Shuttle crew repairs International Space Station, but ISS's troubles on earth continue

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After a 10-day mission, Space Shuttle Atlantis returned to the Kennedy Space Center in the early morning hours of May 29. Atlantis's crew of six Americans and one Russian successfully completed all of the mission objectives to repair the partially-built International Space Station (ISS) and boost its orbit.

The pleasure of another scientific achievement in space must be tempered, however, with the understanding that the repairs had to be made to the ISS even though it has yet to be used. Because of lengthy delays in its construction, the Atlantis astronauts had to replace four of the ISS's 82 kilogram (180 pound), $252,000 nickel-cadmium batteries on the Russian-built power and communications module Zarya. Zarya, launched in November 1998, is a propulsion module that is keeping the early stages of the ISS aloft. The astronauts replaced smoke detectors and fire extinguishers that had exceeded their warranty, repaired the faulty ventilation system, and delivered 1,350 kilograms (3,000 pounds) of supplies. They also mounted construction cranes on the outside of the space station.

In addition, Atlantis boosted the space station's orbit. Due to increased atmospheric drag from high solar activity, the ISS had been sinking slowly. Officials were concerned that Zarya would run out of fuel before the docking of the much delayed Zvezda service module, now scheduled for launch in July, which is equipped to periodically boost the space station's orbit.

Currently, the ISS consists of the Zarya module and Unity, a US-built connecting tunnel, launched in December, 1998. The Zvezda module will provide the first living quarters for the ISS, as well as life support and refueling capabilities. The Zvezda launch is two years behind schedule. It was delayed first because of financial problems in Russia and then because of a crash of a rocket in October 1999. About 86 percent of ISS's components are finished and waiting to be launched and assembled in orbit. The first crew is scheduled to take up residence in ISS around October 30 if the Zvezda launch is successful.

The development of the ISS was first approved by the US Congress in September 1988. It was to be the next generation of space station following Mir, which had been put in orbit by the Soviet Union in 1986. ISS quickly became an international venture as NASA joined forces with the European Space Agency, Canada and Japan. A total of 16 nations are now participating. However, it quickly became mired in bureaucracy and cost overruns that have slowed its construction and made its completion date uncertain. Estimated cost is now $60 billion.

When it is completed, present plans call for a space station which weighs 470 tons, four times the weight of Mir. It will measure 110 meters (361 feet) end to end, the length of a football field, and be seven stories high. It will be able to house a crew of six or seven in 1,300 cubic meters (46,000 cubic feet) of space. The entire space station will be the size of a city block. It will have six trailer-sized labs, two habitation modules and two logistics modules.

Russia's experience—as the only country to run a space station over a long period of time—is vital to the success of the ISS. Since it began assembly in space in February1986, Mir has given Russia predominance in the study of long-term human space flight and given Russian scientists a head start in designing the Zvezda crew quarters. In 1993 NASA revamped the International Space Station program and, for economic and political reasons, Russia became a key partner. Space hardware from a planned Mir 2 program became a major component in ISS construction. All astronauts/cosmonauts for ISS will be trained at Star City, which is 50 kilometers (30 miles) outside of Moscow.

Mir had been designed to be used for five years. An aging infrastructure combined with the financial problems in Russia caused it to run into increasing difficulty. In 1997 Mir had a near fatal fire and several months later an empty cargo ship collided with the station's Spektr science module, nearly killing its crew of three. Mir's captain, Vassili Tsibliev, who Russian President Yeltsin tried to blame for the crash, commented: "All of this is linked to the economic situation, the corruption and to our miserable lives aboard the station and what we have requested ... doesn't exist. This is because the factories no longer operate."

Mir was abandoned by the Russian Aviation and Space Agency, Rosaviacosmos, in August of 1999 because, at an operating cost of $250 million a year, they could no longer afford to keep it occupied. NASA officials abandoned all hope of rescuing Mir and decided to focus exclusively on ISS, which

is scheduled to be completed in 2005 and have a 10-year life span.

The future of Mir changed when the Foundation for the Non-Governmental Development of Space (FINDS), a non-profit policy organization of space activists, scientists, engineers and others, entered into negotiations to lease Mir in the fall of 1999. The main goal of FINDS is the large-scale permanent settlement of space funded by private enterprise. Walt Anderson and Rick Tumlinson from FINDS entered into negotiations with the Russian space company RKK Energia, which operates Mir for the Russian government.

Tumlinson and Anderson offered to raise funds to turn Mir into the first commercially operated outpost in space. The company hopes biotech and pharmaceutical industries will lease lab space to take advantage of Mir's near-zero gravity.

Knowing that the US government was prepared to let Russia bring Mir down, Anderson used $20 million of his own money to make an agreement with RKK Energia. Tumlinson reached an agreement with RKK Energia Chief Yuri Semenov for a joint venture and Anderson then pulled together a group of investors, including telecommunications and internet entrepreneur Chirinjeev Kathuria, to form the Amsterdam-based MirCorp, Inc.

In February, MirCorp announced plans to spend nearly $200 million to renovate the space station. MirCorp is currently in negotiations with several international banks for a public offering of stocks to raise an estimated $800 million needed to turn Mir into an orbiting business and "space hotel" 200 kilometers (125 miles) above Earth.

On April 4, MirCorp sent a two-man repair crew to Mir. At Congressional hearings on April 6, NASA Administrator Dan Goldin said that the mission, which docked with Mir that day, could be a "breach of relations" with the United States if it jeopardized work on the ISS. Goldin expressed anger that Russia was committing funds to fixing Mir when there have been costly delays on delivery of its Zvezda service module to the ISS. Russia has only committed a total of $42 million to its share of building the $60 billion ISS. The cost of sending a crew to Mir is about $19 million. Goldlin did, however, point out that delays in ISS construction were not due to Russia alone, for NASA was also behind schedule in building components.

On April 12, Russia's then President-elect Putin said that Russia would not abandon Mir. "We will fulfill our commitments to the ISS," he said. “But one must not forget national industry. National industry has to be the priority." Most experts in the field are skeptical as to Mir's value for "national industry." Since Mir is already nine years over its projected life span, they do not expect it to be in orbit for more than another year. However Chief Designer and President of RSC Energia, Semenov, insists the facility can be used by commercial investors for two to five more years.

There is growing anger in Congress over the costs of operating the ISS. NASA says it is having trouble estimating costs because of delays and uncertainties about pieces that will be needed. A General Accounting Office report released March 20 by Congress criticized NASA for not having a contingency plan if Russia is not able to fulfill its commitments to the ISS. It also criticized NASA for not shielding the space station from collisions with space debris. NASA estimates it will take three and a half years to add the shielding to the orbiting space station.

Some scientists question whether NASA has the funds to maintain a space station. Last year it could only afford four shuttle missions. At that rate, ISS would take 20 years to build. Since the Zarya module was launched in November 1998 there have been four shuttle missions for ISS, including May's Atlantis mission. A total of 47 missions will be required for completion of the ISS.

The Clinton Administration has cut NASA's budget for seven straight years, leading to a seven-year hiring freeze. It is finally asking Congress for an increase this year. NASA asked for $14 billion in the 2001 budget, 3.2 percent over last year, less than 1 percent of the federal budget. (The defense portion of the budget is $311 billion.) NASA's workforce is now 17,700, down from 25,000 in 1993.

At the hearings April 6, Goldin said requests for money from all 10 of its centers were heavily burdening NASA. An independent review of NASA's Mars programs found that it is underfunded by 50 to 80 percent, making complicated missions increasingly unlikely. NASA has notified companies that commercial experiments on ISS will cost $10,000 per pound, $15,000 an hour if it requires an astronaut's attention, and data sent back to Earth will cost $100 a minute. Estimated cost of a 680 kilogram (1500 pound) experiment with 2,800 kilowatt hours of electrical energy is $20.8 million dollars. NASA warned, however, that since these prices are market driven they could rise depending on demand.

Early in the twentieth century, the pioneers of space travel solved the physical and chemical problems of propulsion enabling us to propel objects, including human beings, off of the Earth. These pioneers envisioned space stations as "islands in the sky" which would be stepping stones to the colonization of the moon and Mars. Though we may have a space station in 2001, problems on Earth make the realization of the dream of colonization as far away as the moon and Mars.