

Hubble Facts

National Aeronautics and
Space Administration

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Hubble Space Telescope Servicing Mission 3A

SERVICE CALL TO HUBBLE

The Hubble Space Telescope Third Servicing Mission, originally scheduled for June 2000, has been divided into two missions. The first part, called SM3A, will be this fall, and the second part, SM3B, is tentatively scheduled for late 2000. This is in response to recent problems with several of Hubble's gyroscopes, which are required to accurately point the telescope at its scientific targets around the sky. During SM3A, astronauts will replace the gyroscopes, upgrade other telescope subsystems and perform scheduled preventative maintenance. In late 2000 a crew of astronauts will complete the remaining upgrades planned for Servicing Mission 3, including the insertion of a new, technologically advanced camera.

Hubble's Mission

The Hubble Space Telescope's mission is to spend 20 years probing the farthest and faintest reaches of the cosmos. This unique observatory operates around the clock, above the Earth's atmosphere, to gather information for teams of scientists who study virtually all the components of our universe, including planets, star-forming regions of the Milky Way galaxy, distant galaxies and quasars.

Crucial to fulfilling this mission is a series of scheduled, on-orbit manned servicing missions. During these servicing missions, astronauts perform a number of planned repairs and maintenance activities to upgrade the observatory's capabilities. The First Servicing Mission took place in December 1993, the Second Servicing Mission in February 1997. Servicing Mission 3A is scheduled for the fall of 1999 and 3B is scheduled for December 2000. The Fourth and final Servicing Mission is currently planned for 2003.

Mission Overview

The nine-day mission, STS-103 is scheduled for the fall of 1999. Members of the STS-103 flight crew are: Commander, Curtis L. Brown; Pilot, Scott J. Kelly; Payload Commander, Steven L. Smith; and Mission Specialists C. Michael Foale, John M. Grunsfeld, Claude Nicollier (European Space Agency), and Jean-Francois Clervoy, Mission Specialist (European Space Agency).

Working in pairs on alternating days, the four Extravehicular Activity (EVA) Crew-members will replace all six of the Telescope's gyroscopes, a guidance sensor and Hubble's main computer. They also will fit Hubble with a new transmitter and solid state data recorder, and they will attach voltage/temperature improvement kits to Hubble's six batteries. The EVA crew also will add new thermal coverings to Hubble's exterior. Astronauts will complete these tasks in four scheduled EVA days. One additional EVA day can be added if necessary.

This service call will leave Hubble renewed and refurbished to continue its 20-year science mission.

What's Being Replaced

Rate Sensor Units: The Rate Sensor Units allow the Telescope to point at stars, planets and other celestial targets. Three are aboard Hubble, and each unit contains two gyroscopes. Hubble needs three of these six gyroscopes to meet its very precise pointing requirements, and the other three are spares. Gyroscopes have limited lifetimes, and currently only three of the six are working properly the minimum number needed to continue science operations. Astronauts will replace all three units, leaving Hubble with six fresh gyroscopes.

Fine Guidance Sensor: This is the second in a "round-robin" series of changeouts and refurbishments of the three fine guidance sensors, which allow fine pointing and keep Hubble stable. The SM3A refurbished Fine Guidance Sensor is the same unit that was returned from Servicing Mission 2. The Fine Guidance Sensor returned from this mission will be refurbished and upgraded for re-use on Hubble's fourth Servicing Mission.

New Spacecraft Computer: The radiation-rugged computer will replace Hubble's original, outdated main computer. The new computer will dramatically increase operational capabilities, reduce the burden of flight software maintenance, and significantly lower operational costs.

Voltage/Temperature Improvement Kits: As Hubble's batteries age, they become more susceptible to overheating if overcharged. The Voltage/Temperature Improvement Kit compensates for this by lowering the battery's charge termination voltage. Astronauts will install one kit for each of Hubble's six batteries.

Spare S-Band Single Access Transmitter: The transmitter replaces an aged and failed unit. That unit will be removed, returned to Earth and refurbished for a later flight.

Spare Solid State Recorder: The digital data recorder will serve as a high capacity backup to

the Solid State Recorder that replaced a mechanical tape recorder in 1997. It is essential for efficiently handling the high volumes of data from Hubble's newest instruments and for maintaining high science productivity.

New Outer Blanket Layer: Stainless steel sheets will be installed in various locations on the Telescope to help control Hubble's internal temperature. Covered with a protective thermal coating, these sheets will fit over existing insulation that has degraded.

The following tasks will be performed on SM3A, time permitting. If there is insufficient time, these tasks will be completed on SM3B:

Shell/Shield Replacement Fabric: Flexible aluminized Teflon sheets will be added to the exterior surfaces of Hubble's forward shell and light shield. This protective covering provides additional insulation against the harsh space environment.

Aft Shroud Latch Repair Kit: Astronauts will replace latches on Hubble's bay door. During Servicing Mission - 2, Astronauts observed galling on these latches. The galling was caused by high torque.

Handrail Covers: Fiberglass cloth, called beta cloth, will be fitted like sleeves around the handrails above the Fine Guidance Sensors bay to prevent contamination to the Aft Shroud area. Flaking paint was observed on these handrails during Servicing Mission - 2.

FOR ADDITIONAL INFORMATION CONTACT

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