the International Space Station. Launch is targeted for December 1998.

AUGUST 1998

Updated: 11/13/1998

Crew Profile

Sergei Krikalev

NAME: Sergei Konstantinovich Krikalev
Russian Cosmonaut

PERSONAL DATA:
Born August 27, 1958, in Leningrad, Russia, which has been renamed St. Petersburg. Married to Elena Terekhina of Samara, Russia. They have one daughter. He enjoys swimming, skiing, bicycle riding, aerobatic flying, and amateur radio operations, particularly from space. His parents, Konstantin and Nadia, reside in Leningrad, Russia. Her parents, Faina and Yuri, reside in Samara, Russia.

EDUCATION:
Graduated from high school in 1975; in 1981, received mechanical engineering degree from the Leningrad Mechanical Institute, now called St. Petersburg Technical University.

SPECIAL HONORS:
He was a member of the Russian and Soviet national aerobatic flying teams, and was Champion of Moscow in 1983, and Champion of the Soviet Union in 1986. For his space flight experience, he was awarded the title of Hero of the Soviet Union, the Order of Lenin, the French title of L'Officier de la L'egion d'Honneur, and the new title of Hero of Russia. He also has been awarded the NASA Space Flight Medal (1994).

EXPERIENCE:
After graduation in 1981, he joined NPO Energia, the Russian industrial organization responsible for manned space flight activities. He tested space flight equipment, developed space operations methods, and participated in ground control operations. When the Salyut 7 space station failed in 1985, he worked on the rescue mission team, developing procedures for docking with the uncontrolled station and repairing the station's on-board system. Krikalev was selected as a cosmonaut in 1985, completed his basic training in 1986, and, for a time, was assigned to the Buran Shuttle program. In early 1988, he began training for his first long-duration flight aboard the MIR space station. This training included preparations for at least six EVA's (space walks), installation of a new module, the first test of the new Manned Maneuvering Unit (MMU), and the second joint Soviet-French science mission. Soyuz TM-7 was launched on November 26, 1988, with Krikalev as flight engineer, Commander Alexander Volkov, and French Astronaut Jean-Loup Chretien. The previous crew (Vladimir Titov, Musa Manarov, and Valeri Polyakov) remained on MIR for another twenty-five days, marking the longest period a six-person crew had been in orbit. After the previous crew returned to Earth, Krikalev, Polyakov, and Volkov continued to conduct experiments aboard the MIR station. Because arrival of the next crew had been delayed, they prepared the MIR for a period of unmanned operations before returning to Earth on April 27, 1989.

In April 1990, Krikalev began preparing for his second flight as a member of the backup crew for the eighth long-duration MIR mission, which also included 5 EVA's and a week of Soviet-Japanese operations. In December 1990, Krikalev began training for the ninth MIR mission which included training for 10 EVA's. Soyuz TM-12 launched on May 19, 1991, with Krikalev as flight engineer, Commander Anatoly Artsebarsky, and British astronaut Helen Sharman. Sharman returned to Earth with the previous crew after one week, while Krikalev and Artsebarsky remained on MIR. During the summer, they conducted six EVA's to perform a variety of experiments and some station maintenance tasks.

In July 1991, Krikalev agreed to stay on MIR as flight engineer for the next crew, scheduled to arrive in October because the next two planned flights had been reduced to one. The engineer slot on the Soyuz-13 flight on October 2, 1991, was filled by Toctar Aubakirov, an astronaut from the Soviet republic of Kazakhstan, who had not been trained for a long-duration mission. Both he and Franz Viehbok, the first Austrian astronaut, returned with Artsebarsky on October 10, 1991. Commander Alexander Volkov remained on board with Krikalev. After the crew replacement in October, Volkov and Krikalev continued MIR experiment operations and conducted another EVA before returning to Earth on March 25, 1992.

In completing his second mission, Krikalev logged more than 1 year and 3 months in space, including seven EVA's.

In October 1992, NASA announced that an experienced cosmonaut would fly aboard a future Space Shuttle mission. Krikalev was one of two candidates named by the Russian Space Agency for mission specialist training with the crew of STS-60. In April 1993, he was assigned as prime mission specialist. In September 1993, Vladimir Titov was selected to fly on STS-63 with Krikalev training as his back-up.

Krikalev flew on STS-60, the first joint U.S./Russian Space Shuttle Mission. Launched on February 3, 1994, STS-60 was the second flight of the Space Habitation Module-2 (Spacehab-2), and the first flight of the Wake Shield Facility (WSF-1). During the 8-day flight, the crew of Discovery conducted a wide variety of materials science experiments, both on the Wake Shield Facility and in the Spacehab, earth observation, and life science experiments. Krikalev conducted significant portions of the Remote Manipulator System (RMS) operations during the flight. Following 130 orbits of the Earth in 3,439,705 miles, STS-60 landed at Kennedy Space Center, Florida, on February 11, 1994. With the completion of this flight, Krikalev logged an additional 8 days, 7 hours, 9 minutes in space.

Krikalev returned to duty in Russia following his American experience on STS-60. He periodically returns to the Johnson Space Center in Houston to work with CAPCOM in Mission Control and ground controllers in Russia supporting joint U.S./Russian Missions. To date he has supported STS-63, STS-71, STS-74 and STS-76. Krikalev is assigned to the first International Space Station crew. A three person crew will be launched to the Space Station aboard a Soyuz rocket from the Baikonur launch site in Kazakhstan in July 1999. Krikalev will serve on the crew of STS-88, the first Space Shuttle mission to carry hardware to space for the assembly of the International Space Station. Launch is targeted for December 1998.

Flight Plan

Mission Milestones

DATE TIME (EST)	DAY	MET	EVENT	CREW
12/03/98 03:59 AM	1	000/00:00:00	LAUNCH	Crew
12/04/98 05:29 PM	3	001/13:30:00	NODE UNBERTH	CDR, MS2, MS3, PLT
12/04/98 06:14 PM	3	001/14:15:00	NODE INSTALL	MS2, MS3, CDR, PLT
12/04/98 07:14 PM	3	001/15:15:00	NODE UNGRAPPLE	CDR, MS2, MS3
12/05/98 01:59 PM	4	002/10:00:00	ISS RENDEZVOUS	PLT, CDR
12/05/98 08:18 PM	4	002/16:19:00	FGB INSTALL	Crew
12/05/98 09:59 PM	4	002/18:00:00	FGB UNGRAPPLE	MS2, MS3
12/09/98 03:09 PM	8	006/11:10:00	NODE INGRESS	CDR, MS1
12/09/98 04:29 PM	8	006/12:30:00	FGB INGRESS	MS1, CDR, MS4
12/10/98 05:54 PM	9	007/13:55:00	FGB EGRESS	Crew
12/10/98 05:59 PM	9	007/14:00:00	NODE EGRESS	Crew
12/11/98 09:34 PM	10	008/17:35:00	SAFER DTO	MS1, MS3
12/12/98 02:39 PM	11	009/10:40:00	UNDOCK SEP OPS	PLT
12/12/98 11:59 PM	11	009/20:00:00	SAC-A DEPLOY	CDR, MS1, PLT
12/13/98 09:39 PM	12	010/17:40:00	MIGHTY SAT DEPLOY	CDR, PLT, MS1
12/14/98 10:44 PM	13	011/18:45:00	DEORBIT BURN	Crew
12/14/98 11:48 PM	13	011/19:49:00	LANDING	Crew

Updated: 11/19/1998

Flight Plan

Summary Timeline - Day 1

DATE	TIME (EST)	DAY	MET	EVENT	CREW
12/03/98	03:59 AM	1	000/00:00:00	LAUNCH	Crew
12/03/98	06:29 AM	1	000/02:30:00	HITCHHIKER ACT	PLT
12/03/98	06:29 AM	1	000/02:30:00	RMS ON-ORBIT INIT	MS2
12/03/98	06:39 AM	1	000/02:40:00	RADIATOR DEPLOY	PLT
12/03/98	07:19 AM	1	000/03:20:00	OMS BURN	CDR, PLT, MS2
12/03/98	08:19 AM	1	000/04:20:00	PRE SLEEP	Crew
12/03/98	08:59 AM	1	000/05:00:00	SLEEP	Crew

Updated: 11/19/1998

Flight Plan

Summary Timeline - Day 2

DATE	TIME (EST)	DAY	MET	EVENT	CREW
12/03/98	04:59 PM	2	000/13:00:00	CREW WAKE	Crew
12/03/98	07:24 PM	2	000/15:25:00	OMS BURN	CDR, PLT, MS2
12/03/98	07:29 PM	2	000/15:30:00	SAFER CHECKOUT	MS1, MS3
12/03/98	09:19 PM	2	000/17:20:00	RMS CHECKOUT	MS2, MS3
12/03/98	11:19 PM	2	000/19:20:00	AIRLOCK PREP	PLT, MS1, MS3
12/03/98	12:19 AM	2	000/20:20:00	EMU CHECKOUT 1,3	PLT, MS1, MS3
12/03/98	12:34 AM	2	000/20:35:00	MULTI AXIS RCS BURN	CDR, MS2
12/03/98	02:34 AM	2	000/22:35:00	EMU CHECKOUT (EMU2)	PLT, MS1, MS3
12/04/98	04:29 AM	2	001/00:30:00	RCS BURN	PLT, CDR, MS2
12/04/98	05:29 AM	2	001/01:30:00	PRE SLEEP	Crew
12/04/98	06:59 AM	2	001/03:00:00	SLEEP	Crew

Updated: 11/19/1998

Flight Plan

Summary Timeline - Day 3

DATE	TIME (EST)	DAY	MET	EVENT	CREW
12/04/98	02:59 PM	3	001/11:00:00	CREW WAKE	Crew
12/04/98	04:29 PM	3	001/12:30:00	+X RCS BURN	PLT, CDR, MS2
12/04/98	05:14 PM	3	001/13:15:00	RMS POWERUP	MS2
12/04/98	05:29 PM	3	001/13:30:00	NODE UNBERTH	CDR, MS2, MS3, PLT
12/04/98	06:14 PM	3	001/14:15:00	NODE INSTALL	MS2, MS3, CDR, PLT
12/04/98	07:14 PM	3	001/15:15:00	NODE UNGRAPPLE	CDR, MS2, MS3
12/04/98	07:59 PM	3	001/16:00:00	NODE PRESS PREP	MS2
12/04/98	08:24 PM	3	001/16:25:00	RMS PWDN(MPMS OUT)	MS2
12/04/98	11:14 PM	3	001/19:15:00	OMS BURN	CDR, MS2, PLT
12/04/98	11:29 PM	3	001/19:30:00	RNDZ TOOLS C/O	MS3, CDR
12/04/98	02:19 AM	3	001/22:20:00	OMS BURN	CDR, PLT, MS2
12/04/98	03:04 AM	3	001/23:05:00	PRE SLEEP	Crew
12/05/98	04:59 AM	3	002/01:00:00	SLEEP	Crew

Updated: 11/19/1998

Flight Plan

Summary Timeline - Day 4

DATE	TIME (EST)	DAY	MET	EVENT	CREW
12/05/98	11:59 AM	4	002/08:00:00	CREW WAKE	Crew
12/05/98	01:59 PM	4	002/10:00:00	ISS RENDEZVOUS	PLT, CDR
12/05/98	08:18 PM	4	002/16:19:00	FGB INSTALL	Crew
12/05/98	09:59 PM	4	002/18:00:00	FGB UNGRAPPLE	MS2, MS3
12/05/98	09:59 PM	4	002/18:00:00	ODS PREP FOR INGR	MS1, PLT
12/05/98	11:09 PM	4	002/19:10:00	VTR PLAYBACK	MS1
12/05/98	11:24 PM	4	002/19:25:00	RMS PWDN(MPMS OUT)	MS2
12/05/98	12:59 AM	4	002/21:00:00	MCC-M COMM CHECK	CDR, MS4
12/05/98	01:09 AM	4	002/21:10:00	MIDDECK PREP FOR EVA	MS1, MS3, PLT, MS4
12/05/98	02:59 AM	4	002/23:00:00	PRE SLEEP	Crew
12/06/98	04:59 AM	4	003/01:00:00	SLEEP	Crew

Updated: 11/19/1998

Flight Plan

Summary Timeline - Day 5

DATE	TIME (EST)	DAY	MET	EVENT	CREW
12/06/98	12:59 PM	5	003/09:00:00	CREW WAKE	Crew
12/06/98	04:09 PM	5	003/12:10:00	RMS POWERUP	MS2
12/06/98	04:44 PM	5	003/12:45:00	EMU PURG/PRBRTH (:50)	MS1, MS3
12/06/98	05:34 PM	5	003/13:35:00	A/L DEPRESS	MS1, MS3
12/06/98	05:54 PM	5	003/13:55:00	EVA1 POST DEPRESS/EG	MS1, MS3
12/06/98	06:39 PM	5	003/14:40:00	PMA2 TO NODE UMBIL	MS3, MS1
12/06/98	08:24 PM	5	003/16:25:00	SLIDEWIRE INSTALL	MS1, MS3
12/06/98	08:54 PM	5	003/16:55:00	PMA1 TO NODE UMBIL	MS3, MS1
12/06/98	10:39 PM	5	003/18:40:00	NODE INIT STEPS 1-3	CDR, MS4
12/06/98	10:54 PM	5	003/18:55:00	FGB TO PMA1 UMBIL	MS1, MS3
12/06/98	11:24 PM	5	003/19:25:00	EVA1 SORTIE CLEANUP	MS1
12/06/98	11:44 PM	5	003/19:45:00	NODE1 INITIALIZATION	CDR, MS4
12/06/98	11:54 PM	5	003/19:55:00	RM MDM THERM CVRS	MS2, MS1, MS3
12/06/98	12:09 AM	5	003/20:10:00	EVA1 INGRESS/PREREPR	MS1, MS3
12/06/98	12:24 AM	5	003/20:25:00	A/L REPRESS	MS1, MS3
12/06/98	01:04 AM	5	003/21:05:00	RMS PWDN(MPMS OUT)	MS2
12/06/98	02:19 AM	5	003/22:20:00	PRE SLEEP	Crew
12/07/98	04:59 AM	5	004/01:00:00	SLEEP	Crew

Updated: 11/19/1998

Flight Plan

Summary Timeline - Day 6

DATE TIME (EST)	DAY	MET	EVENT	CREW
12/07/98 12:59 PM	6	004/09:00:00	CREW WAKE	Crew
12/07/98 03:29 PM	6	004/11:30:00	REBOOST MNVR	CDR
12/07/98 03:59 PM	6	004/12:00:00	INGRESS PREP	MS3, MS1
12/07/98 07:04 PM	6	004/15:05:00	SAFER CHECKOUT	MS1, MS3
12/07/98 01:29 AM	6	004/21:30:00	PRE SLEEP	Crew
12/08/98 03:59 AM	6	005/00:00:00	SLEEP	Crew

Updated: 11/19/1998

Flight Plan

Summary Timeline - Day 7

DATE TIME (EST)	DAY	MET	EVENT	CREW
12/08/98 11:59 AM	7	005/08:00:00	CREW WAKE	Crew
12/08/98 03:34 PM	7	005/11:35:00	EMU PURG/PRBRTH (:50)	MS1, MS3
12/08/98 03:59 PM	7	005/12:00:00	RMS POWERUP	MS2
12/08/98 04:24 PM	7	005/12:25:00	A/L DEPRESS	MS1, MS3
12/08/98 04:44 PM	7	005/12:45:00	EVA2 POST DEPRESS/EG	MS1, MS3
12/08/98 05:59 PM	7	005/14:00:00	EVA TRANS/AIDS INST	MS3, MS1
12/08/98 06:59 PM	7	005/15:00:00	ECOMM EQUIP INST	MS1, MS3
12/08/98 08:44 PM	7	005/16:45:00	N1 SUNSHADE INSTALL	MS3, MS1
12/08/98 09:14 PM	7	005/17:15:00	TRUNNION PIN COVER	MS3, MS2
12/08/98 10:59 PM	7	005/19:00:00	EVA2 INGRESS/PREREPR	MS3, MS1
12/08/98 11:14 PM	7	005/19:15:00	A/L REPRESS	MS1, MS3
12/08/98 11:34 PM	7	005/19:35:00	RMS PWDN(MPMS OUT)	MS2
12/08/98 01:29 AM	7	005/21:30:00	PRE SLEEP	Crew
12/09/98 03:59 AM	7	006/00:00:00	SLEEP	Crew

Updated: 11/19/1998

Flight Plan

Summary Timeline - Day 8

DATE	TIME (EST)	DAY	MET	EVENT	CREW
12/09/98	11:59 AM	8	006/08:00:00	CREW WAKE	Crew
12/09/98	02:39 PM	8	006/10:40:00	ODS & PMA2 INGRESS	CDR, MS1
12/09/98	03:09 PM	8	006/11:10:00	NODE INGRESS	CDR, MS1
12/09/98	03:39 PM	8	006/11:40:00	PMA1 INGRESS	MS1, CDR
12/09/98	04:14 PM	8	006/12:15:00	FGB AIR SAMPLE	MS4
12/09/98	04:29 PM	8	006/12:30:00	FGB INGRESS	MS1, CDR, MS4
12/09/98	04:54 PM	8	006/12:55:00	FGB AIR SAMPLE	MS4
12/09/98	04:54 PM	8	006/12:55:00	ECOMM INST IN NODE	MS1
12/09/98	06:14 PM	8	006/14:15:00	EARLY COMM INIT ACT	MS3, CDR, MS1
12/09/98	06:59 PM	8	006/15:00:00	FGB FILTER C/O	PLT, MS2
12/09/98	06:59 PM	8	006/15:00:00	EARLY COMM VIDEO C/O	MS1, MS3, CDR
12/09/98	07:29 PM	8	006/15:30:00	FGB LNCH RSTNT BOLTS	MS2, PLT
12/09/98	07:44 PM	8	006/15:45:00	FGB EPCS RECEPT C/O	MS4, MS3
12/09/98	08:14 PM	8	006/16:15:00	TRANSFER OPS	MS1, MS3, MS4
12/09/98	10:09 PM	8	006/18:10:00	PAO OPPTY	Crew
12/09/98	10:29 PM	8	006/18:30:00	CREW PHOTO	Crew
12/09/98	01:04 AM	8	006/21:05:00	PRE SLEEP	Crew
12/10/98	03:59 AM	8	007/00:00:00	SLEEP	Crew

Updated: 11/19/1998

Flight Plan

Summary Timeline - Day 9

DATE	TIME (EST)	DAY	MET	EVENT	CREW
12/10/98	11:59 AM	9	007/08:00:00	CREW WAKE	Crew
12/10/98	03:04 PM	9	007/11:05:00	NODE HEPA FILTER	MS2, PLT
12/10/98	05:54 PM	9	007/13:55:00	FGB EGRESS	Crew
12/10/98	05:59 PM	9	007/14:00:00	NODE EGRESS	Crew
12/10/98	06:29 PM	9	007/14:30:00	ODS PMA2 EGRESS	Crew
12/10/98	08:59 PM	9	007/17:00:00	PAO OPPTY	Crew
12/10/98	09:49 PM	9	007/17:50:00	REBOOST MNVR	CDR, PLT, MS2
12/10/98	01:59 AM	9	007/22:00:00	PRE SLEEP	Crew
12/11/98	03:59 AM	9	008/00:00:00	SLEEP	Crew

Updated: 11/19/1998

Flight Plan

Summary Timeline - Day 10

DATE	TIME (EST)	DAY	MET	EVENT	CREW
12/11/98	11:59 AM	10	008/08:00:00	CREW WAKE	Crew
12/11/98	03:29 PM	10	008/11:30:00	EMU PURG/PRBRTH (:50)	MS1, MS3
12/11/98	03:59 PM	10	008/12:00:00	RMS POWERUP	CDR
12/11/98	04:29 PM	10	008/12:30:00	A/L DEPRESS	MS1, MS3
12/11/98	04:49 PM	10	008/12:50:00	EVA3 POST DEPRESS//E	MS1, MS3
12/11/98	06:34 PM	10	008/14:35:00	APAS HARNESS	MS3, MS1
12/11/98	07:34 PM	10	008/15:35:00	FGB HANDRAIL INSTALL	MS1, MS3
12/11/98	09:34 PM	10	008/17:35:00	SAFER DTO	MS1, MS3
12/11/98	10:34 PM	10	008/18:35:00	EVA3 INGRESS/PREPREP	MS1, MS3
12/11/98	10:49 PM	10	008/18:50:00	A/L REPRESS	MS1, MS3
12/11/98	11:34 PM	10	008/19:35:00	RMS PWDN(MPMS OUT)	CDR
12/11/98	01:56 AM	10	008/21:57:00	PRE SLEEP	Crew
12/12/98	03:59 AM	10	009/00:00:00	SLEEP	Crew

Updated: 11/19/1998

Flight Plan

Summary Timeline - Day 11

DATE TIME (EST)	DAY	MET	EVENT	CREW
12/12/98 11:59 AM	11	009/08:00:00	CREW WAKE	Crew
12/12/98 01:54 PM	11	009/09:55:00	NODE1 LEAK CHECK	PLT
12/12/98 02:39 PM	11	009/10:40:00	UNDOCK SEP OPS	PLT
12/12/98 09:59 PM	11	009/18:00:00	PAO OPPTY	Crew
12/12/98 10:19 PM	11	009/18:20:00	VIP CALL	Crew
12/12/98 11:29 PM	11	009/19:30:00	EVA TOOL STOW	MS1, MS3, MS4
12/12/98 11:44 PM	11	009/19:45:00	MNVR SAC-A-DPLY	PLT
12/12/98 11:59 PM	11	009/20:00:00	SAC-A DEPLOY	CDR, MS1, PLT
12/12/98 02:24 AM	11	009/22:25:00	PRE SLEEP	Crew
12/13/98 04:59 AM	11	010/01:00:00	SLEEP	Crew

Updated: 11/19/1998

Flight Plan

Summary Timeline - Day 12

DATE	TIME (EST)	DAY	MET	EVENT	CREW
12/13/98	12:59 PM	12	010/09:00:00	CREW WAKE	Crew
12/13/98	04:59 PM	12	010/13:00:00	DEORBIT PREP BRIEF	Crew
12/13/98	05:49 PM	12	010/13:50:00	RCS HOT FIRE	MS2, PLT, CDR
12/13/98	09:24 PM	12	010/17:25:00	MSAT DEPLOY MNVR	CDR
12/13/98	09:39 PM	12	010/17:40:00	MIGHTY SAT DEPLOY	CDR, PLT, MS1
12/13/98	10:44 PM	12	010/18:45:00	LANDING COMM C/O	CDR
12/13/98	11:24 PM	12	010/19:25:00	CABIN CONFIG/STOW	Crew
12/13/98	01:59 AM	12	010/22:00:00	PRE SLEEP	Crew
12/14/98	04:59 AM	12	011/01:00:00	SLEEP	Crew

Updated: 11/19/1998

Flight Plan

Summary Timeline - Day 13

DATE	TIME (EST)	DAY	MET	EVENT	CREW
12/14/98	12:59 PM	13	011/09:00:00	CREW WAKE	Crew
12/14/98	04:39 PM	13	011/12:40:00	HITCHHICKER DEACT	PLT
12/14/98	06:44 PM	13	011/14:45:00	DEORBIT PREP SS	Crew
12/14/98	10:44 PM	13	011/18:45:00	DEORBIT BURN	Crew
12/14/98	11:48 PM	13	011/19:49:00	LANDING	Crew

Updated: 11/19/1998

RENDEZVOUS

Zarya Rendezvous and Capture

Overview

The Shuttle's rendezvous with Zarya actually begins with the precisely timed launch of Endeavour. Periodically during the 48 hours following launch, a series of rendezvous maneuvers will be performed by Cabana and Sturckow to slowly close in on the orbiting Zarya.

A day before the final rendezvous with Zarya, Currie will use the Shuttle's robotic arm to lift Unity from its horizontal berth in the aft cargo bay and securely latch it vertically atop the Orbiter Docking System in the forward portion of the bay.

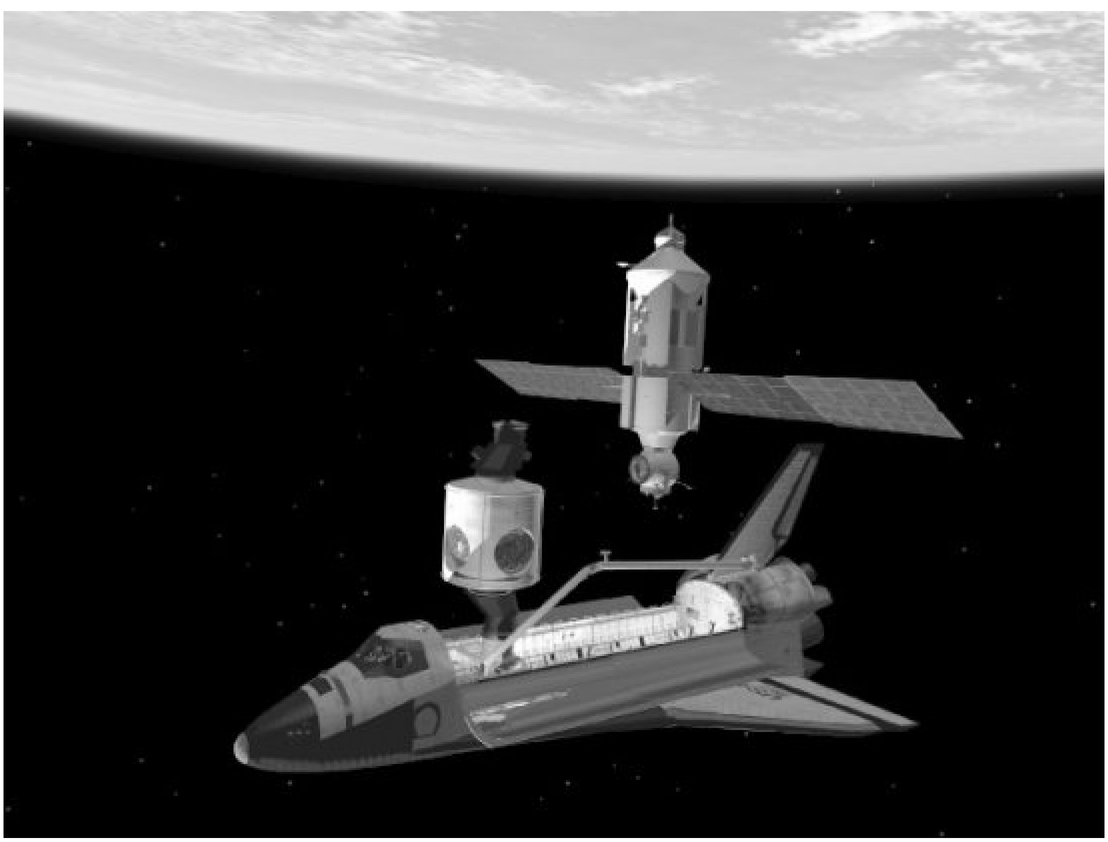
The early approach to Zarya will be similar to those flown by the Shuttle during dockings with the Russian Mir Space Station. As the Shuttle closes in on Zarya, Currie will maneuver the robotic arm to a position above the cargo bay, in place to latch onto the module.

The final approach to the Zarya will be flown manually by Cabana, beginning about an hour before capture as he crosses about 600 feet directly beneath Zarya, crossing an imaginary line running from Zarya toward Earth called the "R-Bar," or radius vector. Cabana will then fly a half circle around Zarya, crossing the module's direction of travel, to again reach what is referred to the minus R-bar at a point about 250 feet directly above the module. Cabana will then move down toward Zarya along the R-bar. Cabana will complete the rendezvous by placing the edge of Endeavour’s payload bay within about 10 feet of Zarya, allowing Currie to capture the module with the arm and dock it on the Node's mating adapter.

Because the view of the Zarya from the crew cabin windows will be blocked by Unity, the final minutes of the rendezvous and capture will be conducted by the crew using only television monitors and the assistance of the Orbiter Space Vision System, an optical alignment aid that has been extensively tested on Shuttle flights leading up to STS-88. The alignment system uses the orbiter’s closed circuit television system’s view of special markings on the Zarya module to create a precise maneuvering aid for the crew when a direct line of sight is unavailable.

To mate Zarya and Unity, Currie will precisely position Zarya's docking mechanism above and adjacent to the mechanism on Unity. Then, as she puts the arm in a "limp" mode that allows movement, Cabana will fire Endeavour's thrusters to force the mechanisms together, similar to operations done earlier in the flight to dock Unity to the shuttle's docking mechanism.

Following the completion of assembly on flight day 11, Sturckow will undock from the newly assembled International Space Station and back away above, in reverse of the final approach. Then, Sturckow will perform a full-circle flyaround of the modules from a distance of about 450 feet for about an hour before firing thrusters to separate Endeavour from the vicinity.



EVAs

Zarya/Unity Assembly Space Walks

Overview

Once Zarya and Unity are attached, Ross and Newman will conduct three spacewalks, or EVAs, to connect power and data transmission cables between Unity, the mating adapters and Zarya; to install antennas and remove protective covers from some exterior equipment; and to install spacewalking gear that will be used on later assembly missions. One approximately six-hour spacewalk will be carried out every other day, with the first occurring on the fifth day of the mission, the day after the Zarya rendezvous and docking.

The first spacewalk will consist primarily of attaching umbilicals and connectors between the mating adapters, Unity and Zarya. Ross and Newman will begin by setting up the Shuttle payload bay and worksites for the three spacewalks. A slidewire will be installed for safety and to provide clearance while the spacewalkers connect umbilicals between the first mating adapter and Unity. Eight umbilicals will be connected, four primary and four backup. Following the umbilical connections, Ross and Newman will remove thermal covers from the exterior computers, called multiplexer-demultiplexers (MDMs), on Unity.

Command checks between Mission Control, Houston, and Mission Control, Moscow, will be conducted the next day, day six of the flight, while the crew pressurizes the Orbiter Docking System vestibule, completes leak checks and prepares S-band communications equipment for installation on the second spacewalk. The ground control checks will include verifying the ability to command Zarya from Houston via the Moscow control center. The mating adapter attached to the Zarya will be pressurized via remote commands and checked for leaks. Filters and fans in Unity and Zarya will be powered on as well.

On the second spacewalk, day seven of the mission, Ross and Newman will install six handrails and other worksite interfaces as well as remove hatch and petal launch restraints from both the left and top berthing ports on Unity. The two astronauts also will install antennas on the port and starboard hatches of Unity for an S-band early communications system as well as a cable for that communications system that runs to the Zarya. Finally a sunshade for the MDM computers will be installed as well as covers for the trunnion pins which latched Unity in the Shuttle cargo bay.

The next day, day eight, the day before the final spacewalk, the crew will enter Unity and Zarya through the Shuttle docking mechanism for the first time. Once inside, portable fans and lights will be installed along with additional components of the S-band early communications system. The crew will perform an early checkout of the early communications system, exterior components of which were installed by Ross and Newman on the previous day. They also will transfer spare equipment from Endeavour to the teleconference capability of the early communications system, conduct a photographic survey of the interior, and replace filters.

The third and final spacewalk will be mostly devoted to tasks that prepare for future station assembly work and not activities needed specifically for Zarya and Unity assembly. The astronauts will start out disconnecting a wiring harness on one of Unity's mating adapters and safely covering the connectors. Next, tool boxes will be stowed on the outside of Unity for use by future assembly spacewalkers. Ross and Newman then will venture to the far end of Zarya to install a handrail that cannot be installed on the module prior to launch due to the fairing that covers the module during liftoff.

Near the end of the third spacewalk, Ross will test fire the Simplified Aid for Extravehicular Activity Rescue jet backpack. The SAFER backpacks act as a type of space lifejacket, available for use by a crew member in the event they become untethered and need to fly back to the station. During an earlier flight test, on Shuttle mission STS-86, a valve failed and prevented the propulsion jets on the backpack from firing. The valve was redesigned and extensively tested on the ground, however this test, during which Ross will remain tethered at all times, will assist in checking out the new design.

The next day, Endeavour will undock from the new station, completing the first International Space Station assembly mission.

Updated: 11/20/1998

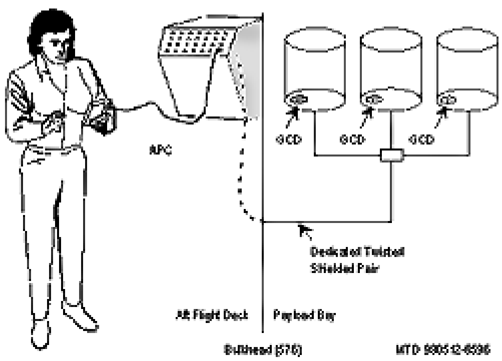
Payloads

Getaway Special G-093

Payload Bay

Prime: Jerry Ross
Backup: James Newman

Overview



Getaway Special Control Concept

The GAS payload G-093 is sponsored by the University of Michigan. The objective of this experiment is to investigate the propagation of a vortex ring through a liquid-gas interface in microgravity.

During ascent, a barometric altitude switch will activate the G-093 payload power and Thermal Control System (TCS). Early in the mission the crew will unstow and set up the Payload and General Support Computer/Bus Interface Adapter (PGSC/BIA) in the Aft Flight Deck (AFD). The crew will then initiate the experiment, just prior to a low-g period (1.0 X 10-4) lasting 8 hours. It is desired that no Orbital Maneuvering Subsystem (OMS) firings occur during this time. The experiment is controlled by an internal sequencer, which will allow the experiment to operate for 8 hours. A minimum of 8 hours after experiment activation, the crew will deactivate the experiment, and remove experiment power.

Updated: 11/13/1998

Payloads

IMAX Cargo Bay Camera (ICBC)

Payload Bay

664 lb. lbs.

Prime: Jerry Ross
Backup: James Newman

Overview

The primary objectives of ICBC on STS-88 are to film the Node 1 installation onto the orbiter docking system (ODS), the functional cargo block (FGB) rendezvous, FGB docking, extravehicular activity (EVA) tasks, separation burn, and flyaround.

The ICBC is a space-qualified, 65 mm color motion picture camera system consisting of a camera, lens assembly, and a film supply magazine containing approximately 3,500 feet of film and an empty take-up magazine. The camera is housed in an insulated, pressurized enclosure with a movable lens window cover. The optical centerline of the 30 mm camera lens is fixed and points directly out of the payload bay along the orbiter Z-axis with a 23-degree rotation toward the orbiter nose. Heaters and thermal blankets provide proper thermal conditioning for the camera electronics, camera window, and film magazines.

For STS-88, the delivery reel is loaded with 3,500 feet of film (nominally), enough for approximately 10.5 minutes of filming at normal camera speed (24 frames per second, fps). On this flight, the camera speed can be changed to 6 fps for photographing slower moving objects. The ICBC can also be loaded with a 2,200-foot film magazine. A single 30 mm wide-angle lens is mounted on the camera; lenses and film cannot be changed during the flight. ICBC operations are terminated when all film is exposed.

The ICBC is controlled from the aft flight deck with the enhanced GAS autonomous payload controller (GAPC) and uses orbiter dc power. A crew member can command the ICBC to turn main power on, go to a standby mode, adjust f-stop and focus, and film a scene. A spotmeter will be used by the crew to aid in setting the IMAX camera f-stops. By using the GAPC, the crew member can also determine the status of the camera, such as the current f-stop and the amount of film exposed. A light level measurement unit is used to set the lens aperture. A fixed focus zone and seven aperture settings are available for this flight. A tape recorder is also provided for crew documentation. All the GAS hardware, such as the GAS control decoders, status responder units, GAPCs, and the GAS signal and control cable, are owned, serviced, and certified by NASA's Goddard Space Flight Center.

The basic operational profile of the ICBC is as follows: enable the heaters within seven hours of launch or approximately 30 minutes before a planned and film magazine, perform a typical filming sequence, and return to thermal conditioning.

A typical filming sequence begins with powering the camera in standby mode. This consists of powering up the internal camera electronics, feed magazine and drive, take-up magazine and drive, IMAX interface electronics, and the lens drive to a standby mode. The f-stop, focus, and frame rate are adjusted to the desired settings. Actual filming occurs when the door motor and camera drive motor are operated. The camera then returns to standby until the end of the filming sequence.

History/Background

The IMAX project is a collaboration between NASA, the Smithsonian Institution's National Air and Space Museum, IMAX Systems Corp., and the Lockheed Corp. This system, developed by IMAX Systems Corp. of Toronto, Canada, uses specially designed 65 mm cameras and projectors to record and display very high definition color motion pictures which, accompanied by six-channel high-fidelity sound, are displayed on screens in IMAX and OMNIMAX theaters that are up to ten times larger than a conventional screen, producing a feeling of "being there."

The 65 mm film from STS-88 will be transferred to 70 mm motion picture film for use in a future large-format feature film. An audio tape recorder with microphones in the crew compartment will record middeck sounds and crew comments during camera operations. The audio will then be transferred to tapes or compact disks to accompany the motion picture.

IMAX cameras have been flown on space shuttle missions STS-41-C, 41-D, 41-G, -29, -34, -32, -31, -42, -46, -51, -61, -63, -71, and -74 to document crew operations in the payload bay and the orbiter's middeck and flight deck as well as to film spectacular views of space and Earth. Film from those missions was used as the basis for the IMAX productions "The Dream Is Alive," "The Blue Planet," and "Destiny in Space."

Benefits

The IMAX project is designed to document significant space activities and promote NASA's educational goals using the IMAX film medium.

Updated: 11/13/1998

Payloads

MightySat 1

Payload Bay

705 lb. lbs.

Prime: Frederick (Rick) Sturckow

Backup: Robert Cabana

Overview

The MightySat 1 payload consists of a nonrecoverable all-composite spacecraft structure and experiments integrated with a Hitchhiker (HH) ejection system (HES), then mounted inside a lidless carrier. The HH equipment consists of one HH lightweight avionics plate (LAP), the HH avionics, one 5-cubic-foot HH canister, and one HH adapter beam assembly (ABA). The payload will be mounted in the orbiter bay 6 port location on a GSFC-provided HH ABA, with the MightySat 1 canister mounted in the forward position and the HH avionics mounted in the aft position.

After the payload bay doors are opened, the crew will activate the power and signal path to the HH carrier via the standard switch panel. The satellite will be ejected from the HH canister on Flight Day 12. MightySat 1 remains in a dormant state until following ejection from the orbiter cargo bay. MightySat 1 is spring-ejected at a minimum rate of 1.7 fps and requires an overflight of a specific location in Albuquerque, N.M. within 6 hours of deploy. Once ejection is complete, flight operations are complete for the satellite. Telemetry and command capability will then be via the Payload Operations Control Center (POCC) at GSFC.

The MightySat 1 experiments include the Alkali Metal Thermal-to-Electric Converter (AMTEC) and the Automated Wafer Cartridge System (AWCS). AMTEC and AWCS were developed by AMPS, Inc.

The AMTEC cell is designed for efficient conversion of heat into electrical energy through a thermally regenerated electrochemical process with metallic sodium (Na) as the working fluid. A ceramic material called Beta Alumina Solid Electrolyte (BASE) is at the heart of the device and serves to separate a higher pressure region of up to 9 psia from a lower pressure region of less than 1 psia. These pressures are determined by the vapor pressure of Na in the various regions of the cell. It is the pressure difference and the properties of BASE that allow AMTEC to operate.

The AWCS consists of an automated material handling system and an autonomous manufacturing process control system. The experiment will provide automated movement of semiconductor wafers from a storage area to a simulated processing area near the top of one of the HH canisters. The wafers will be moved from and to storage locations to demonstrate the

History/Background

MightySat 1 is the first flight of a U.S. Air Force (USAF) Philips Laboratory/Space Experiments Directorate ejectable technology demonstration platform. Four advanced technologies will be demonstrated on MightySat 1. These technologies include a composite structure, advanced solar cells, advanced electronics, and a shock device.

Benefits

The overall goals of the AMTEC experiment are to validate AMTEC technology for developers and operators of military and commercial space systems and to demonstrate AMTEC technology as a prime candidate as the power system for the NASA Pluto Express mission.

The goal of the AWCS flight experiment is to validate the AWCS automation process and autonomous control systems as the prime candidate for future material development and manufacturing facilities and to stimulate interest in the private sector for selection as an "off-the-shelf" product for commercial space missions.

Updated: 11/13/1998

Payloads

Satelite de Aplicaciones/Cientifico-A (SAC-A)

Payload Bay

590 lb. lbs.

Prime: Frederick (Rick) Sturckow

Backup: Robert Cabana

Overview

The SAC-A payload consists of the SAC-A installed in a Hitchhiker (HH) canister equipped with an HH ejection system and an HH motorized door assembly (HMDA). SAC-A is mounted in the forward position on an adapter beam, which is attached to the side wall of the orbiter in the Bay 2 port location.

The satellite power will not be applied until the flight crew opens the HMDA. As the HMDA opens, a switch on top of the satellite will engage, and power from the satellite batteries will be applied to a single momentum wheel. The satellite may be ejected after a minimum of 3 minutes to provide time for the momentum wheel to reach its operating speed.

SAC-A will be deployed from a near-circular orbit with an inclination greater than 38°. It requires a postejection mean orbit height of 200 nautical miles. The end of SAC-A orbital operational lifetime occurs at 135 nautical miles.

A mean altitude of 200 nautical miles at ejection will give the SAC-A an estimated orbit lifetime between five months (using a worst-case solar flux) and nine months (using a best-case solar flux), with seven months being a best estimate. The minimum acceptable lifetime for SAC-A is five months.

SAC-A will have a minimum ejection velocity of 2.6 fps. During the payload deployment operations, the orbiter attitude control will nominally be maintained by the Vernier Reaction Control System (VRCS). The VRCS will be inhibited prior to payload deployment until visual verification that SAC-A has cleared the payload bay. Should the VRCS fail, the Primary Reaction Control System (PRCS) will be selected for attitude control. The PRCS will be inhibited prior to the payload deployment until visual verification that the payload has cleared the payload bay.

At a predetermined time after ejection, another set of switches will engage, and the batteries will provide power to the remaining SAC-A systems.

During the mission, SAC-A will be controlled from the Payload Operations Control Center (POCC) located at GSFC.

History/Background

This is the first flight of SAC-A, a small, nonrecoverable satellite built by the Argentinean National Commission of Space Activities (CONAE). The satellite payload includes a Differential Global Positioning System (DGPS), a charge coupled device (CCD) camera, Argentinean-built silicon solar cells, and a magnetometer.

Benefits

SAC-A will test and characterize the performance of new equipment and technologies that may be used in future operational or scientific missions.

Updated: 11/13/1998

Payloads

Space Experiment Module (SEM-07)

Payload Bay

Prime:
Backup:

Overview

The SEM program is an educational initiative to increase student access to space. Kindergarten through University students are represented. The SEM-07 utilizes a standard 5 cubic-foot GAS canister with a Goddard Space Flight Center (GSFC)-provided internal support structure, battery, power distribution system, data sampling and storage devices, and harness. It will be mounted on an SSP/JSC-provided adaptor beam in Bay 13, port side, forward position. SEM-07 will be PASSIVE. There will be no batteries or power supplied by the Orbiter.

History/Background

NASA began the Space Experiment Module (SEM) program in 1995 as an offshoot of the Getaway Special program, managed by the Shuttle Small Payloads Project at Goddard Space Flight Center in Greenbelt, Md. Since 1982, GAS canisters had flown on the shuttle, offering economic access to space to a broader array of experimenters, particularly students. But participation was still somewhat limited by the high-level engineering skills required to design GAS experiments.

In 1995, the program directors started SEM to relieve students of the engineering burden and let them concentrate on creating their experiments. Since the module is equipped with electrical power, there is no need to engineer and build battery boxes, etc. Students of all ages can create, design, and build experiments with a little help from teachers or mentors. The experiments--which can be simple or complicated, active or passive--are placed in half-moon-shaped SEMs, ten of which are then stacked in a GAS canister.

Payloads

UNITY Connecting Module

Payload Bay

25,600 lbs lbs.

Prime:
Backup:

Overview

The first U.S.-built component of the International Space Station, a six-sided connecting module and passageway, or node, named Unity, will be the primary cargo of Space Shuttle mission STS-88, the first mission dedicated to assembly of the station.

The Unity connecting module, technically referred to as node 1, will lay a foundation for all future U.S. International Space Station modules with six berthing ports, one on each side, to which future modules will be attached. Built by The Boeing Company at a manufacturing facility at the Marshall Space Flight Center in Huntsville, Alabama, Unity is the first of three such connecting modules that will be built for the station. Sometimes referred to as Node 1, the Unity module measures 15 feet in diameter and 18 feet long.

Meeting in Space

Carried to orbit aboard the Space Shuttle Endeavour, Unity will be mated with the already orbiting Zarya control module, or Functional Cargo Block (Russian acronym FGB), a U.S.-funded and Russian-built component that will have been launched earlier aboard a Russian rocket from Kazakstan. In addition to connecting to the Zarya module, Unity eventually will provide attachment points for the U.S. laboratory module; Node 3; an early exterior framework, or truss for the station; an airlock; and a multi-windowed cupola.

Vital Resources

Essential space station resources such as fluids, environmental control and supply work and living areas.

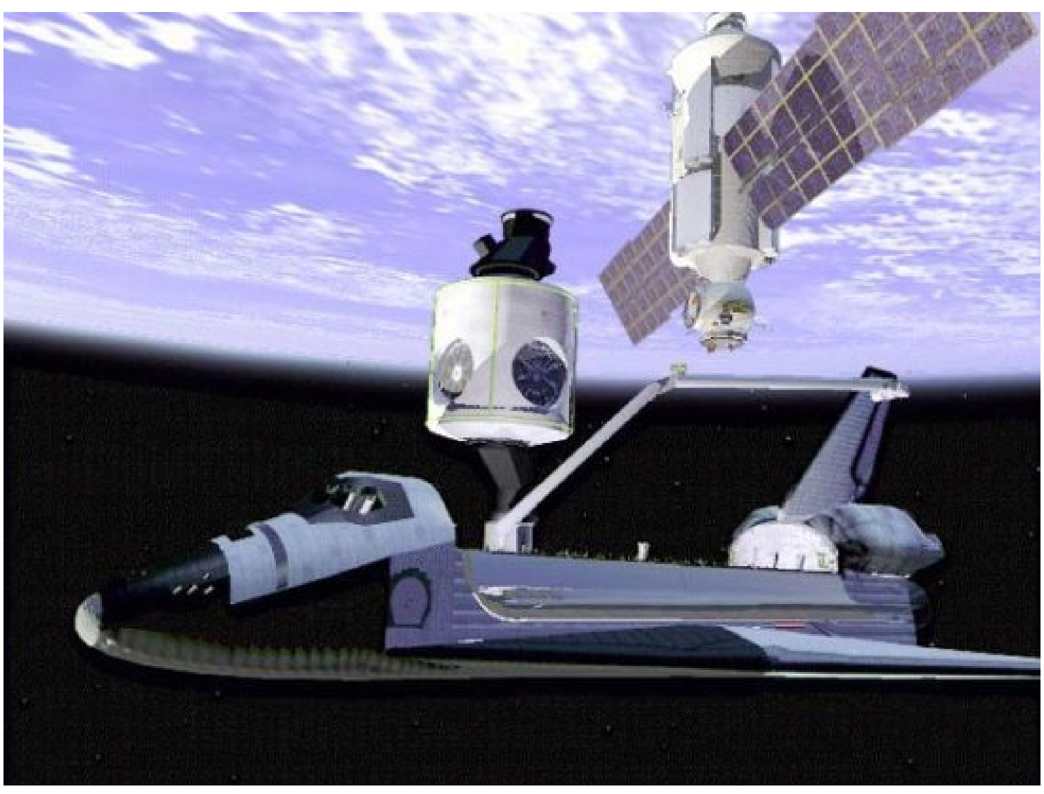
More than 50,000 mechanical items, 216 lines to carry fluids and gases, and 121 internal and external electrical cables using six miles of wire were installed in the Unity node. The detailed and complex hardware installation required more than 1,800 drawings. The node is made of aluminum.

Pressurized Mating Adapters

Two conical docking adapters will be attached to each end of Unity prior to its launch aboard Endeavour. The adapters, called pressurized mating adapters (PMAs), allow the docking systems used by the Space Shuttle and by Russian modules to attach to the node's hatches and berthing mechanisms. One of the conical adapters will attach Unity to the Zarya, while the other will serve as a docking port for the Space Shuttle. The Unity node with the two mating adapters attached, the configuration it will be in for launch, is about 36 feet long and weighs about 25,600 pounds.

Attached to the exterior of one of the pressurized mating adapters are computers, or multiplexer-demultiplexers (MDMs), which will provide early command and control of the Unity node. Unity also will be outfitted with an early communications system that will allow data, voice and low data rate video with Mission Control, Houston, to supplement Russian communications systems during the early station assembly activities.

The two remaining nodes are being built by the European Space Agency (ESA) for NASA in Italy by Alenia Aerospazio. Nodes 2 and 3 will be slightly longer than the Unity node, measuring almost 21 feet long, and each will hold eight standard space station equipment racks in addition to six berthing ports. ESA is building the two additional nodes as partial payment for the launch of the ESA Columbus laboratory module and other equipment on the Space Shuttle. Unity holds four equipment racks.



Benefits

The International Space Station will allow scientists to conduct long-duration experiments and research in the environment of space. It is the largest peacetime scientific mission in history and combines the resources of 16 nations. When completely assembled in 2004, the International Space Station will have a mass of more than 1 million pounds and provide more than 46,000 cubic feet of pressurized living and working space for up to seven astronauts and scientists.

Updated: 11/16/1998

DTO/DSO/RMEs

ASSESSMENT OF HUMAN FACTORS CONFIGURATION A
DSO 904
In-Cabin

Prime: Nancy Currie

Principal Investigator: B. Woolford, M. Whitmore

Backup: Robert Cabana

Overview

By studying variations between preflight training and in-flight task performance and timeline, factors affecting human productivity during space flight may be discerned. This evaluation will specifically analyze human-machine, human-environment, and human-human interfaces. Conclusions from this data will lead to timeline guidelines by classes of experimental activities to assist future principal investigators (PIs) with experiment design, and to improve habitat, hardware, and software designs. The participating crewmember will apply targets (stickers) to specified areas of the body to assist postflight evaluation, and will perform a video setup prior to EVA1 and EVA3. In addition, the participating crewmember will complete a questionnaire on orbit.

Updated: 11/13/1998

DTO/DSO/RMEs

EFFECTS OF MICROGRAVITY ON CELL MEDIATED IMMUNITY AND REACTIVATION OF LATENT VIRAL INFECTIONS

DSO 497

In-Cabin

Prime:

Principal Investigator: Raymond P. Stowe/UTMB-Galveston; Alan D.T. Barrett, Ph.D./UTMB-Galveston; Duane L. Pierson, Ph.D.

Backup:

Overview

This investigation will assess the immune system function using the immune cells from the standard Flight Medicine blood draw. The objective of this study is to examine the mechanisms of spaceflight-induced alterations in human immune function and latent virus shedding. There are no on-orbit activities associated with this DSO.

Updated: 11/16/1998

DTO/DSO/RMEs

INDIVIDUAL SUSCEPTIBILITY TO POST-SPACEFLIGHT ORTHOSTATIC INTOLERANCE

DSO 496

Prime: Frederick (Rick) Sturckow

Principal Investigator: Janice M. Yelle, M.S.; Michael G. Ziegler, M.D.; Peggy A. Whitson, Ph.D.

Backup: Jerry Ross

Overview

Significant alteration of cardiovascular function by space flight is well documented. One of the most important changes negatively affecting flight operations and crew safety is the postflight loss of orthostatic tolerance. Susceptibility to postflight orthostatic intolerance is highly individual. Some astronauts are affected very little and others have severe symptoms. The goal of the proposed studies is to elucidate mechanisms responsible for these differences in order to customize countermeasure protocols. There are no on-orbit activities associated with this DSO.

Updated: 11/16/1998

DTO/DSO/RMEs

THE INTERACTION OF THE SPACE SHUTTLE LAUNCH AND ENTRY SUIT AND SUSTAINED WEIGHTLESSNESS ON EGRESS

DSO 331

In-Cabin

Prime: Robert Cabana

Backup: Nancy Currie

Principal Investigator: Michael C. Greenisen, Ph.D.

Overview

DSO 331 will identify the impact of the Launch Entry Suit/Advanced Crew Escape Suit (LES/ACES) and sustained weightlessness on egress locomotion mechanical efficiency as measured by oxygen consumption and gait alteration. Participating crewmembers will apply instrumentation during suit donning in Deorbit Prep.

Updated: 11/13/1998

DTO/DSO/RMEs

LOW-IODINE RESIDUAL SYSTEM
DTO 691
In-Cabin

Prime: James Newman
Backup: Sergei Krikalev

Principal Investigator: Richard L. Sauer

Overview

This DTO will use a newly developed technology replacing the Galley Iodine Removal Assembly (GIRA) to reduce the concentration of iodine in shuttle potable water system. It will demonstrate that iodine concentrations in Shuttle drinking water can be reduced to medically-acceptable levels while maintaining microbial control in the water distribution system. Ground based microbial and iodine analysis of in-flight water samples will be used to verify performance. When this DTO proves the performance, the process to become operational hardware will be implemented. The crew will set up the LIRS on FD01, perform daily checks and stow on FD13 with water samples taken on FD01 and FD13. If the LIRS does not perform properly the GIRA is flown as a backup.

Updated: 11/13/1998

DTO/DSO/RMEs

SINGLE STRING GLOBAL POSITIONING SYSTEM
DTO 700-14

Prime: James Newman

Principal Investigator: Ray Nuss, Wayne Hensley, Michael Sarafin

Backup: Sergei Krikalev

Overview

The purpose of this experiment is to demonstrate the performance and operations of the GPS during Orbiter ascent, on-orbit operations, entry, and landing phases utilizing a modified military GPS receiver processor and the existing Orbiter GPS antennas. The DTO will be unstowed on FD02 and setup for entry on FD12. There will be a harddrive changeout performed on FD06. Three other on-orbit activities will be performed during the post-undock timeframe. One of these activities will perform a test in Ops 2. The second test activity requires transitioning to Ops 3. The third activity, the PVA Mode analysis, will require powering off the MDM for 90 minutes

Updated: 11/13/1998

DTO/DSO/RMEs

SPACE INTEGRATED GLOBAL POSITIONING SYSTEM/INERTIAL NAVIGATION SYSTEM (SIGI)

DTO 700-15

Prime: James Newman

Principal Investigator: Pamela Lupo, Mark Mangieri, Scott Murray, Moises Montez, Joe Thibodeau, Ray Nuss, and Tony Pham

Backup: Sergei Krikalev

Overview

The Space Integrated Global Positioning System/Inertial Navigation System (SIGI) is intended to replace the shuttle onboard TACAN and, eventually, the HAINS Inertial Measurement Units (IMUs). The SIGI DTO will mitigate the technical and schedule risks of applying this new technology to the Shuttle navigation systems by evaluating the system's performance in spaceflight. SIGI will be unstowed on FD02 and set up for entry on FD12. There will be a harddrive changeout performed on FD09. Data downlinks are scheduled after unstow, harddrive changeout, and entry setup.

Updated: 11/13/1998

DTO/DSO/RMEs

STRUCTURAL DYNAMICS MODEL VALIDATION
DTO 257

Prime: Robert Cabana
Backup: Frederick (Rick) Sturckow

Principal Investigator: K. Schultz

Overview

This test will excite the structural dynamics of the joined Shuttle and International Space Station (ISS) to acquire several critical natural frequencies and their corresponding structural damping. This test will allow confirmation that Shuttle primary jet control algorithm tuning is acceptable prior to attitude control which uses this algorithm. This test will be performed on several early Shuttle/ISS assembly flights for which Shuttle must provide attitude control until ISS primary structural configuration is static.

History/Background

The combined Shuttle and ISS structure after docking on-orbit has some modeling uncertainty which must be validated to be within preflight predictions. These predictions are used to certify flight readiness for structural loads and attitude control stability.

Updated: 11/13/1998

DTO/DSO/RMEs

USA SAFER FLIGHT DEMONSTRATION
DTO 689

Prime: Jerry Ross
Backup: James Newman

Principal Investigator: C. Woolley

Overview

The purpose of the DTO is to demonstrate through an end-to-end on-orbit functional checkout that the USA Simplified Aid for EVA Rescue (SAFER) design performs as expected.

Updated: 11/13/1998

Media Assistance

NASA Television Transmission

NASA Television is available through the GE2 satellite system which is located on Transponder 9C, at 85 degrees west longitude, frequency 3880.0 MHz, audio 6.8 MHz.

The schedule for television transmissions from the orbiter and for mission briefings will be available during the mission at Kennedy Space Center, FL; Marshall Space Flight Center, Huntsville, AL; Dryden Flight Research Center, Edwards, CA; Johnson Space Center, Houston, TX; and NASA Headquarters, Washington, DC. The television schedule will be updated to reflect changes dictated by mission operations.

Status Reports

Status reports on countdown and mission progress, on-orbit activities and landing operations will be produced by the appropriate NASA newscenter

Briefings

A mission press briefing schedule will be issued before launch. During the mission, status briefings by a flight director or mission operations representative and when appropriate, representatives from the payload team, will occur at least once each day. The updated NASA television schedule will indicate when mission briefings are planned.

Internet Information

Information is available through several sources on the Internet. The primary source for mission information is the NASA Shuttle Web, part of the World Wide Web. This site contains information on the crew and its mission and will be updated regularly with status reports, photos and video clips throughout the flight. The NASA Shuttle Web's address is:

http://shuttle.nasa.gov

If that address is busy or unavailable, Shuttle Information is available through the Office of Space Flight Home Page:

http://www.hq.nasa.gov/osf/

General information on NASA and its programs is available through the NASA Home Page and the NASA Public Affairs Home Page:

http://www.nasa.gov

or

http://www.nasa.gov/newsinfo/index.html

Information on other current NASA activities is available through the Today@NASA page:

http://www.nasa.gov/today.html

The NASA TV schedule is available from the NTV Home Page:

http://www.nasa.gov/ntv

Status reports, TV schedules and other information also are available from the NASA headquarters FTP (File Transfer Protocol) server, ftp.hq.nasa.gov. Log in as anonymous and go to the directory /pub/pao. Users should log on with the user name "anonymous" (no quotes), then enter their E-mail address as the password. Within the /pub/pao directory there will be a "readme.txt" file explaining the directory structure:

* Pre-launch status reports (KSC): **ftp.hq.nasa.gov/pub/pao/statrpt/ksc**
* Mission status reports (KSC): **ftp.hq.nasa.gov/pub/pao/statrpt/jsc**
* Daily TV Schedules: **ftp.hq.nasa.gov/pub/pao/statrpt/jsc/tvsked.**

NASA Spacelink, a resource for educators, also provides mission information via the Internet. Spacelink may be accessed at the following address:

http://spacelink.nasa.gov

Access by Compuserve

Users with Compuserve accounts can access NASA press releases by typing "GO NASA" (no quotes) and making a selection from the categories offered.

Updated: 11/12/1998

Media Contacts

NASA PAO CONTACTS

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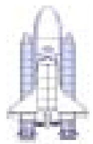
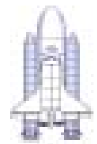
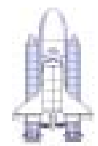
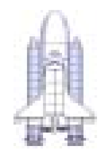
SHUTTLE FLIGHTS AS OF DECEMBER 1998

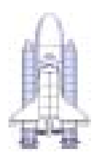
92 TOTAL FLIGHTS OF THE SHUTTLE SYSTEM -- 67 SINCE RETURN TO FLIGHT











STS-90 04/17/98 - 05/03/98		STS-95 10/29/98 - 11/07/98		
STS-87 11/19/97 - 12/05/97		STS-91 06/02/09 - 06/12/98		
STS-94 07/01/97 - 07/17/97		STS-85 08/07/97 - 08/19/97		
STS-83 04/04/97 - 04/08/97		STS-82 02/11//97 - 02/21/97		
STS-80 11/19/96 - 12/07/96		STS-70 07/13/95 - 07/22/95		
STS-78 06/20/96 - 07/07/96		STS-63 02/03/95 - 02/11/95	STS-86 09/25/97 - 10/06/97	
STS-75 02/22/96 - 03/09/96		STS-64 09/09/94 - 09/20/94	STS-84 05/15/97 - 05/24/97	
STS-73 10/20/95 - 11/05/95		STS-60 02/03/94 - 02/11/94	STS-81 01/12/97 - 01/22/97	
STS-65 07/08/94 - 07/23/94		STS-51 09/12/93 - 09/22/93	STS-79 09/16/96 - 09/26/96	
STS-62 03/04/94 - 03/18/94		STS-56 04/08/83 - 04/17/93	STS-76 03/22/96 - 03/31/96	
STS-58 10/18/93 - 11/01/93		STS-53 12/02/92 - 12/09/92	STS-74 11/12/95 - 11/20/95	
STS-55 04/26/93 - 05/06/93		STS-42 01/22/92 - 01/30/92	STS-71 06/27/95 - 07/07/95	
STS-52 10/22/92 - 11/01/92		STS-48 09/12/91 - 09/18/91	STS-66 11/03/94 - 11/14/94	
STS-50 06/25/92 - 07/09/92		STS-39 04/28/91 - 05/06/91	STS-46 07/31/92 - 08/08/92	STS-89 01/22/98 - 01/31/98
STS-40 06/05/91 - 06/14/91		STS-41 10/06/90 - 10/10/90	STS-45 03/24/92 - 04/02/92	STS-77 05/19/96 - 05/29/96
STS-35 12/02/90 - 12/10/90	STS-51L 01/28/86	STS-31 04/24/90 - 04/29/90	STS-44 11/24/91 - 12/01/91	STS-72 01/11/96 - 11/20/96
STS-32 01/09/90 - 01/20/90	STS-61A 10/30/85 - 11/06/85	STS-33 11/22/89 - 11/27/89	STS-43 08/02/91 - 08/11/91	STS-69 09/07/95 - 09/18/95
STS-28 08/08/89 - 08/13/89	STS-51F 07/29/85 - 08/06/85	STS-29 03/13/89 - 03/18/89	STS-37 04/05/91 - 04/11/91	STS-67 03/02/95 - 03/18/95
STS-61C 01/12/86 - 01/18/86	STS-51B 04/29/85 - 05/06/85	STS-26 09/29/88 - 10/03/88	STS-38 11/15/90 - 11/20/90	STS-68 09/30/94 - 10/11/94
STS-9 11/28/83 - 12/08/83	STS-41G 10/05/84 - 10/13/84	STS-51-I 08/27/85 - 09/03/85	STS-36 02/28/90 - 03/04/90	STS-59 04/09/94 – 04/20/94
STS-5 11/11/82 - 11/16/82	STS-41C 04/06/84 - 04/13/84	STS-51G 06/17/85 - 06/24/85	STS-34 10/18/89 - 10/23/89	STS-61 12/02/93 - 12/13/93
STS-4 06/27/82 - 07/04/82	STS-41B 02/03/84 - 02/11/84	STS-51D 04/12/85 - 04/19/85	STS-30 05/04/89 - 05/08/89	STS-57 06/21/93 - 07/01/93
STS-3 03/22/82 - 03/30/82	STS-8 08/30/83 - 09/05/83	STS-51C 01/24/85 - 01/27/85	STS-27 12/02/88 - 12/06/88	STS-54 01/13/93 - 01/19/93
STS-2 11/12/81 - 11/14/81	STS-7 06/18/83 - 06/24/83	STS-51A 11/08/84 - 11/16/84	STS-61B 11/26/85 - 12/03/85	STS-47 09/12/92 - 09/20/92
STS-1 04/12/81 - 04/14/81	STS-6 04/04/83 - 04/09/83	STS-41D 08/30/84 - 09/05/84	STS-51J 10/03/85 - 10/07/85	STS-49 05/07/92 - 05/16/92
OV-102 Columbia (25 flights)	**OV-099 Challenger (10 flights)**	**OV-103 Discovery (25 flights)**	**OV-104 Atlantis (20 flights)**	**OV-105 Endeavour (12 flights)**

Table prepared by Richard W. Orloff, 02/2001