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Hubble Upgrade Results

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HUBBLE SPACE TELESCOPE CHECK-OUT FINDS SUCCESSES, CONCERNS

The Servicing Mission Observatory Verification (SMOV) for NASA's Hubble Space Telescope (HST), currently about halfway through its detailed check-out prior to returning to scientific operations, has found Hubble in overall excellent health, with seven of the eight components replaced or installed during the servicing mission functioning very well to date. However, a few concerns with one of the science instruments are being evaluated.

"The Hubble Space Telescope is checking out extremely well overall, and the few anomalies we see give us no reason to believe we will not be able to meet all our scientific goals," said Dr. Ed Weiler, HST Program Scientist, NASA Headquarters, Washington, DC.

"I'm very impressed that in just the few weeks since the servicing mission, we've already seen Hubble take the best images of Mars ever obtained from Earth's distance. Every observatory commissioning encounters some problems, but we're on track to clear up all our remaining concerns. That's good news for the many, many astronomers who are lined up for observing time on Hubble."

Earlier this month science observations with the Wide Field and Planetary Camera-2 resumed, and on March 10 the science team obtained images of Mars. Also, further optimization and alignment of the mirrors in the new Fine Guidance Sensor (FGS), installed during the servicing mission, were completed with excellent results following its first star observation. Project management officials say it's clearly the best FGS aboard HST.

Commissioning of the new Space Telescope Imaging

Spectrograph (STIS) has proceeded very well, according to project officials. In the coming two weeks team members will test the instrument's ability to acquire targets in the narrow slits. Once this is demonstrated, the instrument will be ready to begin science operations.

Checkout of the Near Infrared Camera and Multi-Object Spectrometer (NICMOS), installed during the second servicing mission, has provided both excellent results and some areas of concern.

The NICMOS, designed to observe the universe in near-infrared light, contains three cameras and a set of highly advanced light sensors which must be maintained at a very cold temperature -- nominally 58 degrees Kelvin (-355 degrees Fahrenheit). These sensors, along with filters and other components, are housed in a large cryogenic dewar (a high-technology insulated bottle filled with about 225 lbs of solid nitrogen embedded in aluminum foam).

The NICMOS Principal Investigator, Dr. Rodger Thompson, University of Arizona, said NICMOS high resolution cameras 1 and 2 have shown excellent images in preliminary focus tests. However, these tests also show that camera 3 focus is currently beyond the range of the NICMOS internal mechanical adjustment capability. Analysis indicates the situation may be due to unexpected thermal contact in the dewar, which results in a slightly warmer cryogen temperature and a subsequent reduction of dewar lifetime.

The most likely explanation is that as the solid nitrogen warms up it expands, and exerts pressure on the internal structure of the dewar. This expansion resulted in an unwanted physical contact between two internal structural components of the dewar, providing a pathway for excess heat to travel from the warmer outer structure of the dewar to its colder internal parts, warming the solid nitrogen to a higher than desired operating temperature. This expansion also is affecting the performance of Camera 3.

The analysis team expects that the thermal contact might release in the future, returning NICMOS to its nominal state. Under these conditions, analysts predict that camera 3 should move back into the instrument's range of focus. Rearrangement of the NICMOS observing schedule could allow the full implementation of the NICMOS science program.

It will take several weeks or months for team engineers to be able to determine for certain the amount of reduction in the lifetime of the cryogen; however, the reduction can be compensated for by rearrangement of observing schedules.

Current plans call for SMOV activities to continue for the next few weeks with results of the Early Release Observation program available in early May.

During the STS-82 HST Second Servicing Mission in February, astronauts aboard the Space Shuttle Discovery replaced two older science instruments aboard Hubble with STIS and NICMOS, and also replaced a Fine Guidance Sensor, a Reaction Wheel Assembly, a Data Interface Unit, a Solar Array Drive Electronics package, an Engineering/Science Tape Recorder, and a Solid State Recorder. In addition, the astronauts performed other maintenance on the observatory, including patching of some insulation and installing covers on the Magnetic Sensing System.

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