Ballunar Fest

NASA JSC2005E35631

NASA JSC2005E35561

NASA JSC2005E35554

NASA JSC2005E35462

The Ballunar Liftoff Festival brought dozens of hot-air balloons, and hundreds of guests, to JSC Aug. 26-27. The festivities on Aug. 28 had to be cancelled due to the weather, but the other two days' events provided plenty of fun for the visitors. The festival included hot-air balloon glows, live entertainment, skydiving exhibitions, arts and crafts exhibits and aviation equipment displays. In addition, several JSC facilities were available for guests to tour.

Ballunar Fest photographers: James Blair, Robert Markowitz, Carlos Sanchez and Regan Geeseman.

Space Center Roundup

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History in the making

Since the first International Space Station components launched in 1998, the space station has proven to be a construction marvel. See, on page 6, how this incredible engineering and science laboratory has evolved over the last five years.

Backdropped by a colorful Earth, this aft zenith view of the space station was photographed during the flyaround by the space shuttle *Discovery* following the undocking of the two spacecraft. *Discovery* pulled away from the complex at 2:24 a.m. (CDT) on Aug. 6. The view in the background is over the North Caspian Sea and Kazakhstan, Russia.

October
2005
Houston, Texas

Guest column...

Opportunity...

"How would you like the opportunity to excel?" Ever heard that before? How did you react?

Recently, we had the opportunity to transition control of the International Space Station to Moscow under an emergency situation and the results were picture perfect. We have had the opportunity to support the human occupancy of the space station for almost five years. And we have had the opportunity to support friends and family through the course of two hurricanes. The fact is that, in our world, opportunities abound.

As we begin a new fiscal year, we also begin a new era in the human exploration of space. JSC was created to support human spaceflight and we have been provided a firm Vision for the path forward. Opportunities associated with the Constellation Program and its projects, including the Crew Exploration Vehicle as well as continued support for the Space Shuttle and Space Station Programs, will be daunting but we would not have it any other way.

As we celebrate five years of living and working 24 hours a day in space and as we look to a future of vibrant space exploration, we understand that each and every day will be made up of many opportunities. I am told that, when written in Chinese, the word "crisis" is composed of two characters – one represents danger and the other represents opportunity. It is a matter of perspective.

"How would you like the opportunity to excel?" You will hear it again. How will you react?

Randy K. Gish
Chief of Staff
Associate Director

Shooting from the heart

Astronaut finds passion for photography in space

by Amiko Nevills

NASA ISS010E15457

The Himalaya Mountains are featured in this image photographed by Leroy Chiao on the International Space Station.

Moroccan desert sand seas ripple in the sunlight. Rugged, snowcapped Himalaya Mountains pierce the heavens. Egyptian lakes spill liquid metal onto the Earth's surface while stretches of shoreline summon the eye.

The eye widens, zeroes in and blinks. Whir, click-click. Captured!

For more than a century, travels to exotic lands have inspired explorers to record their journeys in snapshots. However, no place on Earth lends a better view to these beautiful places than does space.

Unlike most travelers, Astronaut Leroy Chiao has come full circle. Orbiting the Earth every 92 minutes onboard the International Space Station, Chiao made his trek from afar, capturing more than 24,000 images along the way.

Photography – Greek for the words light and writing – from space is useful for scientific research on Earth. Among Chiao's tasks in space as Expedition 10 Station Commander was to snap up various meteorological and atmospheric phenomena as well as geographical, human-made and natural landmarks.

With no darkroom onboard, the perfect temperature and mix of developer, fixer and stop-bath solutions are replaced with pixels, a sensor and various lenses. Digital cameras aid astronauts in getting the right shot with instant image processing.

"I was able to see my results quickly and adjust technique and composition for next time," Chiao said.

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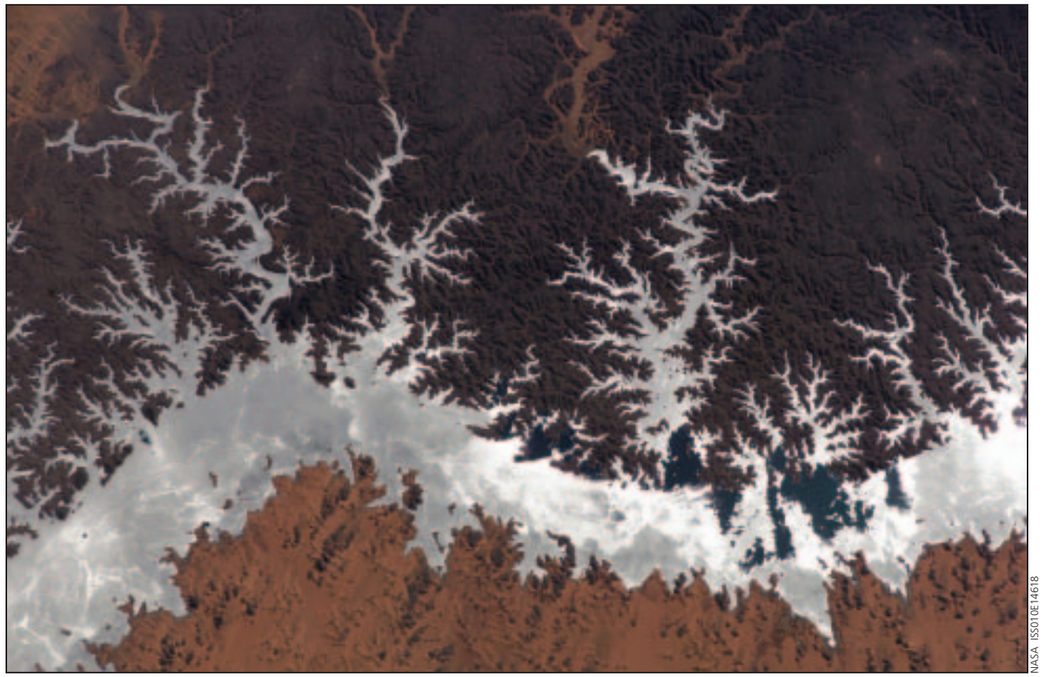
"The beauty of the Earth was very inspiring, and I tried to find new ways to capture and express that beauty."

Leroy Chiao



NASA ISS010E14618

Egypt's Lake Nasser, centered roughly at 22.64 degrees north latitude and 32.45 degrees east longitude, was captured with an electronic still camera by Leroy Chiao onboard the International Space Station. The sun glinting on the lake makes it more easily visible.

Still, pointing a digital camera at Earth from space while flying 230 miles above the planet calls for a different approach to "light writing" altogether.

"Being in space means having to find ways to support yourself and the camera," Chiao said. "Since the Earth is moving past at 17,500 mph, one must pan the camera as the shutter is released, otherwise the image will smear and appear out of focus."

A special team of scientists identifies photo opportunities that align with the orbiting vehicle's path and notifies the working astronauts in advance. Other shots come by chance as astronauts peer out their window to the world.

Flying at five miles a second, however, these opportunities come only as mere flashes. Trigger-happy fingers must set the perfect aperture and shutter speed – major aspects of good photography – before the opportunity vanishes.

Weather and lighting also play a major factor in photography from space.

With six months of consistent practice, Chiao improved his camera skills while in space and developed a real passion for it.

"Technically, one can practice and master the right methods of shooting good space photos," he said. "For engineers like me, I recommend that they think about composition. That is, don't just capture the data, but try to compose photos that are beautiful too."

In photography, the eyes have it. When shooting from space, this is especially true. The camera's eye – the lens – determines what will be in the picture and how. It also gives the photographer more reach or wider angles.

"I shot mostly 180mm, 400mm and 800mm, but also worked with 50mm and 58mm," said Chiao, who chose his lenses to grab the best focus and exposure of his targets.

Depending on the lens and the aperture (the size of the camera's "eye" opening), some shots show great depth of field with artistic details of hard rock, ridges, valleys and rivers.

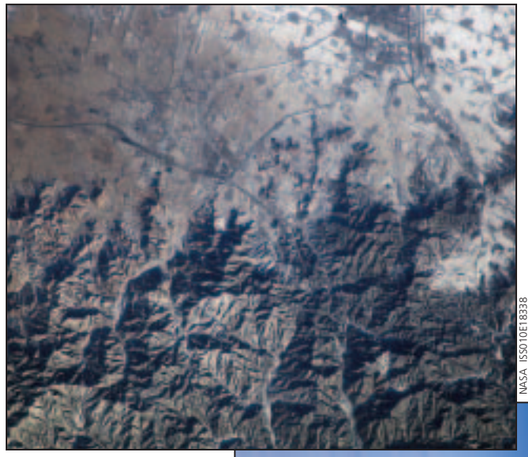
Within Chiao's photo album is the first confirmed picture from space of the Great Wall of China. Although the Great Wall was difficult to see with the unaided eye, Earth's geological diversity in Chiao's collage of images remained very visible. Chiao also collected snapshots of the Chinese launch site.

"The launch site was of great interest to me because of its historical significance," Chiao said. "It is only the third place in history from where astronauts were launched into space."

Other memorable shots for Chiao were the Tokan Lakes in Egypt, the pyramids at Giza and the moon next to the Earth's limb – a shot that can only be taken from space's vantage point.

"I try to be artistic, but I am in many ways a typical engineer," Chiao said. "Photography in space helped bring out the artistic side in me. The beauty of the Earth was very inspiring, and I tried to find new ways to capture and express that beauty."

Chiao's vivid experience in space opened new horizons for him. Though being an astronaut will always come first, he plans to continue to develop his photography skills now that he's back on Earth.



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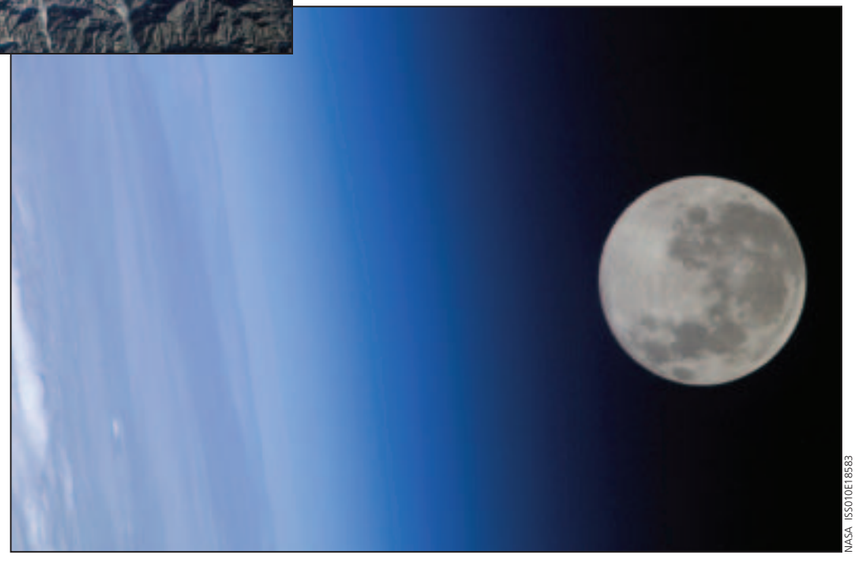


NASA ISS010E18583

Clockwise from above left: *The Great Wall of China and Inner Mongolia are featured in this image.*

An unpiloted Progress 17 resupply craft launched at 1:09 p.m. (CST) on Feb. 28 from the Baikonur Cosmodrome in Kazakhstan to deliver two tons of food, water, supplies, equipment and fuel to the Expedition 10 crewmembers onboard the station.

A full moon is visible in this view above Earth's horizon and airglow.

THE HUMAN PRESENCE IN SPACE

We've only just begun

by Catherine E. Borsché

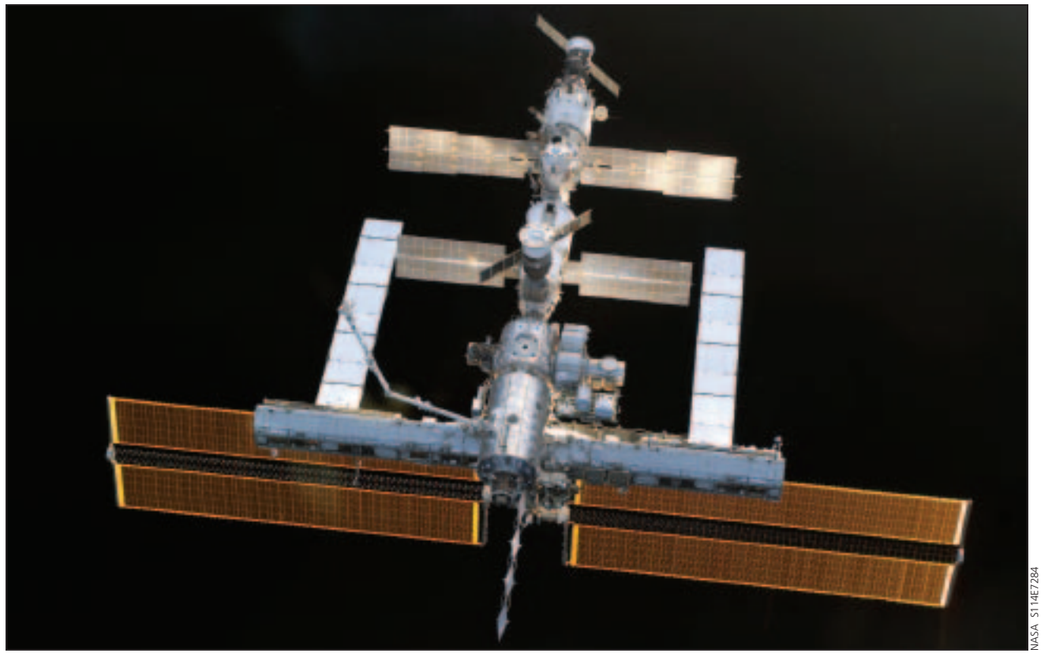
Break out the thermostabilized beef tips with mushrooms and rehydratable apple cider! NASA is poised to celebrate a major space milestone on Nov. 2, as the International Space Station will clock its fifth anniversary of continuous human presence in space.

Since Expedition 1 arrived on the scene Nov. 2, 2000, the space station has grown and evolved into an unprecedented, state-of-the-art laboratory complex. Offering a microgravity environment that cannot be duplicated on Earth, space station continues to further humankind's knowledge of science and how the human body functions for extended periods of time in space – all of which will prove to be vital on long-duration missions to Mars.

"It gives us unique access to the space environment, where we hope we can do very interesting and productive research, but it really means we (will) develop a lot of the capabilities and technology that'll allow humans to go elsewhere away from the planet," Expedition 1 Commander Bill Shepherd said about the space station. "So, if we don't have this progress with this space station, it means that humans in space are pretty much destined to stay close to the Earth – and I don't think that's what humans are about."

Solving unsolved mysteries

To date, 89 scientific investigations have been conducted on the space station and more breakthroughs are to come. New results from early space station research, including basic science to exploration research, are being published each month.



NASA S114E7284

The International Space Station was photographed onboard the space shuttle Discovery *following the undocking of the two spacecraft.*

For instance, great strides have been made in understanding the significant rate of bone loss by crewmembers while in orbit, and where in the bones the loss is occurring. Also, a complete characterization study of the radiation environment in the space station has been done, with evaluation of models of radiation shielding by the station's structure.

Many things, including eating habits and nutritional deficiencies, have been looked into to see how they all relate to the physiological effects of being in microgravity. New use of medical ultrasound equipment as a diagnostic tool and in-space soldering to repair potential hardware damage have also been tested on the space station. And that's only a tiny fraction of the studies conducted so far.

Expedition 9 Flight Engineer and ISS Science Officer Mike Fincke, who had the opportunity to work with Advanced Diagnostic Ultrasound and In-Space Soldering experiments while on the space station, believes that many unknowns can be solved during expeditions.

"The International Space Station is a perfect stepping-stone for us to perfect the technology, to perfect the operational tempo, operational parameters that we need to in order to make those long-duration missions successful," Fincke said.

A silver lining

Due to a space shuttle hiatus after the *Columbia* accident on Feb. 1, 2003, the space station had to become a more efficient research machine. Crews have been limited to two people, and experiments and supplies are now ferried to the orbiting outpost using either the Russian Soyuz or Progress ship.

However, what could have been a problem for the program turned into a unique learning tool. Future trips to Mars could take years to complete roundtrip, with little or no resupply opportunities, as well as limited cargo space. Repair techniques that are being perfected now could also be used during long-duration missions. Lessons taken from the space station during this period of heightened efficiency will help in planning for Mars missions later.

There's no place like home

As the space station has served as a science laboratory, it has also given crews something more important – a home away from home on Earth. During the upcoming five-year anniversary, the space station will be home to Expedition 12. Inside the ultra-modern "home," 15 Americans and 15 Russians have lived and worked aboard the space station.

With 15,000 cubic feet of habitable volume, more room than a conventional three-bedroom house, the space station affords many of the comforts one finds on Earth. There is a weightless "weight room" and even a musical keyboard alongside research facilities. Holidays are observed, and, with them, traditional foods such as turkey and cobbler are eaten – with lemonade to wash the foods down.

Continued on page 8

NASA ISS002E7172

The Expedition 2 and STS-100 crewmembers (above) get together for a group portrait in the emptied Raffaello Multi-Purpose Logistics Module. Clockwise from the 12 o'clock point in the circle are Kent V. Rominger, Yuri V. Lonchakov, Yury V. Usachev, Umberto Guidoni, James S. Voss, Jeffrey S. Ashby, Scott E. Parazynski, John L. Phillips and Chris A. Hadfield, with Susan J. Helms at center. Usachev, Helms and Voss were members of the Expedition 2 crew, with the other seven serving as the STS-100 crew on the space shuttle Endeavour.

Astronaut Mike Fincke (below), Expedition 9 ISS science officer and flight engineer, performs one of multiple tests of the Capillary Flow Experiment (CFE) investigation in the Destiny laboratory of the International Space Station. CFE observes the flow of fluid, in particular capillary phenomena, in microgravity.

NASA ISS009E23442

One thing that makes the space station so distinctive is the experience that it gives the crews visiting the orbiting complex. After months of settling into a "routine" aboard the station, crewmembers never forget how special it is to be where they are.

"Of course, this 'routine' happens in the novel environment of space," Expedition 5 Flight Engineer Peggy Whitson wrote in her 13th letter home from the station. "Being here, living here, is something that I will probably spend the rest of my life striving to find just the right words to try and encompass and convey just a fraction of what makes our endeavors in space so special and essential."

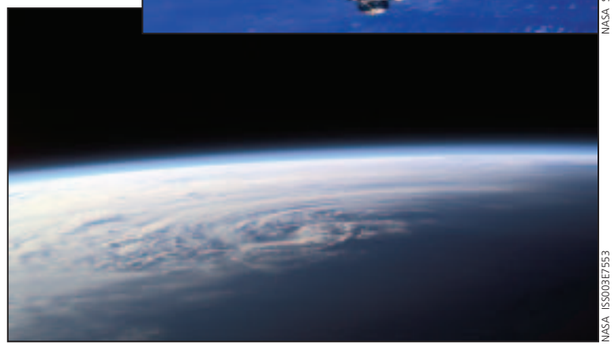
Another year flown by...

Nov. 29, 2004: It was a short trip, considering they were moving at about five miles a second. Space station crewmembers, Soyuz Commander Salizhan Sharipov and Expedition 10 Commander Leroy Chiao, flew their Soyuz TMA-5 spacecraft from the Pirs Docking Compartment to a docking port on the Zarya module. The move was made to prepare for two spacewalks from Pirs early in 2005.

Dec. 25, 2004: It was propelled by a rocket instead of reindeer, but the Progress cargo craft made things aboard the space station look a lot more like Christmas. The unpiloted Russian cargo carrier docked to the space station with a Christmas delivery of 2.5 tons of food, fuel, oxygen, water, supplies and gifts for Chiao and Sharipov.

Jan. 12, 2005: The earthquake that rocked the Earth beneath the Indian Ocean Dec. 26, 2004, caused massive tsunamis to devastate parts of the coasts of almost a dozen countries inland. As the space station circled the globe, flying some 230 miles above the affected areas, the Expedition 10 crew captured snapshots from space of the tsunamis' aftermath.


NASA ISS096-715-042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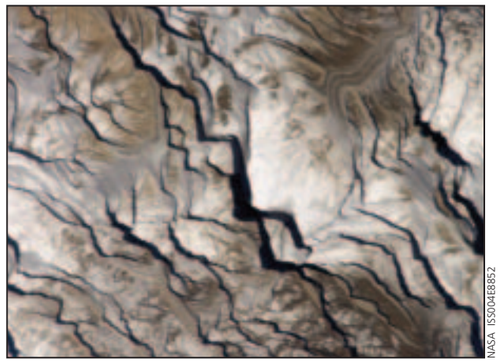
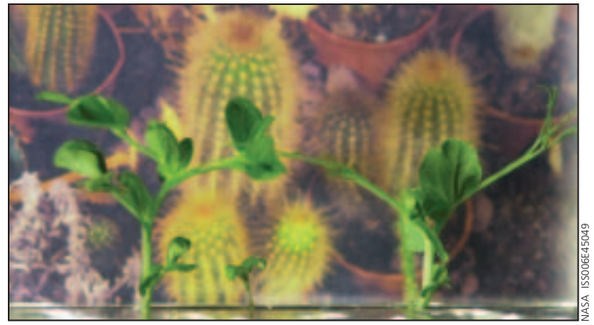

NASA ISS004E8852

An STS-96 crewmember aboard Discovery *recorded this image (top photo) of the International Space Station with a 70mm camera during a fly-around following separation of the two spacecraft.*

Pictured near Earth's horizon, Hurricane Michelle made landfall on Cuba Nov. 4, 2001, with sustained winds of 135 miles per hour.

Astronaut Daniel W. Bursch, flight engineer for Expedition 4, captured this image of Mt. Everest (near frame center). "One morning I happened to be up early. I realized that we were in an attitude that would allow me to open the window shutter and there was Mt Everest! The low sun angle (it was close to orbital sunrise) gave tremendous relief to the mountains."


NASA ISS005E21775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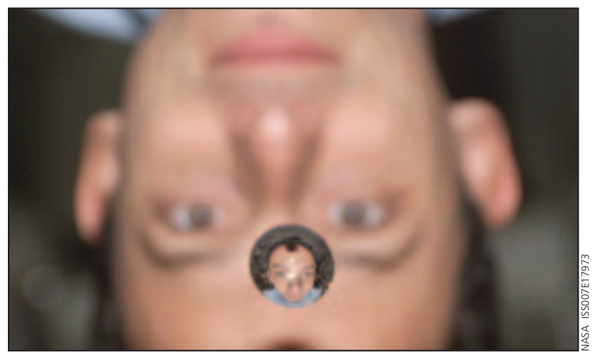
NASA ISS007E17973

Astronauts Michael E. Lopez-Alegria (left) and John B. Herrington, STS-113 mission specialists, work on the newly installed Port One truss on the International Space Station during a session of extravehicular activity. The end effector of the Canadarm2/Space Station Remote Manipulator System and Earth's horizon are visible in right frame.

A close-up view of sprouts on the Russian BIO-5 Rasteniya-2/Lada-2 (Plants-2) plant growth experiment, which is located in the Zvezda Service Module on the International Space Station.

European Space Agency Astronaut Pedro Duque of Spain watches a water bubble float between him and the camera, showing his image refracted, on the International Space Station.

March 2, 2005: An unpiloted Russian cargo craft with about 2.3 tons of supplies and equipment aboard docked with the space station. The Progress 17 spacecraft docked to the station's Zvezda Service Module.

March 28, 2005: Space station crewmembers wound up a successful spacewalk, finishing preparations to welcome the Automated Transfer Vehicle (ATV). Chiao and Sharipov installed on the Zvezda Service Module the final three antennas of a six-antenna set for the ATV, an unpiloted European cargo carrier scheduled to make its first trip to the station early in 2005. They also installed a Global Positioning System antenna for the ATV.

April 14, 2005: The Expedition 11 crew – Commander Sergei Krikalev and NASA Science Officer Astronaut John Phillips – launched from the Baikonur Cosmodrome in Kazakhstan. With this eleventh crew of the space station was European Space Agency Astronaut Roberto Vittori of Italy.

June 14, 2005: Congressional testimony reached new heights. The House Subcommittee on Space and Aeronautics, chaired by Rep. Ken Calvert (R-Calif.), heard testimony from Phillips as he orbited the Earth. It was a first for the Congressional representatives and for Phillips.

June 18, 2005: Progress 18 lifted off June 16 from the Baikonur Cosmodrome in Kazakhstan and docked June 18. Among its 4,662 pounds of cargo were 397 pounds of propellant, 242 pounds of oxygen and 926 pounds of water. Also aboard was a camera that was used to photograph thermal protection tiles of *Discovery* as the orbiter approached the station on the space shuttle's Return to Flight mission, STS-114.

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July 28, 2005: STS-114 visited the space station! After completing leak checks, the STS-114 crew entered the space station. STS-114 was the first shuttle mission to visit the station since STS-113 left in December 2002. The two crews conducted a station safety briefing and began joint operations after they greeted each other.

Aug. 16, 2005: Krikalev became the human with the most cumulative time in space. At 12:44 a.m. CDT, he passed the record of 748 days held by Cosmonaut Sergei Avdeyev. In Space Station Mission Control Houston, Spacecraft Communicator Ken Ham called Krikalev to congratulate him. “Fly on, Sergei,” Ham said.

Aug. 18, 2005: Krikalev and Phillips closed the airlock hatch of the Pirs docking compartment, ending a successful spacewalk on the space station. The first task was to remove a Russian Biorisk experiment container housing bacteria from the outside of Pirs. Next they removed a micro-particles capture (MPAC) and space environment exposure device (SEED) panel from the large-diameter aft section of the Zvezda Service Module. MPAC is a micrometeoroid and orbital debris collector. SEED is a materials exposure array. Crewmembers then moved to the Matroska experiment, a torso-like container with radiation dosimeters in human-tissue-equivalent material. They removed it and later, with the MPAC and SEED panel, brought it back inside the station.

NASA ISS010E33563 NASA ISS011E09646

Lightning was the suspected cause of this giant wildfire, raging through an area northeast of Phoenix. This is one of a series of images photographed by Astronaut John Phillips, Expedition 11 flight engineer and NASA ISS science officer, aboard the orbiting complex, flying at an altitude of 220 miles.

NASA ISS011E12547

Astronaut Leroy Chiao, Expedition 10 commander and NASA ISS science officer, in the first of two sessions of extravehicular activities performed by the Expedition 10 crew during their six-month mission. Chiao and cosmonaut Salizhan S. Sharipov (out of frame), flight engineer representing Russia's Federal Space Agency, spent 5-1/2 hours outside the space station installing a work platform, cables and robotic and scientific experiments on the exterior of the Zvezda Service Module.

Damage from Hurricane Katrina in Biloxi, Miss., is featured in the image at left photographed by an Expedition 11 crewmember. Flooded areas are indicated by dark greenish-brown coloration along river courses to the northeast and northwest of downtown.

SCENES FROM THE DESERT

NASA’s ‘RATS’ test technologies for tomorrow’s treks

by Amiko Nevills

Rust-colored sand sifts through gloved hands as he slips the soil into a pouch – a travel souvenir. Standing, the suited explorer recharges his air tank, looks across the rocky landscape and imagines colonization on distant lands.

He studies the map his route planner plotted before climbing into a two-seated buggy. Bound for the next steep slope, he treks across the barren, rugged terrain, dipping and bumping along the way.

This scene, scripted from the high desert of Arizona, may one day become a real-life drama in space as humans first inhabit Mars. Future explorers will need the help of sophisticated technology to venture across stretches of the Red Planet. Gathering clues of its past, while planning for its potential future with humans, will depend on mobility.

Developing that mobility requires extensive testing, like that recently done by NASA’s Desert Research and Technology Studies (RATS) team.

“NASA’s future involves returning to the moon and then human exploration of Mars,” said Johnson Space Center’s Joe Kosmo, who led the team. “Field work will be the basic method of operation on these planetary surfaces. Field testing prepares and provides a high-fidelity, hands-on experience base for engineers and scientists to better design and operate the emerging technologies for planetary surface systems.”

For the eighth consecutive season, the RATS team took over the dry, dusty desert land of Arizona to torment some of their latest vehicles and gear to better understand just what it takes to be mobile.

Arizona’s high desert is far from Mars – about 200 million miles – but its environment is not far off the mark as a testbed. Its red, rocky surface and harsh climate comes closest to Mars on Earth.

The desert trials put to the test two spacesuited explorers, a new Science Crew Operations and Utility Testbed rover and a system to recharge air tanks while they’re in use. The 10-day trials took place in remote areas near Flagstaff, Ariz.

The Desert RATS team included engineers and scientists from JSC and NASA’s Glenn and Ames Research Centers in cooperation with experts from Oceaneering Sea and Space Systems, Hamilton Sundstrand, ILC/Dover, Carnegie Institute, University Space Research Association and Virginia Commonwealth University.

Engineers and scientists worked side by side in the desert with robots on tasks supported by a variety of advanced spacesuit prototypes, field assistant vehicles and science equipment. Long-distance support and coordination was provided by the Mission Operations Exploration Planning and Operations Center in Houston.

Desert RATS team members weren’t the only ones learning from the desert. Students across the country also tapped into the arid region through satellite-link Webcasts by NASA’s Digital Learning Network. These one-hour programs showed students what it will take to send humans to Mars, and may have provided the kids with the answers they’ll need when they venture to the Red Planet. As the next generation of explorers, one of these students may be the first person to set foot on Mars.

NASA/Markowitz JSC2005E38283

Science, Crew, Operations and Utility Testbed Project Lead Frank Delgado and Desert RATS Lead Joe Kosmo (right) of JSC discuss experiment operations as technicians prepare the rover and two suited subjects for a test.