

Hubble Facts

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771



FS-1999-06-018-GSFC

Hubble Space Telescope Servicing Mission 3A SPACE TELESCOPE OPERATIONS CONTROL CENTER

Inside the Hubble Command Center

Working 24 hours a day at NASA's Goddard Space Flight Center in Greenbelt, Md., ground controllers command and control the Hubble Space Telescope. From the Space Telescope Operations Control Center or STOCC, as it's better known, commands are sent to the Telescope to direct the observation of astronomical targets, one after another, all across the sky. The Telescope sends information to the STOCC that engineers use to make sure everything is going as planned. The STOCC is the focal point of all Hubble Space Telescope operations.

Here Hubble's operators monitor the Telescope's health and safety while they control flight operations and engineering and science activities. One section of the STOCC supports the preparation, test and simulation for the next servicing mission, while routine operations continue simultaneously in an adjacent area. In another area, engineers perform in-depth subsystem analysis, conduct simulated subsystem tests, integrate new databases, and validate new ground software and updates to flight software.

Fulfilling a Vision

In February 1999, the mission operations team began using the new Control Center System (CCS) to command and control Hubble. CCS is the culmination of a massive reengineering of both the flight and ground system begun in

February 1995 to improve Hubble's overall performance and drastically reduce the cost of operations and systems maintenance. This effort, called Vision 2000, goes well beyond replacing outdated software and hardware. It streamlines the functional flow, eliminates redundant systems and provides the operators and spacecraft engineers with a user-friendly interface. Architectural complexity is greatly reduced by consolidating the functions of the five original systems of spacecraft control, analysis, data management, command management and subsystem calibration into a single system.

CCS is very portable. It may be operated in a single computer mode at a user facility or in a high performance multi-computer mode, the configuration used in the STOCC. Currently 25 CCS strings support a broad range of activities including: operations; servicing mission simulations; payload and spacecraft flight software development; operator training; procedure development and verification; software maintenance and test; new spacecraft hardware test and integration at Goddard Space Flight Center and science instrument development at Ball Aerospace in Colorado. Users can customize their string's databases to suit their particular application. Some of the advanced performance features of CCS are identified below.

CCS automates engineering telemetry management, including the merging of real-time and stored spacecraft data, thereby reducing the delay

in obtaining this data for analysis and trouble shooting from 6-48 hrs to 0-8 hrs. In the past, this process has involved as many as sixteen people; that number is now reduced to zero.

At all times, controllers have instant access to six months of telemetry data, stored either on-line or in data warehouse. CCS provides approximately 300 users concurrent access to Hubble Space Telescope data via an advanced, interactive graphical interface to perform monitoring and analysis. The operators can obtain visual displays of any requested telemetry, produce graphs and perform analysis on the data in near real-time at the consoles.

The Team Behind the Telescope

Just as the astronauts have trained extensively for the upcoming 1999 servicing mission, so too has Hubble's Flight Operations Team in the STOCC. Shortly after launch, this team will prepare Hubble for the on-orbit service call. They will begin by transitioning the Telescope from normal science operations to a "ready for servicing" condition.

The team will command Hubble to its capture attitude and configure it for rendezvous with the Space Shuttle Discovery. They will command Hubble's aperture door to close and the high gain antennas to be stowed in preparation for capture by the Shuttle's robotic arm and berthing in the payload bay. The solar arrays will remain deployed and following berthing, Hubble's power will be provided by the Shuttle. To aid astronauts in their servicing tasks, the Telescope will then be rotated to several different positions on its

berthing platform to allow easy access to the equipment bays.

After the new equipment is installed, STOCC ground controllers will command tests on the newly installed items. These tests will be done immediately after installation, with the crew positioned at a safe location, to determine if the installed equipment will require any further astronaut activity. Later, while the crew sleeps, the STOCC team will perform more detailed functional checkouts of the installed equipment to determine if further work is necessary.

After all servicing is completed, Hubble and Discovery will be configured for battery charging. The Shuttle crew will transfer the Telescope to internal power, disconnect the power feed, and using the robotic arm, position Hubble for deployment. The STOCC will command the deployment of the high gain antennas and opening of the aperture door. All equipment powered off for servicing will be reactivated and checked out. Hubble will then be released. Operational re-commissioning of the telescope will take place, and normal science operations will resume.

FOR ADDITIONAL INFORMATION CONTACT

Nancy Neal
Goddard Space Flight Center
Office of Public Affairs
(301) 286-0039