

NASA Facts

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This photo shows the Mission Operations Room in the Space Telescope Operations Center, the locus for Hubble Space Telescope operations at NASA's Goddard Space Flight Center.

Hubble Space Telescope Operations Control Center

The focal point of all Hubble Space Telescope (HST) activities is the Space Telescope Operations Control Center (STOCC) at NASA's Goddard Space Flight Center in Greenbelt, Md., where the orbiting observatory is managed.

The HST Nerve Center

The STOCC truly is the nerve center for Hubble — all commands to the space telescope are issued from the facility, and data gathered by the observatory arrive there first. The STOCC consists of seven facilities: Mission Operations Room, Secondary Mission

Operations Room, System Engineering and Evaluation Room, Payload Operations Control Center, Mission Support Room, Engineering Support System and Mission Planning Office. A description of each facility comprises the rest of this fact sheet.

Mission Operations Room (MOR): The MOR is used to control and monitor HST flight operations, engineering and science activities. It contains the operational work stations and displays required to monitor the health and safety of the spacecraft. It also provides the system capability to command the spacecraft and monitor all engineering and science activities. Adjacent to the MOR is another room called the Secondary Mission Operations Room (SMOR), which is used to support the preparation, test and simulation for the HST First Servicing Mission in December 1993 while routine operations are conducted simultaneously at the MOR. The SMOR has the same capabilities as the MOR and can quickly be configured to support routine operations or any other Hubble spacecraft support activity. (An illustration of these rooms and a staffing outline appear later in this fact sheet.)

System Engineering and Evaluation Room (SEER): The SEER is used by the HST subsystem engineers to perform in-depth subsystem analysis, to conduct simulated subsystem tests, to integrate new data bases, and to validate new ground software and updates to flight software. This room has the same capabilities as the MOR and also can be configured as a backup operations control room.

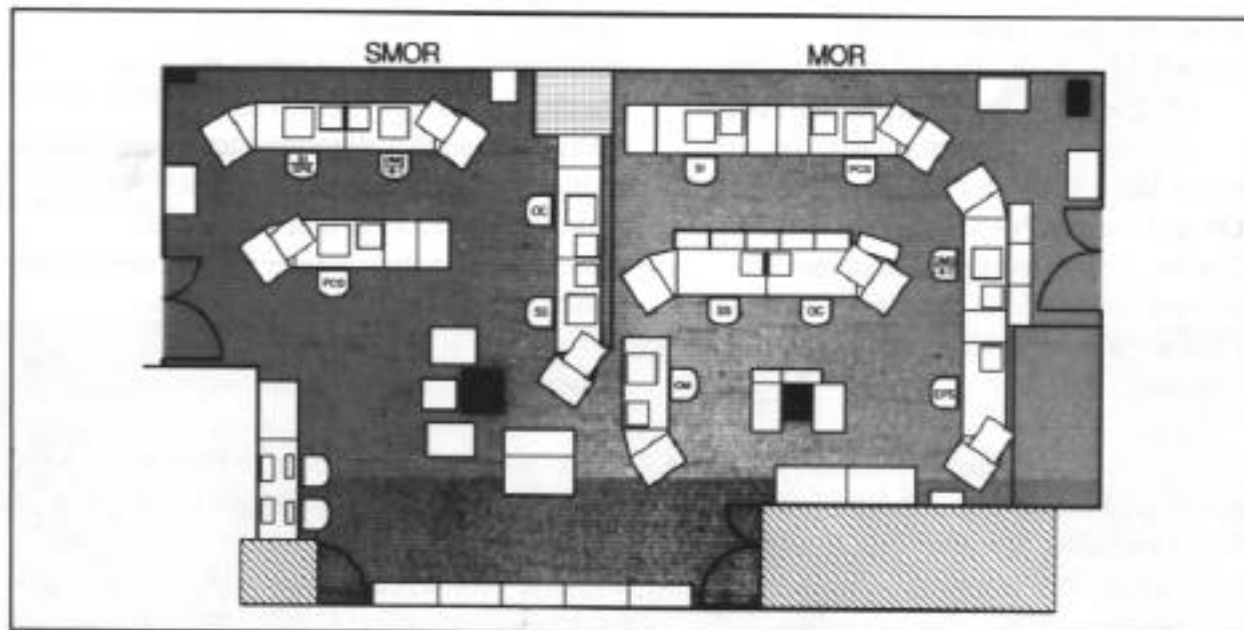
Payload Operations Control Center (POCC): The POCC is an essential element of the overall HST ground system. The POCC supports all HST activities by coordinating communication and data acquisition with MOR personnel and the NASA Network

Control Center (NCC) at Goddard. This facility houses all application processor computers, data receiving and recording subsystems, telemetry and commanding equipment; and the communications equipment needed to achieve HST mission operations objectives.

Mission Support Room (MSR): The MSR directly supports day-to-day flight operations and engineering activities by providing off-line mission planning functions and data processing. MSR personnel provide the scheduling interface with the Network Control Center at Goddard, generate the science and engineering load for the onboard computers, and perform astronomy and engineering data processing. In addition, MSR analysts provide the updates necessary to maintain navigational integrity and pointing accuracy of the observatory.

Engineering Support System (ESS): The ESS supports mission operations requirements for subsystem analysis and trending. It provides near real-time and post analysis support using spacecraft engineering data.

Mission Planning Office (MPO): The MPO coordinates all mission operations scheduling activities, science mission specifications processing and development of the loads for onboard computers. The MPO is the primary interface with the Space Telescope Science Institute in Baltimore, Md., in resolving science mission specification scheduling conflicts and coordinating science activities.



This diagram shows the layout of the Secondary Mission Operations Room, left, and the Mission Operations Room. Abbreviations correspond to staffing locations.

Mission Operations Room

Space telescope operations — including health and safety of the spacecraft, efficient operation and flight system engineering of the observatory — are the responsibility of NASA contractors under the Mission Operations, System Engineering and Software (MOSES) contract. The contract was implemented by the HST Operations and Ground System Project, which manages the space telescope. The following positions are staffed by MOSES personnel except for the Operations Manager, who is a civil servant:

The **Operations Manager (OM)** is NASA's space telescope project operational representative. The OM manages and provides technical direction to the Flight Operations Team during normal HST operations activities, engineering tests and simulations. This functional position assures project representation around the clock to meet day-to-day mission objectives. The OM, while on duty, is responsible for the overall operations and health and safety of the observatory in orbit.

The **Shift Supervisor (SS)** is the lead member of each Flight Operations (FO) team. The SS oversees the activities of all mission operations personnel on shift and has overall responsibility for assuring the real-time health and safety of the space telescope. The SS coordinates the execution of all real-time commanding to the vehicle and, from the master console in the MOR, must issue a software "allow" to authorize any commanding during critical operations. The SS coordinates the interface configurations with the many elements required to support mission operations and ensures that personnel adhere to responsible operations conduct.

The Operations Controller (OC) is responsible for controlling all commanding to the HST. The OC controls the on-line system capabilities and assignments at each console position and coordinates interfaces between the MOR and various NASA organizations. The OC is the central point of contact for communications within the MOR and acts in the place of the Shift Supervisor during his or her absence.

The Science Instrument/Command and Data Handling/Thermal Control Subsystem

Flight Controller is responsible for the health and safety of the science instruments and the science instrument command and data handling subsystem. This flight controller also monitors the status of the onboard NSSC-1 computer, which controls the payload, and its interface with the onboard DF-224 engineering computer and the science instruments. The thermal state of the spacecraft also is monitored by this flight controller, who also recommends to the Operations Controller any commanding necessary to safeguard the vehicle or payload.

The Electrical Power Subsystem/Optical Telescope Assembly/Pointing Control Subsystem

Flight Controller verifies the performance of the space telescope's batteries during their use in Earth shadow and recharging in sunlight, and ensures that the solar arrays are positioned correctly to maximize power to the spacecraft. This flight controller also is responsible for the health and safety of the pointing control subsystem and

for verifying its nominal performance, including the state of the gyros, reaction wheels, and safing system. The flight controller monitors all target acquisitions and verifies that the spacecraft is stable. This controller also ensures that the optical telescope assembly is within thermal limits and monitors the status of the fine guidance sensors. The controller advises the Shift Supervisor in the event of an anomaly involving these subsystems and recommends to the Operations Controller any commanding necessary to safeguard the vehicle or payload.

The Data Management Subsystem/Instrumentation and Control/Structures and Mechanisms

Flight Controller monitors the performance of the onboard DF-224 engineering computer and performs onboard tape recorder management. This flight controller also is responsible for the flow of commands to, and data from, the space telescope and determines the proper data mode, telemetry rate, format, and receiver and transmitter configurations to support this function. The flight controller monitors the mode and quality of the forward and return links between the HST and the Space Network or the Ground Network and verifies the correct pointing of the high-gain antennae. In the event of an anomaly involving any of these subsystems, the controller advises the Shift Supervisor and recommends to the Operations Controller any commanding necessary to safeguard the vehicle or payload.