



c/o ST-ECF
ESO, Karl-Schwarzschild-Str.2
D-85748 Garching bei München,
Germany
Telephone: +49 (0)89 3200 6306
Cellular: +49 (0)173 38 72 621
Telefax: +49 (0)89 3200 6480
hubble@eso.org

NEWS RELEASE
NEWS RELEASE

www.spacetelescope.org

HEIC9905

News release:

HST - Telescope, Observations and Servicing Mission

25-Nov-1999: **The Hubble Space Telescope (HST) is a joint ESA/NASA project launched into a low-Earth orbit 600 km above the ground in 1990 by Space Shuttle mission STS-31. During its first nine years of operations HST has become one of the most important science projects ever.**

Today the HST Archives contain more than 260 000 astronomical observations. More than 13 000 astronomical objects have been observed by hundreds of different groups of scientists. Direct proof of the scientific significance of this project is the record-breaking number of papers published: over 2400 to date.

Footnote 10 December: Launch date under review.

Some of HST's most memorable achievements are:

the discovery of myriads of very faint galaxies in the early Universe, unprecedented, accurate measurements of distances to the farthest galaxies, significant improvement in the determination of the Hubble constant and thus the age of the Universe, confirmation of the existence of black holes, a far better understanding of the birth, life and death of stars, a very detailed look at the secrets of the process by which planets are created.

Europe and HST

ESA's contribution to HST represents a nominal investment of 15%. ESA provided one of the two imaging instruments - the Faint Object Camera (FOC) - and the solar panels. It also has 15 scientists and computer staff working at the Space Telescope Science Institute in Baltimore (Maryland). In Europe the astronomical community receives observational assistance from the Space Telescope European Coordinating Facility (ST-ECF) located in Garching, Munich. In return for ESA's investment, European astronomers have access to approximately 15% of the observing time. In reality the actual observing time competitively allocated to European astronomers is closer to 20%.

Looking back at almost ten years of operation, the head of ST-ECF, European HST Project Scientist Piero Benvenuti states: *"Hubble has been of paramount importance to European astronomy, much more than the mere 20% of observing time. It has given the opportunity for European scientists to use a top class instrument that Europe alone would not be able to build and operate. In specific areas of research they have now, mainly due to HST, achieved international leadership."*

One of the major reasons for Hubble's success is the advantage of being in orbit, beyond the Earth's atmosphere. From there it enjoys a crystal-clear view of the universe - without clouds and atmospheric disturbances to blur its vision. European astronomer Guido De Marchi from ESO in Munich has been using Hubble since the early days of the project. He explains: *"HST can see the faintest and smallest details and lets us study the stars with great accuracy, even where they are packed together - just as with those in the centre of our Galaxy"*. Dieter Reimers from Hamburg Observatory adds: *"HST has capabilities to see ultraviolet light, which is not possible from the ground due to the blocking effect of the atmosphere. And this is really vital to our work, the main aim of which is to discover the chemical composition of the Universe."*

The Servicing Missions

In the early plans for telescope operations, maintenance visits were to have been made every 2.5 years. And every five years HST should have been transported back to the ground for thorough overhaul. This plan has changed somewhat over time and a servicing scheme, which includes Space Shuttle Servicing Missions every three years, was decided upon. The two first Servicing Missions, in December 1993 (STS-61) and February 1997 (STS-82) respectively, were very successful. In the first three years of operations HST did not meet expectations because its primary mirror was 2 microns too flat at the edge. The first Servicing Mission in 1993 (on which the European astronaut Claude Nicollier flew) dealt with this problem by installing a new instrument with corrective optics (COSTAR - Corrective Optics Space Telescope Axial Replacement). With this pair of 'glasses' HST's golden age began. The images were as sharp as originally hoped and astonishing new results started to emerge on a regular basis.

The first Servicing Mission also replaced the solar panels and installed a new camera (Wide Field and Planetary Camera 2 - WFPC2). The High-Speed Photometer (HSP) was replaced by COSTAR.

During the second Servicing Mission instruments and other equipment were repaired and updated. The Space Telescope Imaging Spectrograph (STIS) replaced the Goddard High Resolution Spectrograph (GHRS) and the Near-Infrared Camera and Multi-Object Spectrometer (NICMOS) replaced the Faint Object Spectrograph (FOS).

Servicing mission 3A

The original Servicing Mission 3 (initially planned for June 2000) has been split into two missions - SM3A and SM3B - due in part to its complexity, and in part to the urgent need to replace the failed gyroscopes on board. Three gyroscopes must function to meet the telescope's very precise pointing requirements. With only two new operational, observations have had to be suspended, but the telescope will remain safely in orbit until the servicing crew arrives.

During this servicing mission

all six gyroscopes will be replaced,
a Fine Guidance Sensor will be replaced,
the spacecraft's computer will be replaced by a new one which will reduce the burden of flight software maintenance and significantly lower costs,
six voltage/temperature kits will be installed to protect spacecraft batteries from overcharging and overheating if the spacecraft enters safe mode,
a new S-Band Single Access Transmitter will replace a failed spare currently aboard the spacecraft,
a solid-state recorder will be installed to replace the tape recorder,
degraded telescope thermal insulation will be replaced if time allows; this insulation is necessary to control the internal temperature on HST.
For the mission to be fully successful the gyroscopes, the Fine Guidance Sensor, the computer and the voltage/temperature kits must be installed. The minimum mission success criterion is that HST will have 5 operational gyros after the mission, 4 of them newly installed.

The Future

During SM3B (presently scheduled for 2001) the astronauts will replace the Faint Object Camera with the Advanced Camera for Surveys (ACS), install a cooling system for NICMOS enabling it to resume operation, and install a new set of solar panels. Replacement of the thermal insulation will continue and the telescope will be reboosted to a higher orbit.

The plans for the fourth Servicing Mission are preliminary at this time, but two new science instruments are being developed for that mission: Cosmic Origins Spectrograph (COS), which will replace COSTAR, and Wide Field Camera 3 (WFC3), which will replace WFPC2.

It is planned to retrieve Hubble at the end of its life (around 2010) and bring it back to Earth.

In the future ESA may have the opportunity to continue its collaboration with NASA on the Next Generation Space Telescope (NGST), which in many ways can be seen as Hubble's successor. The plan is to launch NGST in 2008, and ESA is currently considering a possible role in the project. Piero Benvenuti concludes: 'The European Space Agency, in deciding to join NASA on the HST Project, made a very successful investment on behalf of European science. Today, NASA would not consider proceeding alone on the continued operation of HST or on the design of NGST. Not just because of the benefit of shared cost, but mainly because of the intellectual contribution by the European astronomers, who have made such effective scientific use of HST.'

#

For more information, please contact:

Lars Lindberg Christensen

Hubble European Space Agency Information Centre, Garching, Germany

Phone: +49-(0)89-3200-6306

Cellular (24 hr): +49-(0)173-38-72-621

E-mail: lars@eso.org