

Hubble Facts

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771



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Hubble Space Telescope Servicing Mission 3A COST TO TAXPAYERS

NASA's Hubble Space Telescope is the first observatory designed for routine maintenance, upgrade, and refurbishment on orbit. The program is planned as a 20-year mission with periodic servicing by Shuttle astronauts. Hubble's modular design allows for more than 90 spacecraft components and all of the scientific instruments to be replaced on orbit. Servicing maintains the spacecraft, ensures operation at maximum scientific efficiency and allows for incorporation of new technology.

Hubble was launched on April 24, 1990 with a full complement of six scientific instruments. At that time, an inventory of spare HST hardware was available to support future servicing missions. Since launch, HST budgets have been sized to develop new instruments, to maintain the spare hardware, to sustain hardware expertise, to plan and develop servicing activities, and to test and integrate the payloads with the Shuttle.

Due to gyroscope failures and the potential for interruption of the science program should another gyroscope fail, a servicing mission was needed as soon as replacement gyroscope hardware could be ready. Servicing Mission 3 (scheduled for June 2000) was divided into two flights—Servicing Mission 3A (SM3A), scheduled for Fall 1999, and Servicing Mission 3B (SM3B), scheduled no earlier than 2001. Much of the hardware planned for Servicing Mission 3

will not be ready in time for the first flight, and will therefore be installed on SM3B.

The cost to carry out the 3A mission is \$136 million. This includes \$19 million of HST costs for the additional servicing mission, \$7 million of HST costs to switch from Columbia to Discovery, and \$110 million for the Shuttle to carry out the mission and replace Space Shuttle flight hardware previously assigned to another mission. NASA has also spent approximately \$69 million on Servicing Mission 3A, in addition to the \$136 million, reflecting the costs of building and testing the planned replacement hardware, ground operations and other related activities.

All 6 gyroscopes will be replaced during the Fall 1999 SM3A mission. In addition, the crew will replace a guidance sensor (a unit brought back to the ground after the last mission and refurbished) and the spacecraft's computer. The new computer will reduce the burden of flight software maintenance and significantly lower operating costs. Voltage/temperature kits will be installed to protect spacecraft batteries from overcharging and overheating in certain, infrequent spacecraft modes of operation. A new radio frequency transmitter will replace a failed spare one currently aboard the spacecraft, and a spare solid state recorder will be installed to allow more efficient handling of high-volume data.

HST Programs & STS-103 Costs

Servicing Mission Costs - HST

Planned Servicing Mission Hardware & Software

Gyroscopes	8
Fine Guidance Sensor	13
Advanced Computer	7
Other Flight Hardware	11
Simulators/Testing	6
Ops/Software Development	24

Sub-total 69

Costs for Flight Changes

HST Cost for Additional Servicing Mission	19
HST Cost for Switching from Columbia to Discovery	7

Sub-total 26

HST Total 95 Million

Servicing Mission Costs - Shuttle

Shuttle Flight Costs 110 Million

Total STS-103 Mission Costs

Shuttle	110
HST	95

Total 205 Million

For additional information contact:

Nancy Neal

Goddard Space Flight Center
Office of Public Affairs
(301) 286-0039
Internet: <http://www.gsfc.nasa.gov>

Don Savage

NASA Headquarters
Office of Public Affairs
(202) 358-1600
Internet: <http://www.nasa.gov>