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# SPACE CENTER Roundup

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## Crew prepares for third Hubble servicing mission

By Kyle Herring

### *Has it been three years already?*

Seems that's about the right interval between trips to probably the most famous telescope in the world, named after one of the most respected astronomers – Edwin P. Hubble.

The telescope bearing Hubble's name is due for a 400-million-mile checkup next month, albeit earlier than originally planned in order to change the observatory's six gyroscopes that have proven quite finicky over the course of its on-orbit life.

The Hubble Space Telescope continues to amaze, enlighten and spark the imagination of people around the world with almost every observation. Three of its six gyros have failed, prompting the team to call for an earlier-than-planned visit to change all six and perform some other tasks scheduled for the normal servicing call that was planned next year.

With this earlier house call, the third servicing mission has been split into two – servicing missions 3A and 3B. The next visit will wait until 2001 with the successful restoration to full redundancy of all gyroscopes.

As with the two previous servicing calls, four space walkers will form two teams to tackle the tasks during four excursions outside after the observatory is safely captured by the robot arm and secured atop its familiar work platform in *Discovery's* payload bay.

Air Force Col. Curt Brown, no stranger to space flight, will lead the STS-103 mission. He is preparing to head into orbit for a U.S. record-tying sixth time – third as commander.

"I am very honored and very excited about being part of the Hubble mission," he said. "There's a lot of folks up at Goddard that do a tremendous amount of work... so I'm very excited to be a part of that team and I'm hoping that we can go up and...bring Hubble back to A-1 condition."

NASA's Goddard Space Flight Center in Greenbelt, MD, oversees the telescope's operation and maintenance and has tested all of the equipment to be installed in, and on, Hubble during the scheduled 10-day flight set to launch in the pre-dawn hours of December 6.

Launch is timed to occur as the telescope flies within range of the Kennedy Space Center, FL. Two days later, Brown will fly *Discovery* in for a manual approach to within 35 feet – just enough to allow Jean-François Clervoy to reach it with the robot arm.

Clervoy, calling this role the "summit" of the mission for him personally, has big shoes to fill on this task. He follows his fellow European Space Agency astronaut Claude Nicollier, now one of the four space walkers, and Steve Hawley, the premier arm operator when it comes to Hubble.

The shuttle's cockpit will be a busy one during the rendezvous phase. While Brown and Clervoy float side-by-side at the aft windows – Brown flying the shuttle and Clervoy poised with the arm – pilot Scott Kelly (Navy Lieutenant Commander) will be sitting in the commander's seat watching over orbiter systems and computer commands. Steve Smith will be next to him inputting commands, as necessary, to the telescope. John Grunsfeld will be taking precise distance measurements with a laser while Mike Foale oversees photography and television operations.

Once the telescope is firmly in the grasp of the arm, it will be lowered onto the Flight Support System in the back of the payload bay where it will stay for the next six days.

During that time, four space walkers will perform four excursions outside in teams of two as has been the procedure for the previous servicing missions. Alternating the space

walks will be Smith, payload commander and veteran of the previous trip to Hubble in 1997, and Grunsfeld. The two will perform the first and third extravehicular activities (EVA). Foale and Nicollier will tackle the second and fourth space walks.

As with previous missions, the astronauts will be distinguishable by the markings on their extravehicular mobility units (EMUs), or spacesuits. Smith will have a solid red stripe on the upper portion of his suit. Grunsfeld will have an all-white suit. Foale will have a broken red stripe and Nicollier will wear a suit with a diagonal broken red stripe.

Also as before, all tasks are prioritized to maximize the time available to complete all scheduled activities. But each astronaut is completely cross-trained in each task in the event that one is moved to a different day.

Smith performed three space walks on the '97 mission and is the payload commander on this flight. He remembers vividly seeing Hubble as it grew larger in the shuttle's overhead windows during the rendezvous.

"As it got closer and closer, the arrays, which are gold, really kind of sparkled and I'd always heard that once you see Hubble, you'll never forget it. It really is this magical looking spaceship, and it really is just a spectacular sight to see," said Smith.

Once captured and safely affixed to its support structure, Hubble will get its electrical power from *Discovery* for the duration of its stay in the payload bay.

The next day, Smith and Grunsfeld will change the three Rate Sensor Units housing the six gyroscopes. Other tasks on the first space walk include opening some valves on the Near Infrared Camera and Multi-Object Spectrometer to ensure its nitrogen system is fully depleted. The system will be repaired on the next visit and this short task will help that future activity. The final scheduled task for EVA day one will be to install six small voltage regulators to protect the telescope's aging batteries from overheating.

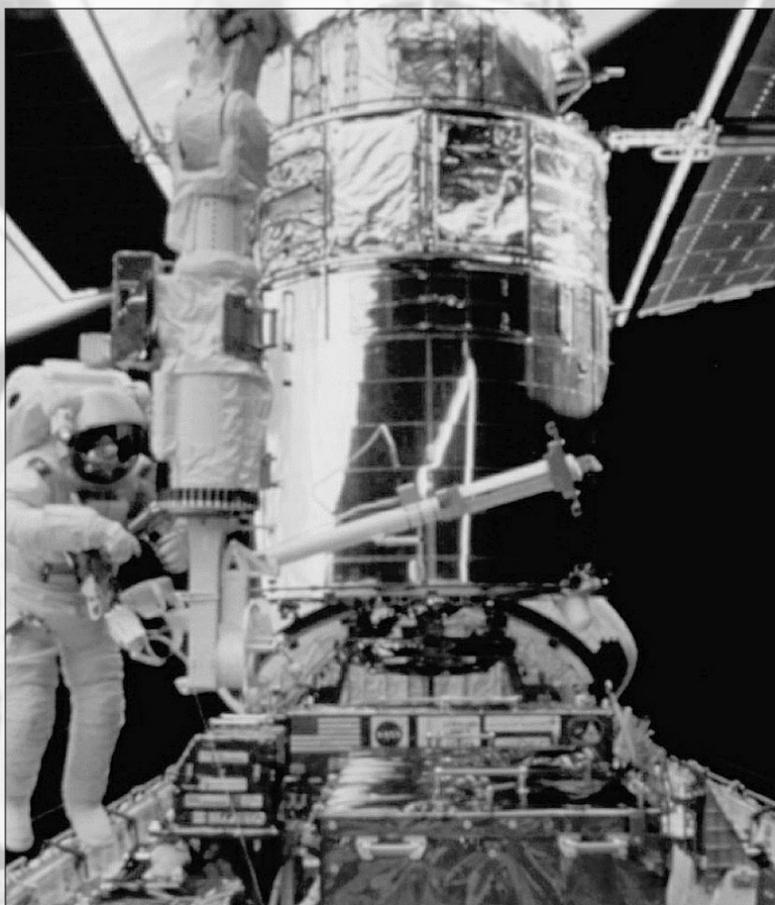
Grunsfeld says his path to this point seems to have been fate. He studied astronomy and physics at MIT, then moved on to the University of Chicago where Edwin Hubble received his Ph.D., and then on to the California Institute of Technology where Hubble went after the University of Chicago. Heading to the Mount Palomar Observatory to work on instruments and make observations as Hubble did led Grunsfeld to the realization that "this is a mission I'd been training for nearly all my life. It's absolutely a dream come true [and I] couldn't imagine anything more fulfilling for an astronomer, but also for me personally... than being on this Hubble mission."

As with previous missions, the EVA 1 and 3 crew will take a day off while the 2 and 4 crew heads outside.

Foale and Nicollier will team on EVA day two. They will install a new computer in the telescope and then change out one of the Fine Guidance Sensors. This task will be quite familiar to most observers since an identical task was performed on the last HST mission. The FGS is a pie-shaped instrument weighing about 500 pounds. It locks on stars to hold the telescope in a precise position for long periods while other scientific instruments are conducting observations. It has been refurbished and upgraded from the '97 mission.

"Hubble is like the gem payload of NASA," Foale says. "It's produced some of the most startling visual images ever.... It's putting out these fantastically high quality images that captivate the rest of the world."

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