

# Chiao (and Sharipov) Down!

Expedition 10 is home at last

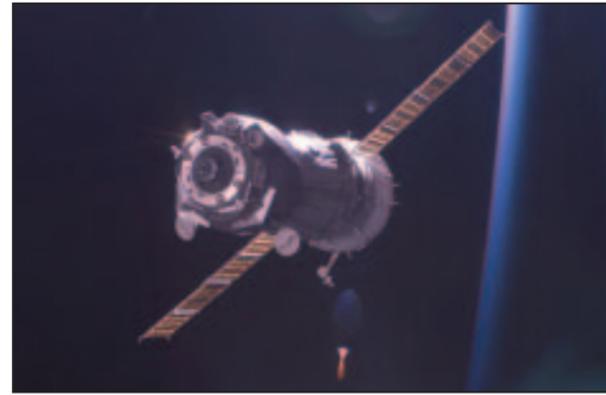
By Catherine Borsché

Expedition 10 has completed its descent back down to Earth, and the crewmembers are now recuperating after their long but successful six-month visit to the International Space Station (ISS).

Before the mission began, Expedition 10 Commander Leroy Chiao spoke about his goals for this expedition. "Well, I'll tell you that the biggest reward for me and the biggest measure of success is if we can accomplish the goals of the flight, which are to maintain the Station and keep it healthy while also performing some of the assembly tasks and experiments."

This mission completed its objectives and further accelerated the Vision for Space Exploration with its scientific and medical studies and engineering aspects. Some experiments conducted include Pore Formation and Mobility, Protein Crystal Growth, Effect of Prolonged Spaceflight on Human Skeletal Muscle, Advanced Diagnostic Ultrasound in Microgravity and Crew Earth Observations. The crew also performed two spacewalks designed to continue the external outfitting of the Zvezda Service Module.

Chiao's crewmate, flight engineer and Soyuz Commander Salizhan Sharipov, reiterates that their mission and others are also making a profound impact on Earth. "The ISS is an international project, and the participating countries are doing a lot for the progress of humanity. The ISS is demonstrating to us how we should work and live together; this is an example of how we coexist in the future."



NASA/Ingalls ISS01TEG0015



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**Top:** Back dropped by the blackness of space and airglow of Earth's horizon, the Soyuz TMA-5 spacecraft departs from the International Space Station carrying Expedition 10 Commander Leroy Chiao, Russian Federal Space Agency Flight Engineer Salizhan S. Sharipov and European Space Agency Astronaut Roberto Vittori of Italy. Undocking occurred on April 24.

**Above:** Astronaut Leroy Chiao (right), Expedition 10 commander and NASA ISS science officer; Cosmonaut Salizhan S. Sharipov (center), flight engineer representing Russia's Federal Space Agency; and European Space Agency Astronaut Roberto Vittori of Italy speak with members of the media following their pre-dawn landing in the Soyuz TMA-5 capsule on April 25.

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## Thumbs up – way up!

The crewmembers onboard the International Space Station give a unified "thumbs up" in the Destiny laboratory following the Change-of-Command ceremony from Expedition 10 to Expedition 11. From the left are Astronaut John L. Phillips, Expedition 11 NASA ISS science officer and flight engineer; Cosmonaut Sergei K. Krikalev, Expedition 11 commander representing Russia's Federal Space Agency; Astronaut Leroy Chiao, Expedition 10 commander and NASA ISS science officer; European Space Agency Astronaut Roberto Vittori of Italy; and Cosmonaut Salizhan S. Sharipov, Expedition 10 flight engineer representing Russia's Federal Space Agency.

Explore. Discover. Understand.

June  
2005  
Houston, Texas

# Beak sends...

A MESSAGE FROM CENTER DIRECTOR LT. GEN. JEFFERSON D. HOWELL JR.



## Steady!

The title is a very meaningful command used throughout the military in dynamic or stressful situations. In an aircraft on an instrument approach or a ship on a stormy sea, this command implies "Hold your course; don't change your direction." To soldiers under attack "Steady!" is a command to hold their position and not waver. "Steady!" is used on the parade ground where it is barked out to troops who are being dressed-up on line as they prepare for inspection. As you probably guessed, in that situation it means "Don't move; stay right where you are."

In all of the above situations "Steady!" is not just a command. It is also a strong statement of reassurance. The director or leader who gives this command is indicating that "You're doing all right; stay with it." He or she is also saying "I'm with you on this thing and I'm going to help you get through this successfully." As you can imagine, "Steady!" has helped calm the nerves and bolster the confidence of many people placed in a tough spot. I can personally attest to that.

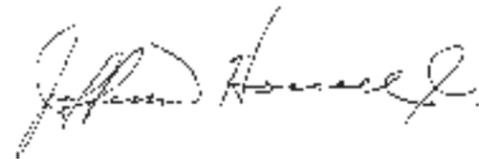
It's obvious that we are part of an institution that is going through a period of dramatic change. We have a new leader, who is bringing in fresh ideas, new organization and innovative direction to our Agency, all of which inherently create some discomfort and concern. The exploration initiatives, already the subject of a major change to NASA's traditional ways, are now getting redirected. Add proposed budget cuts, as well as the current delay in STS-114 with its corresponding technical issues, and there is plenty of grist for the anxiety mill.

My response to all of this is...STEADY!

Please remember that maintaining the viability of the International Space Station and ensuring Return to Flight is still our highest priority. We must stay focused on them and take care of the business at hand. Without the successful return to flight of the Shuttle, the entire vision for exploration will be in jeopardy.

Our administrator has a clear understanding of the exploration vision as well as a profound intent to carry it out. I am fully confident that he possesses the knowledge, ability, will and leadership to succeed. He has assured me that JSC will be a key player in returning people to the Moon and going beyond. However, he expects us to do first things first. Let's keep our eye on the prize and stay on course...Steady!

IT'S GREAT TO BE ALIVE AND IN HOUSTON!



The Rotating Service Structure is rolled back from around Space Shuttle Discovery at Launch Pad 39B for a propellant-loading test of Discovery's External Tank on April 14. During the test, the tank was filled to launch levels with ultra-cold hydrogen and oxygen propellants, known as "cryogenics." The test is designed to evaluate how the tank, orbiter, Solid Rocket Boosters and ground systems are performing under full "cryo-load." Throughout testing, engineers observed the effectiveness of key safety modifications made to the tank.

## Shuttle Return to Flight

# NASA announces a new window

**July 13 to 31** is the new launch planning window for the Space Shuttle *Discovery* mission. The new window gives the Agency time to do additional work to ensure a safe Return to Flight for *Discovery* and its crew.

The announcement follows recent Space Shuttle Program reviews. Managers identified the need to do more work to validate engineering analyses of potential debris hazards and to make some additional modifications to the external fuel tank. NASA officials and program managers agreed to take the time to complete the work.

"This is consistent with our overall approach to the STS-114 mission, which is that we're going to return to flight, we're not going to rush to flight," NASA Administrator Michael Griffin said at a recent news conference at NASA Headquarters. "Our intent with this effort is to make certain we are as safe as we know how to be before we launch the Space Shuttle and its crew. We want it to be right."

"From the beginning we've been milestone-driven," said William Readdy, NASA associate administrator for Space Operations. "This time, the milestones on debris and ice analyses, propulsion system troubleshooting and External Tank modifications drove us to retarget for July. We've never been reluctant to adjust the dates as information becomes available."

The Return to Flight mission will take Shuttle Commander Eileen Collins and six crewmembers to the International Space Station. The mission is the first of two test flights to evaluate new thermal protection system inspection and repair techniques and to deliver supplies and equipment to the Station.

# Michael Griffin takes the helm

by Kendra Phipps



*Despite his six postgraduate degrees, new NASA Administrator Michael Griffin wants employees to know that he considers himself a regular guy.*

“Please just call me ‘Mike,’” he said with a smile in his first address to Agency employees. “I’m not ‘sir’ or ‘Dr. Griffin.’ The NASA administrator is not royalty, and I’m certainly not.”

Griffin reported to work April 14 as NASA’s 11th administrator after having been confirmed a day before by the U.S. Senate.

In his employee address, Griffin said that he is “intensely proud” to be leading the Agency.

“Of all the federal agencies in this country, NASA is the one whose reach is the boldest and which has the longest effect on what we do as a nation,” he said.

He said he sees himself as part of a team, and he plans to rely on input from employees Agencywide as NASA turns the Vision for Space Exploration into reality.

“The Agency is in transition; we are on a new path. There are going to be some difficult decisions to make and I won’t tell you otherwise,” he said to the NASA workforce. “But I promise you that I will make those choices as fairly, impartially, openly

and humanely as I can, with guidance from you and with every effort to hear what you have to say.”

Griffin told employees that public support for the Vision for Space Exploration is high.

“People want a space program that goes somewhere and does something, for the same reason that, a hundred years ago, the media covered expeditions to the South Pole,” he said. “In the human spirit lives an incredibly strong desire to learn what we don’t know, and that is the very basic element of which exploration consists.”

During the question-and-answer segment of his workforce address, Griffin fielded employees’ concerns that the Vision for Space Exploration would squeeze out other NASA interests, such as scientific research and aeronautics.

Griffin said that limited resources do force NASA to prioritize, but not at the complete expense of any of its objectives. He called NASA’s science program one of the Agency’s “crown jewels” and cited his own extensive work experience in the

sciences. While he admitted to being less immersed in the aeronautics world, he pledged to learn as much as possible and to sustain NASA’s excellence in that area as well.

While the Vision for Space Exploration is the current top priority, that does not mean the Agency will abandon all other efforts, he said.

“We will do what we need to do and make the necessary decisions to shape NASA along the lines of the president’s space policy,” he said. “The only promise or pledge I can bring to you is to surround myself with people who are at least as capable as I am. They say that a good manager wants to be the dumbest person on his team; that’s my goal, and some people have assured me that it should not be hard to achieve.”

Griffin’s self-deprecating remarks drew laughs from the audience at NASA Headquarters. The new administrator holds five master’s degrees and a doctorate, is a registered professional engineer and is a certified flight instructor with instrument and multiengine ratings. He is a recipient of the NASA Exceptional Achievement Medal and the Department of Defense Distinguished Public Service Medal, the highest award given to a nongovernment employee.

Griffin was serving as the Space Department head at Johns Hopkins University’s Applied

Physics Laboratory in Baltimore when he was nominated for the role by President George W. Bush. Earlier in his career, Griffin served as NASA’s chief engineer and as deputy for technology at the Strategic Defense Initiative Organization. He has served as an adjunct professor at three universities, where he taught courses in spacecraft design, applied mathematics, guidance and navigation, spacecraft attitude control, astrodynamics and more. Griffin has authored more than two dozen technical papers and a textbook.

This breadth of experience should serve him well in his new role, he said. Griffin indicated that he looks forward to working with, and learning from, the many talented people within the Agency.

“I’ve worked at NASA on several occasions. I’ve been a customer of NASA and I’ve been a partner of NASA; I know the Agency fairly well,” he said. “I’ve worked real programs with real people that are among the most talented I’ve ever known. I know the kind of talent we have in this Agency and I know what we can do when we set our minds to it.”

Griffin will be focusing on Return to Flight efforts for the time being, after which he plans to visit the NASA centers.



**During his April 12 confirmation hearing before the U.S. Senate, the Administrator stated that his priorities, consistent with the Vision for Space Exploration, will be to:**

- Fly the Space Shuttle as safely as possible until its retirement, not later than 2010
- Bring a new Crew Exploration Vehicle into service as soon as possible after the Space Shuttle is retired
- Develop a balanced overall program of science, exploration and aeronautics at NASA, consistent with the redirection of the human spaceflight program to focus on exploration
- Complete the International Space Station in a manner consistent with our International Partner commitments and the needs of human exploration
- Encourage the pursuit of appropriate partnerships with the emerging commercial space sector
- Establish a lunar return program that has the maximum possible utility for later missions to Mars and other destinations

*With his wife and daughter by his side, Griffin took the oath of office as NASA’s 11th Administrator on April 14.*

# A new spin on *artificial* gravity

by Bill Jeffs

**Keeping crewmembers in good health** on long-duration missions to Mars and beyond may require that they bring artificial gravity with them to counter the ill effects of weightlessness on the human body.

The body responds to loss of gravity by adapting itself for optimal efficiency in the weightless environment of space. This includes losing bone and muscle that are no longer needed and changing the way the cardiovascular and motor coordination systems function. By bringing along artificial gravity, in the form of centrifugal force, these normal changes could be prevented and the health and safety of long-duration crewmembers could be protected.

For more than a century, people have speculated that gravity could be created in space by rotating a spacecraft, giving space travelers a one-gravity condition like here on Earth. The idea long postulated is to rotate the vehicle and so, at least on the transit between Earth and Mars and back, people would be able to live in a one-gravity environment. Or perhaps a centrifuge could be installed in the spacecraft. Crewmembers could spin around in it for a prescribed amount of time and increase the gravitational loading so that their body responds and maintains a certain level of physiological fitness.

Cost and design issues have plagued the rotating environment idea. For the latter scenario, that of installing a centrifuge onboard a spacecraft, many questions have been raised

including how often people need to spin around and how much artificial gravity they need to stay fit.

But with the national impetus to return humans to the Moon and travel to Mars and beyond, new artificial gravity studies are about to begin to find answers to these questions.

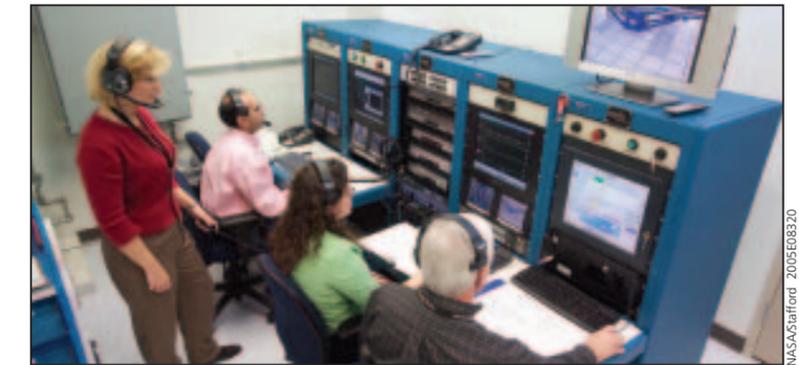
The new research will begin this summer at the University of Texas Medical Branch (UTMB) at Galveston, overseen by Johnson Space Center. A NASA-provided Short-Radius Centrifuge (SRC) will be used to attempt to protect normal human test subjects from deconditioning when confined to strict bed rest. Bed rest can closely imitate some of the detrimental effects of weightlessness on the body. For the first time, researchers will study how artificial gravity may serve as a countermeasure for the body as a whole to prolonged simulated weightlessness.

"The Vision for Space Exploration includes destinations beyond the Moon," said Dr. Jeffrey Davis, director of JSC's Space Life Sciences Directorate. "This artificial gravity research is an important step in determining if spacecraft design options should include artificial gravity. The collaboration between NASA, UTMB and Wyle Laboratories demonstrates the synergy of government, academic and industry partnerships."

The NASA-sponsored research is divided into two phases. The first phase will use the SRC to support NASA's Artificial Gravity



**Back row, left to right:** Hamid Tabibian, Stewart Robinson, Elisa Allen, David Compton, Freddie Ferrara, Maneesh Arya, Gina Pariani, Jon-Michael Tucker, Lisa Gustafson, Joe Sinka, Dr. Bill Paloski, Eric Warren  
**Front row, left to right:** Jan Bergeron, Larry Meeker, Keena Acock



**Clockwise from left:** Test dummy lying in centrifuge with view screen visible above its head.

Control room during testing with the Human Centrifuge.

Human Centrifuge at UTMB Galveston Clinical Research Center.

Pilot Study. A second phase will include enhancements to the centrifuge design, including addition of resistive and aerobic exercise stations, to provide support for a multinational artificial gravity project that would involve Germany and Russia.

For the initial study this summer, 32 test subjects will be placed in a six-degree, head-down, bed-rest position for 21 days to simulate the effects of microgravity on the body. Half that group will spin once a day on the centrifuge to determine how much protection it provides from bed-rest deconditioning. The "treatment" subjects will be positioned in the centrifuge and spun up to a force equal to 2.5 times Earth's gravity at their feet for an hour and then go back to bed.

"The studies may help us to develop appropriate prescriptions for using a centrifuge to protect crews and to understand the side effects of artificial gravity on people," said Dr. Bill Paloski, NASA principal scientist in JSC's Human Adaptation and Countermeasures Office and principal investigator for the project. "In the past, we have only been able to examine bits and pieces. We've looked at how artificial gravity might be used as a countermeasure for, say, cardiovascular changes or balance disorders. This will allow us to look at the effect of artificial gravity as a countermeasure for the entire body."

To do this, Paloski and his co-principal investigator, Professor Laurence R. Young of Massachusetts Institute of Technology, have assembled a group of 24 scientists from leading universities and research centers around the United States to participate in the study. Under the guidance of Paloski and

Young, this unprecedented, multidisciplinary research team will collect, analyze and interpret all of the data necessary to determine how artificial gravity affects the various systems of the body. The tests are expected to end in the fall of 2006.

The research will take place in UTMB's National Institutes of Health-sponsored General Clinical Research Center. The study supports NASA's Artificial Gravity Biomedical Research Project.

The centrifuge was built to NASA specifications by Wyle Laboratories in El Segundo, Calif. It was delivered to UTMB in August 2004 and will complete design verification testing, validation of operational procedures and verification of science data this spring. The centrifuge has two arms with a radius of 10 feet (three meters) each. The centrifuge can accommodate one subject on each arm.

"The design rigor and processes used to develop this hardware, its built-in automatic safety shutdown features and the medical monitoring and control devices incorporated make this centrifuge a very safe system," said Hamid Tabibian, NASA centrifuge engineering manager, JSC Engineering Directorate.

The NASA Exploration Systems Mission Directorate, Headquarters, Washington, D.C., is supporting this research.



STS-114 crewmembers touring upgraded facilities and navigation aides at White Sands Space Harbor (Facility and NAVAID upgrades were deemed to be RTF).

NASA/Rosales WSTF0804e7240

In addition, WSTF has conducted extensive evaluation and testing associated with the design of a flexible hose installed in the forward RCS propellant system. Since WSTF maintains the Fleet Lead test articles and preserves the history of the components installed, the facility is working to resolve a concern about the life expectancy of the flex hoses.

On the aft RCS test article, WSTF recently evaluated the effect of closing a valve in the propellant supply system to the rocket engine. This action would effectively starve the thruster of propellant, similar to running out of gas, in the event the engine failed to turn off when commanded. This test will help figure out a way to reduce the risk of a Shuttle mishap when docking with the International Space Station.

WSTF employees continue to focus on the ongoing objectives of various projects. The depot continues to perform evaluation, repair and overhaul of flight hardware to ensure that sufficient spare components are available. The Fleet Lead Program maintains active test articles to evaluate components for life-dependent failures and provide a test bed for anomalies or process changes at the Kennedy Space Center. Tests are being conducted on the Space Shuttle Auxiliary Power Unit to extend its qualified life.

Additionally, employees have been testing low- and high-velocity impacts against the Shuttle wing's leading edge. The Hypervelocity Group has completed three separate test programs related to the Return to Flight effort. One program was the Impact Penetration Sensor System test, which lasted

throughout 2004. More than 211 total tests were performed on the thermal protection tile panels, the fiberglass leading edge of the wing and the Reinforced Carbon-Carbon (RCC) panel. Over 100 sensors were applied to each test article to evaluate the magnitude and arrival time of the impact-generated stress waves. Two data acquisition systems with support personnel from Johnson Space Center, Langley Research Center and Boeing supported the effort full-time.

"Our team is continually researching to find answers to the potential questions Houston may have about strikes from orbital debris," said Don Henderson, project leader for the Hypervelocity Impact Team.

Another Return to Flight evaluation was the RCC Damage Assessment Program. Flown RCC test coupons from the RCC panel of *Atlantis* were impacted with projectiles of various sizes. The RCC specimens were then sent to an arc-jet facility to determine the effect of hypervelocity impacts.

WSTF is proud to contribute its expertise to making Return to Flight as safe as possible. The testing being done at WSTF will provide astronauts an improved stepping-stone to the cosmos.

"It is an honor to work here at WSTF and work to keep the Space Shuttle and its astronauts safe," said David Hirsch, supervisor of the hypervelocity impact team.

## White Sands Test Facility

# Testing for Return to Flight

by Cheerie R. Patneau  
NASA White Sands Test Facility

Employees at the White Sands Test Facility (WSTF), located near Las Cruces, N.M., have been gearing up toward returning the Space Shuttle to flight. WSTF performs a wide range of activities in support of the Space Shuttle Program, including refurbishing flight hardware, maintaining and operating Fleet Leader test articles, performing hypervelocity impact testing, conducting materials and component tests and supporting the astronaut approach and landing training missions.

"This has been a very busy time for us. As we approach the Return to Flight launch, other issues or concerns are likely to arise. However, I am confident that the employees of WSTF can and will step up to the challenge in conducting the testing and

component repairs necessary to ensure a safe and successful mission," Robert Cort, chief of the Propulsion Office, said.

The WSTF flight hardware depot has been extremely busy performing preventative maintenance, repairs and overhaul of components from the Orbital Maneuvering Subsystem and Reaction Control Subsystems (RCS). These rocket propulsion subsystems provide thrust to the orbiter for in-orbit operations ranging from orbit circularization, rendezvous and docking to deorbit. Most of the activity has been geared towards the RCS thrusters. Each Space Shuttle orbiter has 38 of these relatively small rockets, and WSTF has completed maintenance and repair on every one of them scheduled to fly on the Return to Flight mission.



NASA/Rosales WSTF0804e6920



NASA/Rosales WSTF0804e777

Hypervelocity Impact Testing of RCC Wing Leading Edge.



Expedition 11 crew, from left, Commander Sergei Krikalev and NASA ISS Science Officer and Flight Engineer John Phillips.

## Space Station tops the list as a popular summer stop

by Joanne Hale

**Expedition 11** Commander Sergei Krikalev, 46, and NASA ISS Science Officer and Flight Engineer John Phillips, 54, will be busy this summer taking care of business onboard the International Space Station as well as welcoming a variety of guests.

Highlights of the new Expedition 11 crew's mission include welcoming the crew of the Space Shuttle *Discovery* on its STS-114 mission, the first Shuttle flight since the *Columbia* accident.

The crew also may see the addition of a third crewmember who will be brought to the Station by *Atlantis* on the STS-121 mission. Plans call for them to do one spacewalk, in Russian spacesuits from the Pirs Airlock. The spacewalkers will continue outfitting the Station's exterior and work with scientific experiments.

The Expedition 11 crew will also welcome the arrival of two Progress uncrewed supply vehicles. Progress 18 is scheduled to reach the Station in June and Progress 19 should be launched near the end of August.

In August, Krikalev and Phillips will move their Soyuz spacecraft from the Pirs docking compartment to the Zarya docking port. That will permit use of the Pirs Airlock for the spacewalks.

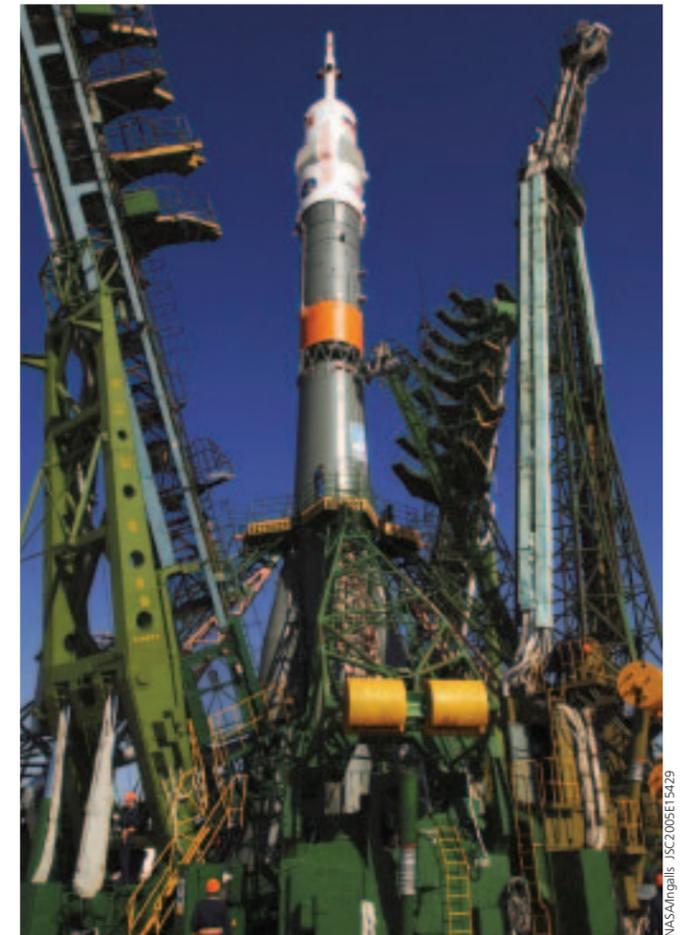
Krikalev is a veteran of five previous spaceflights, including two missions to the Russian space station Mir and two Shuttle flights. He was a member of the first Station crew, serving aboard a much smaller Space Station from Nov. 2, 2000, to March 18, 2001. He has spent a year, five months and 10 days in space. This flight should see him become the world's most experienced space traveler.

Born in Leningrad (now St. Petersburg), Russia, he graduated from what is now St. Petersburg Technical University in 1981 and then joined NPO Energia, the Russian organization responsible for human spaceflight. He was selected as a cosmonaut in 1985.

Phillips was born in Fort Belvoir, Va., and considers Scottsdale, Ariz., his home. He graduated from the Naval Academy in 1972 and became a Naval aviator. After leaving the Navy in 1982, he earned a master's and doctorate in geophysics and space physics from the University of California in 1984 and 1987. He did postdoctoral work at the Los Alamos Scientific Laboratory in New Mexico.

He was selected as an astronaut in 1996. He was a member of the STS-100 crew of *Endeavour* in 2001. On that mission he coordinated two spacewalks at the Station to install Canadarm2.

Phillips has wanted to return to the Station ever since. "It was a wonderful place to be," he said. "The crew was doing a great job; they were having a good time." He wanted to stay longer then. Now he'll have about six months there.



The Soyuz TMA-6 vehicle rolled to its launch pad at the Baikonur Cosmodrome in Kazakhstan on April 13, 2005, in preparation for its launch April 15 (Kazakhstan time) to send Cosmonaut Sergei K. Krikalev, Russia's Federal Space Agency Expedition 11 commander; Astronaut John L. Phillips, NASA ISS science officer and flight engineer; and European Space Agency Astronaut Roberto Vittori of Italy to the International Space Station. Krikalev and Phillips will spend six months in space and greet the first Shuttle crew to fly in more than two years when it arrives at the Station, while Vittori spends eight days on the Station under a commercial contract between ESA and the Russian Federal Space Agency.

Krikalev and Phillips are the Station's fifth two-person crew. After the *Columbia* accident on Feb. 1, 2003, the ISS Program and the international partners determined that because of limitations on supplies the Station would be occupied by two crewmembers instead of three until Shuttle flights resume.

The 11th crew will continue science activities, initially with facilities and samples already on the Station but later with experiments scheduled to arrive at the Station aboard *Discovery*.

Krikalev and Phillips are scheduled to spend about 180 days on the Station, returning to Earth in October, a little over a week after the arrival of their Expedition 12 successors.