Thomas continues research; cosmonauts reset space walk

U.S. Astronaut Andy Thomas continues his microgravity research aboard Russia's Mir Space Station as two cosmonauts prepare to try again in April to mount a space walk to brace the damaged Spektr solar array.

Mir 25 Commander Talgat Musabayev and Flight Engineer Nikolai Budarin were preparing to exit the Mir space station from the airlock in the Kvant 2 module two weeks ago to effect the solar array repairs, but were unable to open a secondary latch on the airlock hatch.

The hatch has 10 primary latches and 10 secondary latches and Musabayev and Budarin were able to release all the primary latches and nine of the secondary latches, but not the final one. During their efforts, the special tool used to unfasten the latches was broken. A second general purpose wrench also was bent. A supply of additional wrenches is on Mir, but none of those in the airlock was the correct size.

If a space walk were required at this time, the crew has the necessary tools on board to open the latches. However, Mir's Russian controllers have chosen not to perform any space walks until after the next Progress resupply vehicle arrives March 17.

Prior to the solar array space walk, beginning sometime in early April, there will be three space walks to replace the propulsion system atop the Safora boom assembly on the Kvant-1 module. This propulsion assembly has been operating since its delivery to the station in March 1987, and is close to running out of propellant.

Thomas continued to oversee the Biotechnology System Co-Culture experiment designed to grow two different cell types and form three dimensional tissue samples in space.

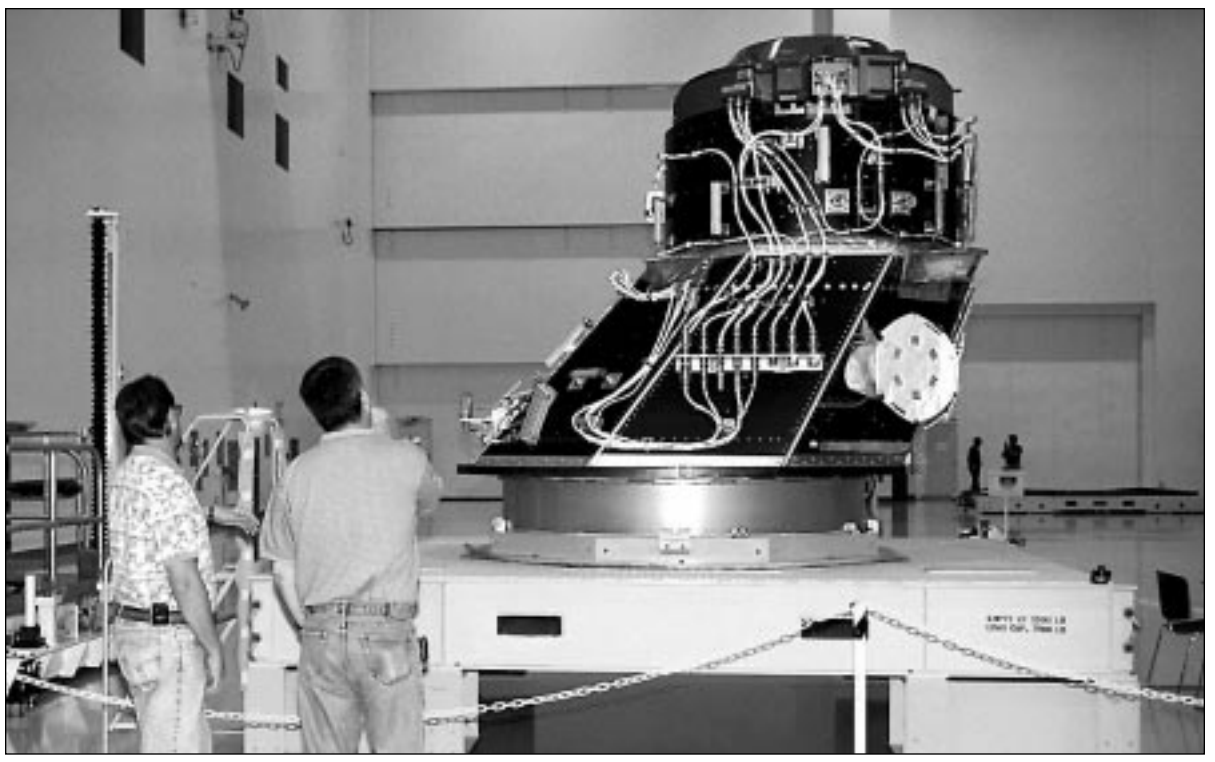
Air bubbles in the rotating chamber have hampered the experiment's effectiveness, but researchers on the ground have developed troubleshooting measures in an effort to remove the bubbles from the chamber's growth medium. Thomas reduced the rate at which media and nutrients rotate around the reactor chamber to eliminate bubbles and decrease the oxygen reaching the cells. COCULT researchers wanted to ensure the cells receive the correct amount of oxygen.

In a letter home posted on the NASA Shuttle-Mir Web of the Internet, Thomas described the STS-89 docking with Mir that made him the seventh and final NASA astronaut to live on Mir.

"I have to admit, my first views of the station were a little daunting, and it was very confining as we floated down the Kristall module to the Base Block," Thomas wrote. "There was a lot of equipment stowed on all the panels and in every available location. But it did open out at the base block which is more spacious by comparison."

He also recalled the experience of watching the shuttle depart.

"On the one hand I was sorry to see my colleagues leave, but on the other, it meant that I was now able to get on with the mission and work assigned to me. The shuttle was a breathtaking sight as it pulled away and flew around the station. During the daylight phase of the orbit the brilliant white of its tiled insulation system was caught in the sunlight. In the night passes the plumes of flame coming from the jet control system would light up the surrounding elements of the station," he wrote. "It was not long before they were out of sight and I was now totally committed to my stay on Mir for the next four months."



NASA Photo KSC-98PC-0313

ADAPTER ARRIVAL—Pressurized Mating Adapter-3, an element of the STS-92 mission scheduled for launch aboard *Atlantis* in January 1999, arrives from the Boeing Company in Huntington Beach, Calif., for processing in Kennedy Space Center's Space Station Processing Facility on Feb. 20. While in orbit, PMA-3 will be removed from the orbiter's payload bay by the astronauts using the remote manipulator arm and mated to Node 1, a connecting passageway to the living and working areas of the International Space Station. The primary purpose of PMA-3 is to serve as a shuttle docking port through which crew members and equipment will transfer to the International Space Station during later assembly missions.

More station elements arrive for processing

Two key components for the International Space Station are now at Kennedy Space Center and beginning processing for the third assembly flight.

Pressurized Mating Adapter-3 and the Z1 Integrated Truss Segment, the initial framework component for the International Space Station, were shipped from the Boeing Company in Huntington Beach, Calif., and are beginning processing at KSC's Space Station Processing Facility.

The PMA-3 and the Z1 truss are set to fly on STS-92, the third ISS assembly flight. While in orbit, PMA-3 will be removed from the shuttle's payload bay by the astronauts using the remote manipulator arm and mated to Node 1, a passageway connecting the living and working areas of the International Space Station. The primary purpose of PMA-3 is to serve as a shuttle docking port through which crew members and equipment will transfer to the space station during later assembly missions.

The Z1 truss allows the temporary installation of the U.S. power module to Node 1. The truss will have gyroscopes attached to it for attitude control and also will hold Ku-band and S-band telemetry equipment. In addition, it provides a mounting location for extra vehicular activity equipment.

Beginning this year, with the launch of the first International Space Station element, more than 100 components will ultimately be assembled in low-Earth orbit over the next five years using approximately 45 assembly flights.

When complete, the station will provide access for researchers around the world to permanent, state-of-the-art laboratories in the weightless environment of space.

Lunar Prospector finds evidence of ice at Moon's poles

There is a high probability that water ice exists at both the north and south poles of the Moon, according to initial scientific data returned by NASA's Lunar Prospector.

The mission also has produced the first operational gravity map of the entire lunar surface, which should serve as a fundamental reference for all future lunar exploration missions, project scientists announced at Ames Research Center.

Just two months after the launch of the cylindrical spacecraft, mission scientists have solid evidence of the existence of lunar water ice, including estimates of its volume, location and distribution.

"We are elated at the performance of the spacecraft and its scientific payload, as well as the resulting quality and magnitude of information about the Moon that we already have been able to extract," said Dr. Alan Binder, Lunar Prospector principal investigator from the Lunar Research Institute, Gilroy, Calif.

The presence of water ice at both lunar poles is strongly indicated by data from the spacecraft's neutron spectrometer instrument, according to mission scientists. Graphs of data ratios from the neutron spectrometer "reveal distinctive 3.4 percent and 2.2 percent dips in the relevant curves over the northern and southern polar regions, respectively," Binder said. "This is the kind of data 'signature' one would expect to find if water ice is present."

However, the Moon's water ice is not concentrated in polar ice sheets, mission scientists cautioned.

"While the evidence of water ice is quite strong, the water 'signal' itself is relatively weak," said Dr. William Feldman, co-investigator and spectrometer specialist at the Department of Energy's Los Alamos National Laboratory, N.M. "Our data are consistent with the presence of water ice in very low concentrations across a significant number of craters."

Using models based on other Lunar Prospector data, Binder and Feldman predict that water ice is confined to the polar regions and exists at only a 0.3 percent to 1 percent mixing ratio in combination with the Moon's rocky soil, or regolith.

Assuming a water ice depth of about a foot and a half, the depth to which the neutron spectrometer's signal can penetrate, Binder and Feldman estimate that the data are equivalent to an overall range of 11 million to 330 million tons of lunar water ice, depending upon the assumptions of the model used. This quantity is dispersed over 3,600 to 18,000 square miles of water ice-bearing deposits across the northern pole, and an additional 1,800 to 7,200 square miles across the southern polar region.

Twice as much of the water ice mixture was detected by Lunar Prospector at the Moon's north pole as at the south.

Dr. Jim Arnold of the University of California at San Diego previously has estimated that the most water ice that could conceivably be present on the Moon as a result of meteor and comet impacts and other processes is 11 billion to 110 billion tons. The amount of lunar regolith that could have been "gardened" by all impacts in the past 2 billion years

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Shuttle veterans depart NASA for private interests

Astronauts Jerry Linenger, Blaine Hammond and Rhea Seddon have retired from NASA to pursue private interests.

Linenger, a Navy captain, lived aboard the Russian Mir Space Station for 122 days from January to May 1997. He arrived at Mir as a member of the STS-81 crew and returned with the STS- 84 crew, logging 132 consecutive days in space during those combined missions. Selected as an astronaut in 1992, his first space flight was on STS-64, an 11-day mission in 1994.

Hammond, an Air Force colonel who retired from NASA and the Air Force to join a private aerospace firm in California, was selected as an astronaut in 1984 and is a veteran of two shuttle flights. He served as the pilot on STS-39, the first unclassified Department of Defense mission in 1991, and for STS-64, an 11-day mission in 1994 to study the atmosphere and the Earth's environment.

Seddon, a physician and one of the first six women selected as astronauts in 1978, has retired to pursue a private career. She is a veteran of three space missions, accumulating 722 hours in space. She flew first on STS-51D in April 1985 on a mission to deploy two commercial satellites. Seddon then flew on two life science research missions, Spacelab Life Sciences 1 and 2, in 1991 and 1993. From September 1996 through November 1997, she was detailed to Vanderbilt University Medical School in Nashville, to assist in developing experiment protocols for Neurolab.

"Jerry, Blaine and Rhea contributed greatly to the success of the missions they flew," said David Leestma, director of Flight Crew Operations. "We wish them the best of luck in their new ventures."

JSC Photo by Bonnie Dunbar

CONGRESSIONAL VISIT—Rep. John Tanner, D-Tenn., takes a seat in the Crew Compartment Trainer in JSC's Bldg. 9 during a Feb. 21 visit. Tanner looked in on both the space shuttle and International Space Station mockups, Rocket Park and the old and new Mission Control Centers with Astronaut Bonnie Dunbar. NASA Administrator Daniel S. Goldin and JSC Director George Abbey also joined the congressman for part of the visit.

Costs force partial termination of Clark Earth science mission

NASA has partially terminated the Clark Earth science mission due to mission costs, launch schedule delays, and concerns over the on-orbit capabilities the mission might provide. NASA will retain launch vehicle services.

The Clark mission was part of NASA's Small Satellite Technology Initiative program, originally scheduled for launch in mid-1996. Named after the famous American explorer William Clark, the Clark spacecraft was to provide a very high resolution optical element with stereo imaging capabilities that would provide NASA's former Office of Mission to Planet Earth (now the Earth Sciences enterprise) with useful environmental data.

Imagery provided from Clark also would have been available commercially with applications such as helping city planners assess community growth from the space perspective.