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STS-103/Discovery

Ensuring the Hubble Space Telescope's Health for the Future

The crew of Space Shuttle Discovery will tune-up the Hubble Space Telescope on a mission that will close out an impressive century of space flight and ensure that Hubble's revolutionary discoveries can continue into the new millennium.

Space Shuttle flight STS-103, the third Hubble Space Telescope servicing mission, is designed to upgrade the 9-year-old observatory and replace worn parts. Four spacewalks are planned during the flight. This servicing mission originally was scheduled for June 2000, but after the third of Hubble's six gyroscopes failed, it was split into two separate missions. Discovery will fly the first, scheduled for Dec. 2, 1999, with the second to follow in 2001.

The gyroscopes, which are part of Hubble's pointing system, measure attitude when Hubble is changing its pointing from one target to another, and they help control the telescope's pointing while observing targets. Three working gyroscopes are needed to meet the telescope's precise pointing requirements.

During the mission, all six of Hubble's gyroscopes will be replaced. In addition, the crew will replace other equipment, including a guidance sensor and the spacecraft's main computer. The new computer, which is 20 times faster with six times more memory than Hubble's original computer, will reduce flight software maintenance and significantly lower costs.

In addition, a voltage/temperature kit will be installed to protect spacecraft batteries from overcharging and overheating when the spacecraft goes into safe mode. A new transmitter will replace a failed spare currently aboard the spacecraft, and a spare solid state recorder will be installed to allow efficient handling of high-volume data. Telescope insulation that has degraded will be replaced. The insulation is necessary to control the internal temperature on the Hubble.



Because of periodic servicing missions planned throughout Hubble's 20-year mission lifespan, the observatory has and will continue to benefit from technological advances. The Hubble Space Telescope is the first observatory designed for extensive maintenance and refurbishment in orbit. Features such as handrails and foot restraints are built into the telescope to help astronauts perform servicing tasks in the Shuttle cargo bay as they orbit Earth at 17,500 mph.

The mission will be led by Commander Curtis L. Brown Jr. (Lt. Col., U.S. Air Force). Scott J. Kelly (Lt. Cmdr., U.S. Navy) will serve as Pilot and Steven L. Smith as Payload Commander. Mission Specialists are C. Michael Foale, Ph.D., John M. Grunsfeld, Ph.D., Claude Nicollier (Capt., Swiss Air Force) of the European Space Agency and Jean-Francois Clervoy, European Space Agency.

To prepare for their mission, the seven-member Discovery crew members trained extensively. Training

for Brown and Kelly focused on rendezvous and proximity operations, such as retrieval and deployment of the telescope. Mission Specialists Smith, Foale, Grunsfeld and Nicollier trained for the multiple spacewalks required during the mission. As principal operator of the robotic arm, Clervoy practiced specifically for capture and redeployment of the telescope, rotation and pivoting of the telescope on the Flight Support System, and related contingencies.

STS-103 is the 96th Space Shuttle mission and the 27th flight of Discovery. The Space Shuttle will lift off from Launch Pad 39B. The orbital insertion altitude will be 317 nautical miles (587 kilometers/365 statute miles), and inclination will be 28.45 degrees to the equator. Discovery will rendezvous with Hubble 320 nautical miles (512 km) above the Earth. Landing is scheduled for Kennedy's Shuttle Landing Facility.

The Crew

Crew Commander Curtis L. Brown Jr. (Lt. Col., U.S. Air Force), who served as Mission Commander on two previous Shuttle missions and as Pilot on three others, will lead the STS-103 mission. His other missions include STS-47, STS-66, STS-77, STS-85 and STS-95 (a 9-day mission during which the crew supported a variety of research payloads including the Hubble Space Telescope Orbital Systems Test Platform). Brown, from Elizabethtown, N.C., received a bachelor of science degree in electrical engineering from the Air Force Academy in 1978. He served as an A-10 and F-16 test pilot before joining NASA and has logged over 6,000 hours flight time in jet aircraft. Brown logged over 1,190 hours in space since being selected by NASA in June 1987, as an astronaut candidate.

Pilot Scott J. Kelly (Lt. Cmdr., U.S. Navy) is a first-time flier aboard the Space Shuttle. Kelly, from Orange, N.J., received a bachelor of science degree in electrical engineering from the State University of New York Maritime College in 1987, and a master of science degree in aviation systems from the University of Tennessee, Knoxville, in 1996. Kelly was first designated as a naval aviator in July of 1989 and then completed training to become a test pilot in June 1994. He has logged over 2,000 flight hours in more than 30 different aircraft. Kelly joined the astronaut program in August 1996.

Payload Commander Steven L. Smith is a veteran of two space flights, STS-68 and STS-82 (the second Hubble servicing mission). Smith performed three spacewalks during STS-82. Smith was born in Phoenix, Ariz., but considers San Jose, Calif., to be his hometown. He received both bachelor and master of science degrees in electrical engineering and a master's degree in business administration, all from

Stanford University. He was a payload officer with NASA before being selected as an astronaut candidate in March 1992.

Mission Specialist C. Michael Foale, Ph.D., will be making his fifth space flight after previously accumulating more than 160 days in space, including a four-month stay on the Russian space station, Mir. He was a Mission Specialist on STS-45, STS-56 and STS-63. Foale was born in Louth, England, but considers Cambridge to be his hometown. He attended the University of Cambridge, Queens' College, receiving a bachelor of arts degree in physics, with first-class honors, in 1978. He completed his doctorate in laboratory astrophysics at Cambridge in 1982. Before Foale was selected as an astronaut candidate in June 1987, he was a payload officer in the Mission Control Center at Johnson Space Center.

Mission Specialist John M. Grunsfeld, Ph.D., has flown on two previous Shuttle missions, including STS-67 (the second flight of the Astro observatory, a complement of three telescopes) and STS-81. Born in Chicago, Ill., Grunsfeld received a bachelor of science degree in physics from the Massachusetts Institute of Technology in 1980, and a master of science degree and a doctor of philosophy degree in physics from the University of Chicago in 1984 and 1988, respectively. Grunsfeld started his astronaut training in August 1992, after holding numerous academic positions and performing research in various areas of astrophysics.

Mission Specialist Claude Nicollier, (Capt., Swiss Air Force) will be making his fourth space flight. His previous Shuttle missions include STS-46, STS-61 (the first Hubble Space Telescope servicing mission) and STS-75. Nicollier is a native of Vevey, Switzerland. He received a bachelor of science degree in physics from the University of Lausanne in 1970, and a master of science degree in astrophysics from the University of Geneva in 1975. Nicollier was selected as a European Space Agency astronaut in 1978, and, under an agreement between NASA and the European Space Agency, he joined the NASA astronaut candidates selected in May 1980.

Mission Specialist Jean-Francois Clervoy, a European Space Agency astronaut, has flown on two other Space Shuttle missions, STS-66 and STS-84. Clervoy, from Toulouse, France, received his baccalauréat from Collège Militaire de Saint Cyr l' Ecole in 1976, and graduated from Ecole Polytechnique, Paris, in 1981. He lectured in signal processing and general mechanics at the Ecole Nationale Supérieure de l'Aéronautique et de l'Espace in Toulouse. He was selected as a French astronaut in 1985. Clervoy trained in Star City, Moscow, on the Soyuz and Mir systems in 1991, and was selected as an ESA astronaut in 1992.