In one of the most detailed astronomical images ever produced, NASA's Hubble Space Telescope captured an unprecedented look at the Orion Nebula. This turbulent star formation region is one of astronomy's most dramatic and photogenic celestial objects. More than 3,000 stars of various sizes appear in this image, and some of them have never been seen in visible light.

The crisp image is a tapestry of star formation. It varies from jets fired by stars still embedded in their dust and gas cocoons to disks of material encircling young stars that could be the building blocks of future solar systems.

NASA JSC2006E19733

Photo credit: NASA, ESA, M. Robberto (Space Telescope Science Institute), Hubble Space Telescope Orion Treasury Project Team

Space Center Roundup

The Roundup is an official publication of the National Aeronautics and Space Administration, Johnson Space Center, Houston, Texas, and is published by the Public Affairs Office for all Space Center employees. The Roundup office is in Bldg. 2, Rm. 166A. The mail code is AP411. Visit our Web site at: **http://www.jsc.nasa.gov/roundup/online/** For distribution questions or to suggest a story idea, please call 281/244-6397 or send an e-mail to **jsc-roundup@mail.nasa.gov**.

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National Aeronautics and Space Administration

Lyndon B. Johnson Space Center
SPACE CENTER ROUNDUP
Volume 45 • Number 6
JUNE 2006

Roundup

NASA/Markowitz S89-1061

A pioneer says goodbye

FROM THE

director

A MESSAGE FROM CENTER DIRECTOR MICHAEL L. COATS

The Exploration Wellness Program

The Exploration Wellness Program at the Gilruth Center has been a fantastic success. I'm delighted to see that over 4,800 members of our space team have joined the program and are trying to wear out the exercise equipment at Beak's Body Shop. I know I'm pointing out the obvious, but let me emphasize again that even a little bit of exercise has significant health benefits.

What may not be quite so obvious is that we also have to take care of our mental and emotional health. The space program is an exciting and satisfying profession, and we attract the best and brightest hard-chargers in the world, but it can also be a job with long hours and a great deal of stress. During my cardiac rehabilitation I heard several physicians and nurses refer to aerospace as the "widow-maker business." The same type of success-oriented and highly motivated personalities attracted to this work are also the type of people who have a hard time admitting mistakes or admitting they are over-stressed. We're all proud of the comment that "failure is not an option," but the reality is that we're human beings and occasionally we do make mistakes and we do fail. I believe strongly that if we don't fail now and then, we're not reaching far enough. But we also have to learn from our mistakes, let go of them and get on with the new challenge and opportunities (and new failures occasionally). We are all susceptible to stress, and occasionally depression, and it's critical to understand there are times when we may need help in dealing with the pressures of our increasingly hyper society. There is not and should not be any stigma attached to asking for help with *any* physical, mental or emotional problem. Feelings of helplessness or being overwhelmed should not be ignored. Help is available, and we all need to be alert to signs of chronic stress in our coworkers.

Stress is part of our lives, and some of it is actually good for us, but we all need to build resilience to stress with good physical and mental health. We have an outstanding Employee Assistance Program here at JSC, available to everyone. It is located in Building 32, Room 132, and the phone number is (281) 483-6130. The program has well-trained and experienced people who can help. Most of us love to fix things and make them work better. That should include ourselves and each other.

Aircraft Operations helps shuttles get off the ground

by Kendra Phipps

NASA/Markowitz JSC2004E47014

JSC's Aircraft Operations Division maintains a fleet of aircraft, including the T-38 shown here, that helps support space shuttle missions.

Most people get their weather reports by turning on the local news, or by searching a weather Web site.

In Florida, there's another option: just ask your friendly neighborhood pilot to jump in a high-tech aircraft and check things out.

To be fair, these are not ordinary five-day forecasts. These "weather reconnaissance flights" are performed by JSC's Aircraft Operations Division (AOD) using the Shuttle Training Aircraft (STA). The flights help determine whether the weather conditions at Kennedy Space Center (KSC) are right for a space shuttle launch, and are just one of the many tasks that AOD performs for each shuttle mission.

"We do weather flights starting about an hour prior to launch," said Alyson Hickey, STA flight simulation engineer. "Usually, the head of the Astronaut Office will be the pilot, giving feedback on sun angle, crosswinds, clouds in the area—anything the (shuttle) pilot might want to know."

Weather flights are also done a couple of hours before a shuttle landing.

The STA's primary function has more to do with runways than raindrops: The aircraft is used to train astronauts to land the shuttle, which acts like a glider on its descent to Earth. The shuttle has been compared to a falling brick—a sensation that the STA, a modified Gulfstream-2, is designed to replicate.

Hickey is part of the AOD team that works on the STA's software requirements. "Our own software runs the simulation, so we keep up with any shuttle changes that would affect the landing portion," she said. "When the shuttle world makes a change, we have to make the same change in our software."

To keep the astronauts current in their landing skills, STA training is a year-round job for AOD. A shuttle pilot may fly in the STA as close as two days before launch.

"As you can imagine, you want to get up-to-the-minute training so it's as close as possible to the mission," said Ken Cockrell, AOD's WB-57 program manager.

As important as STA training is, all of the aircraft in AOD's fleet play important roles in shuttle missions.

To get to and from STA training sessions, which are often held in New Mexico, AOD relies on the T-38 aircraft. T-38s are also used to transport astronauts to KSC prior to launch, while mission managers and crew families hitch a ride to Florida on a Gulfstream-2.

The WB-57 planes were given an important task for STS-114: getting images of *Discovery* during its ascent to check for tile damage.

"It's called the WAVE: WB-57 Ascent Visualization Experiment," said Cockrell. "Using one or both WB-57s, we fly at 52,000 feet in the vicinity of the path the shuttle takes during ascent to get high-quality imagery." WAVE is scheduled to be repeated for STS-121.

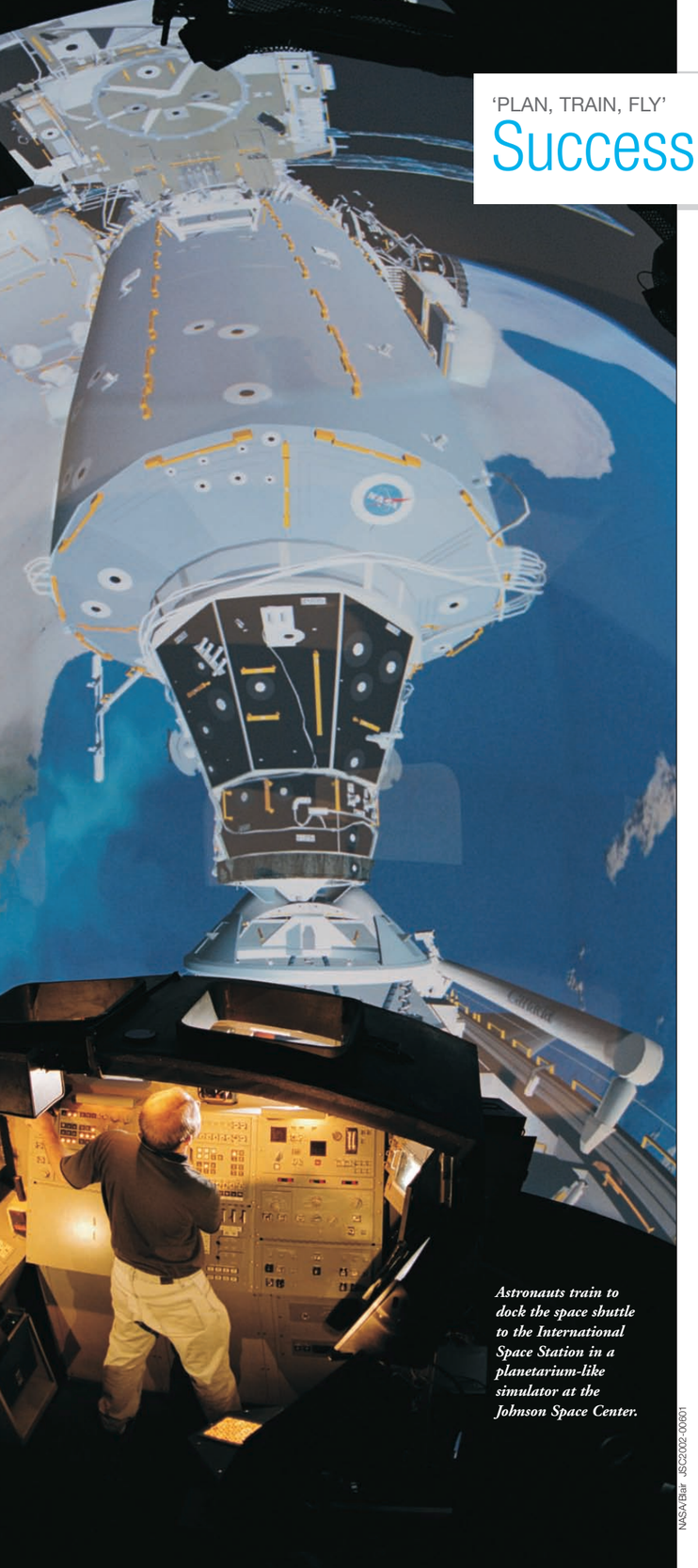
The Shuttle Carrier Aircraft (SCA) is also on standby during each mission in case the shuttle lands somewhere other than KSC and needs a ride home.

"If the shuttle lands at Edwards (Air Force Base), we operate the SCA, which ferries shuttle back to KSC," said Ken Baker, chief of the Flight Operations Branch. Baker said that multiple factors affect how long it takes to get a shuttle from Edwards to KSC—for instance, the weight of an orbiter varies with each mission's payloads and affects how quickly the SCA will use up fuel.

The AOD team strives to keep JSC's entire aircraft fleet ready for any tasks that come its way, Baker said.

"For every mission, we have to be ready. Every plane has to be ready," he said.

"Supporting the space program is always exciting."



Astronauts train to dock the space shuttle to the International Space Station in a planetarium-like simulator at the Johnson Space Center.

NASA/Blair JSC2002-00601

'PLAN, TRAIN, FLY'

Success is in the details

by Catherine E. Borsché

To describe in infinite detail how the Mission Operations Directorate (MOD) prepares for a shuttle mission is a task that would require more pages than the average novel. Under the various divisions, massive coordination and teamwork takes place to orchestrate the "perfect" mission.

"The preparation is really the heart and soul of being able to execute the missions," Phil Engelauf, chief of the Flight Director Office, said. "It's the preflight preparation, knowing all of the ins and outs and the variations, that makes you smart enough to be able to respond in real time."

For space shuttle missions, preparation begins about a year out.

"The standard thing is about a year before a mission, you get assigned, and that's when you start working it," Tony Ceccacci, lead shuttle flight director for STS-121, said. "From a year to three months prior to the flight you're developing procedures, timelines and such. About three months prior to the flight you actually get to practice them and start doing all the simulations."

A big part of the preparation involves writing the flight plans and flight rules.

"The lead flight directors in charge of the mission are responsible for all of the mission operations and preparation," Engelauf said. "They oversee the development of the flight plans and the assembly and development of the flight rules that will be used to execute the mission." Flight rules are predetermined decisions of what to do during a flight in regards to priorities, failure responses and more.

"We look at what are the specific objectives of this mission and the things that require special procedures, and we'll write those and then do verification of (the procedures) in the simulator," said Stan Schaefer, chief of the systems division in MOD.

Joint Operations Panel meetings are held regularly to cement the plans into place and go over any possible problems the mission could encounter.

"We talk about any issues that come up with regards to our mission timeline and the operations that we're going to perform during the mission," Rick LaBrode, lead International Space Station flight director for STS-121, said. "And we walk through the very, very fine details of the issues and come to a conclusion as to what we are going to do operations-wise in order to either avoid the problem or work around the problem."

The Operations Division within MOD is instrumental in the planning phase of the mission.

"The Operations Division may begin preparing for a shuttle mission years before the mission, depending on the complexity," Jim Clement, deputy of the Operations Division, said. "We play a significant role in the overall process of 'plan, train and fly.'"

NASA/Blair JSC2002E33377

Astronaut Terrence Wilcutt sits in the commander's seat in the flight deck of a shuttle mock-up in the motion-based simulator.

"The International Operations Branch provides a group of controllers (that works) to provide everything from systems experts to interpreters to technical documentation necessary to keep control centers around the world operating smoothly," Clement said. "In the same branch, the Procedures Management Group manages the development, production and configuration management of the thousands of crew and ground procedures necessary for astronaut crews and Mission Control to safely operate the shuttle and station."

The division is also involved in negotiating and producing integrated plans for flight crews onboard both the shuttle and station.

"Within the Cargo Integration Branch, our team works across discipline lines to make sure we can accomplish the objectives of the mission and solve problems within vehicle capability," Clement said. And for space station assembly missions, the Design Integration Office performs operational design assessments in the strategic assembly timeline.

But it's the simulations, actually putting all the procedures and rules to the test, that make up the core of the preparation.

The simulations take many forms, whether it is the entire mission team and management working in Mission Control and other planning rooms alongside the crew in the shuttle simulator, or the crew practicing spacewalks in the Neutral Buoyancy Lab or working in the Virtual Reality Lab. The simulations also vary in time, length and intensity, although most are just over a particular flight day.

"We do have long sims," Ceccacci said. "They used to go through the whole entire mission, but now that they can be 12 days long, we do them one day at a time. Sometimes we've had long sims, in which we've done three days at a time. In those all three teams get to support it, and we practice the various handovers and tasks required for the three different shifts."

The simulations have also grown in scope over the last few years, including a major portion of several programs across the center.

"Since the *Columbia* accident, we've had requirements from the Mission Management Team to include them in some of our simulations," Michael Collins, chief of Flight Design and Dynamics Division in MOD, said. "So the shuttle program and engineering and MOD people all participate in these major Mission Management Team situations, where the training team puts in malfunctions and we see how the entire team, including the astronauts and management, all respond to those problems."

Simulations are critical in identifying potential flaws in the flight plan or within a team.

"We script simulations that will help exercise any weaknesses that we've identified in an individual crew (member) or in the crew and how they work together. So we will go exercise that and provide them feedback on how we think they're doing," Tom Hanson, team lead in shuttle training division for Barrios Technology, Inc., said. "As we get closer to flight we'll go through the integrated training, where we're actually working with the flight control team that's assigned to our flight."

In the integrated training, another group of instructors enters the mix to evaluate the flight controllers themselves.

"They are looking at the chunks of the timeline that we've identified we're going to train, and they're looking for places where maybe we can throw the flight controllers a curveball and exercise them and get them ready," Hanson said.

The practice "failures" are determined by the flight plan itself.

"They look at what things would be unexpected, or the (occurrences) that would have the biggest impact on the mission," Schaefer said. "For example, if you're getting ready to do a rendezvous and you lose some of your navigation equipment, how would you reconfigure the system so that you could continue with the rendezvous? Or would you have to break out and stop the rendezvous? A lot of those decisions are made in our flight rules, and so in a simulation they might put in a failure case to test out some of those flight rules or make sure that the person is going to make the right decision."

Not only that, but simulations also help identify how all the teams work together, especially the crew and the flight controllers.

But all the coordination is worth it to the folks in MOD, who take pride in a mission's success.

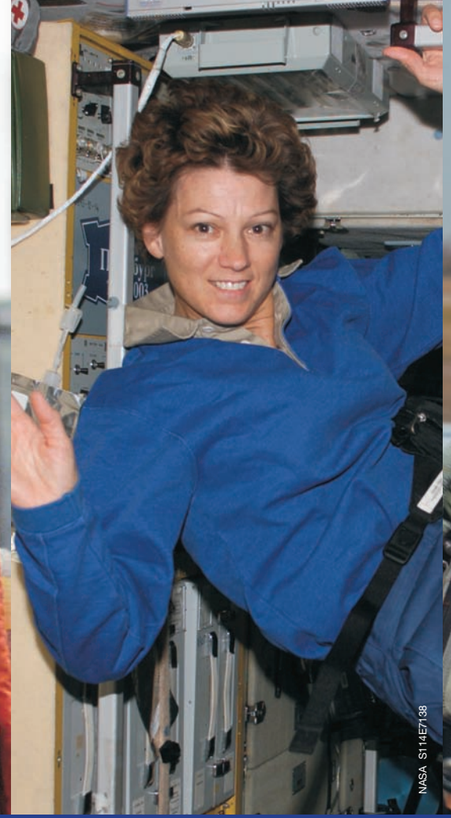
"I think we do a superb job. STS-114 went off flawlessly from our perspective, which is just a great testament to the individuals, the flight controllers and the training team, because it had been so long since we had flown," Schaefer said. "There were a number of new people who either didn't have a lot of flight experience or had none, and they performed like they had been doing this forever."

It is MOD's aim to make the mission so seamless that the crew is fully able to complete the mission objectives.

"We really are an extension of the crew onboard, and we do a lot of things so that they don't have to," Schaefer said, "so they can focus on the reasons why they're there in space."

Astronaut Eileen M. Collins, STS-114 commander, dons a training version of the shuttle launch and entry suit prior to the start of a mission training session in the Neutral Buoyancy Laboratory near Johnson Space Center.

NASA/Stafford JSC2004E41381



Collins, STS-114 commander, waves while floating in the Zvezda Service Module of the International Space Station while Space Shuttle Discovery *was docked to the station.*

NASA S114E7138

Collins, STS-114 commander, prepares for a T-38 flight to the Kennedy Space Center from Ellington Field, near Johnson Space Center.

NASA/Markowitz JSC2004E01407

Collins is visibly moved at the STS-114 homecoming ceremony, which was held in Hangar 276 at Ellington Field.

NASA/Markowitz/Blair/Sanchez JSC2005E29489

Curtain call for astronaut Eileen Collins

by Catherine E. Borsché

An inspiration to little girls everywhere, astronaut Eileen Collins leaves NASA having given the space program a much richer history. With her departure, she offers advice for those embarking on their own amazing life journeys.

"Find something that you really love doing, something where you feel you are making a contribution. Learn as much as you can, be as smart as you can, find a niche," Collins said. "If you find something you can do, take charge—fill the void."

Collins said that, "if you don't love what you are doing, you will give it up. I love to fly. I'm an astronaut and I'm a mother. Those are the two things that give me energy. I'm excited about getting my kids up and training."

Collins exits this chapter in her life to glowing reviews from NASA leaders.

"Eileen is a true pioneer in space and on Earth," Mike Coats, director of Johnson Space Center, said. "Her service and dedication to her country, to NASA and to space exploration are an inspiration. She meets every challenge with confidence and an ever-present smile."

Collins is not one that could be fit into a preexisting mold. Her career with the Air Force and NASA was truly revolutionary.

In 1979, Collins graduated from Air Force Undergraduate Pilot Training at Vance Air Force Base in Oklahoma, where she was a T-38 instructor pilot until 1982. From 1983 to 1985, she was a C-141 aircraft commander and instructor pilot at Travis Air Force Base in California. During her service with the Air Force, she was an assistant professor of mathematics and a T-41 instructor pilot. Collins was selected for the astronaut program while attending Air Force Test Pilot School.

Collins became a member of the elite astronaut corps in July 1991, where she served as, among other things, a Mission Control spacecraft communicator (CAPCOM), an Astronaut Office Spacecraft Systems Branch chief, a chief information officer, a shuttle branch chief and an Astronaut Safety Branch chief.

In between her various desk duties, she also managed to forge new ground as the first woman to pilot the space shuttle (STS-63, *Discovery*) and the first woman shuttle commander (STS-93, *Columbia*).

"Eileen Collins is a living, breathing example of the best that our nation has to offer," said NASA Administrator Michael Griffin. "She is, of course, a brave, superb pilot and a magnificent crew commander. Beyond those qualities, she is both very bright and modestly self-effacing about that fact. And above all, she is possessed of a quiet determination to attain the very highest levels of accomplishment. I am proud to know her and will greatly miss her at NASA."

Collins participated in four spaceflight missions, two as pilot and two as commander. She also commanded the STS-114 Return to Flight mission aboard *Discovery*, where she and her crew tested and evaluated new procedures for flight safety and shuttle inspection and repair techniques.

The two-week, 5.8-million-mile journey in space would be her last, though, as she announced her departure from NASA on May 1. With her exit she plans to pursue private interests and spend more time with her family.

"I have been at NASA for 15-and-a-half years. It's time for me to step aside and give the other astronauts a chance to fly," Collins said. "It's important that our country has a larger number of people with experience in space."

Collins will be sorely missed by those who have had a chance to work with her and see her professionalism in action.

"Eileen is a gifted leader who knows what it takes to get a team through the most difficult of times," Flight Crew Operations Director Ken Bowersox said. "All of us will feel Eileen's absence, but regardless of the path she pursues after leaving NASA, I know she will continue to exert a positive influence on the explorers of today and tomorrow."

Collins is appreciative of her many years within the NASA family.

"I have greatly enjoyed all of the various jobs I have had in the Astronaut Office; most specifically, I have enjoyed working with our superb NASA and contractor employees," Collins said. "The people I work with are the finest professionals. These are people who love spaceflight and love being a part of exploration."

Collins hopes her amazing journey is not the last as NASA reaches further into the solar system.

"I hope to continue to work in the aerospace industry in some capacity. I leave the astronaut job with great memories, but also great expectations for our country's future in space!" Collins said. "Per NASA's current plan, people will again walk on the moon, and my dream is to someday see astronauts from the United States living on Mars."

That would be a fitting tribute for a woman whose legacy will always endure within the NASA family and beyond.

JSC takes baby steps towards moon and Mars

by Kendra Phipps

Someday soon, NASA's next-generation spacecraft will thunder off the launch pad, taking the United States back to the moon and setting off an exhilarating new era of exploration.

But first, we have to put an astronaut in a tube.

That's the nickname for an experiment that will pinpoint the ideal size for a hatch, and it's just one of the many baby steps on the road to that exciting launch day. Read about it, and another first step, below.

ASTRONAUT IN A TUBE

The "tube" in question is actually the Low Impact Docking System (LIDS), which will be a docking interface on the Crew Exploration Vehicle (CEV). In designing the LIDS, a key question needs to be answered: what size does the hatch need to be to let a suited astronaut fit through it?

"We need to answer the basic questions first, then go into the details," said John Park. Park is the manager of the Architecture, Habitation and Integration Team within the Crew and Thermal Systems Division.

A test was devised using a partial gravity counterbalance system (PGCS), which simulates reduced gravity. The PGCS in Building 29 held a low-fidelity LIDS mockup while a suited astronaut attempted to "float" through it.

"We actually suspended the mockup, and the astronaut stood there and simulated floating through it by pulling it down," said Park. The team tested a variety of diameters to narrow the hatch parameters, and also to see which current spacesuits could be adapted for use on the CEV. The next step will be to repeat this test with a more realistic LIDS mockup.

Suited astronauts also tried to move through different hatches in the CEV mockup in Building 9, Park said.

"We found some good results and took some video analysis," he said. "It was good for getting a ballpark figure."

Park is quick to point out that this test is a team effort. It involves people from the Extravehicular Activity (EVA) Office, the Constellation Program and the Space Life Sciences and Engineering Directorates, to name a few.

"Our job is to integrate all that together and conduct the test with their assistance," said Park. "It's a challenging job, but something we really enjoy."

WALKBACK TEST

In search of some fantastic moon rocks, an explorer on the moon takes the lunar rover out for a spin. She's gone a few kilometers away from the base when the rover crawls to a stop. Uh-oh.

In that scenario, would the astronaut be able to walk back to safety, or would her spacesuit be too cumbersome for the journey?

Enter the "walkback" test. This experiment aims to determine whether an astronaut could walk long distances if necessary, and to refine suit designs to make such a walk easier. The data could also be used in the design of portable life support systems.

The test is spread out over several weeks and uses Building 9's PGCS, which is nicknamed "POGO." Several test subjects take turns walking while strapped in the POGO, which is rigged to simulate reduced gravity. While they're walking, the subjects are monitored closely—their heart rates, temperatures and carbon dioxide outputs are recorded, and more subjective traits such as discomfort, gait and ease of motion are noted as well.

"The subject is hooked up to a metabolic cart, and the advanced biometrics facility is looking at how their movement changes in different gravity levels," said Jessica Vos, test project manager in the Spacesuit Systems Branch. "The lab assesses their cognitive changes, evaluates how hard the exercise is and how much they're compensating."

The first round of the walkback test allows the subjects to walk in everyday clothing. Later, each person will put on a spacesuit—specifically, the Mark III Advanced Space Suit Technology Demonstrator suit—and try walking again, this time for a long duration.

"We're going to have the same crew members get in the suit and try to walk 10 kilometers, picking a gait that's comfortable to them," said Vos. She added that the subjects are not required to complete the full 10 kilometers, but can stop when they need to. Each person will try the long walk three times, each at a different simulated gravity level.

The results will help engineers design suits that will not only stand up to a mission's planned tasks, but also to unexpected events like a very long walk.

But if an astronaut made the long trek back to the base, she would then have a hatch to deal with. Would she be too mentally and physically exhausted to open it at that point?

The questions just keep coming, but one by one, tests like this are helping to answer them. Vos said that the walkback test is a collaborative effort among many JSC teams, including several engineering branches and the EVA Office.

CLOCKWISE FROM LEFT
Jason Norcross records data during the test.

Lesley Lee monitors the speed of the treadmill as Mark Dub is lifted by the POGO apparatus to simulate the moon's gravity.

Mark Dub adjusts his head gear.

Interpreters keep communication lines open for Mission Control

by Donna Lin

ALONG with the flight controllers and directors, another small team works around the clock to ensure that the International Space Station Mission Control Center (MCC) operates smoothly. Both American and Russian team members depend on this group. What group is it?

Give up? It's the interpreters who keep the bilingual communication lines open between the MCC and its counterpart in Moscow.

Alina Spradley is one of the Russian interpreters who help keep operations in the MCC going 24 hours a day, seven days a week. Some of these hardworking people are translators, performing written translations, while others are interpreters, specializing in oral translation.

Spradley said that she always wanted to be a translator, even attending the Monterey Institute of International Studies in Monterey, Calif. to earn her master's degree in formal translating and interpreting.

"I love languages, but I don't really like to write my own words down," Spradley said. "Translating is perfect for me because I can take the words that other people say and make them pretty for another person to understand."

JSC's translators must complete a long path to become qualified MCC Russian translators. New translators are hired by TechTrans International (TTI), a language support and logistics services company, where they begin a rigorous training regimen to learn the technical language that is so prevalent in the spaceflight world. Translators begin by performing written translation tasks, reading training materials and working alongside editors.

Eventually, new translators are given their first assignments and work their way up to more difficult projects and tasks. Spradley said it takes approximately two years for a translator to be considered fully proficient and MCC-certified. Out of the 37 translators working at JSC, 21 are MCC-certified.

Not all translators are native Russian speakers. Some native speakers of English work for TTI, having received formal training in Russian as undergraduate and graduate students. Spradley said that a formal education is helpful but not a necessity when it comes to being a good translator. TTI employs translators and interpreters who come from a wide variety of educational backgrounds, including engineering, technical and biomedical backgrounds.

NASA/Markowitz JSC2006E18149

From left to right are translators Peter Stavitsky, Alina Spradley, Michael Toubin, Alex Altayev, Lydia Bryans and Olga Dickerson (sitting).

"To be able to translate, you really have to know the language well. But you don't need to have formal training in Russian," she said. "Being a good translator relies on having a natural talent for it, strong interpersonal skills and a good cultural knowledge of others' backgrounds."

MCC-qualified translators can also become certified in two different areas of focus—space-to-ground operations and extravehicular activity (EVA). Space-to-ground operations include translating Russian to English for the MCC, and English to Russian for the control center in Moscow.

When space station crews are scheduled to perform spacewalks, translators are seated next to the CAPCOM in the MCC for the duration of the event.

"I've been seated next to the CAPCOM for the past three EVAs, and I'm there just in case the Russian cosmonaut involved in the EVA doesn't understand the instructions he's being given," Spradley said. "I've never had to step in and translate for a cosmonaut, and I hope that I will never need to, because this means everything is going well."

Although it may seem as if the life of a Russian translator at JSC becomes routine, it is anything but. The translators' schedules are determined by several factors, including training priorities and professional growth opportunities.

Spradley said that keeping translators on different projects helps them to maintain their proficiency with different areas of the MCC. She may be assigned to space-to-ground operations for two weeks, then moved to the MCC to support technical interchange meetings. Most of the interpreters support teleconferences on a regular basis, which normally begin between 6 and 7 a.m. and last approximately two hours. This allows interpreters to spend the rest of their days supporting meetings, crew training and flight operations.

Although translators are usually grouped into regular nighttime and daytime shifts, Spradley said they sometimes have to work irregular hours to address crew members' needs.

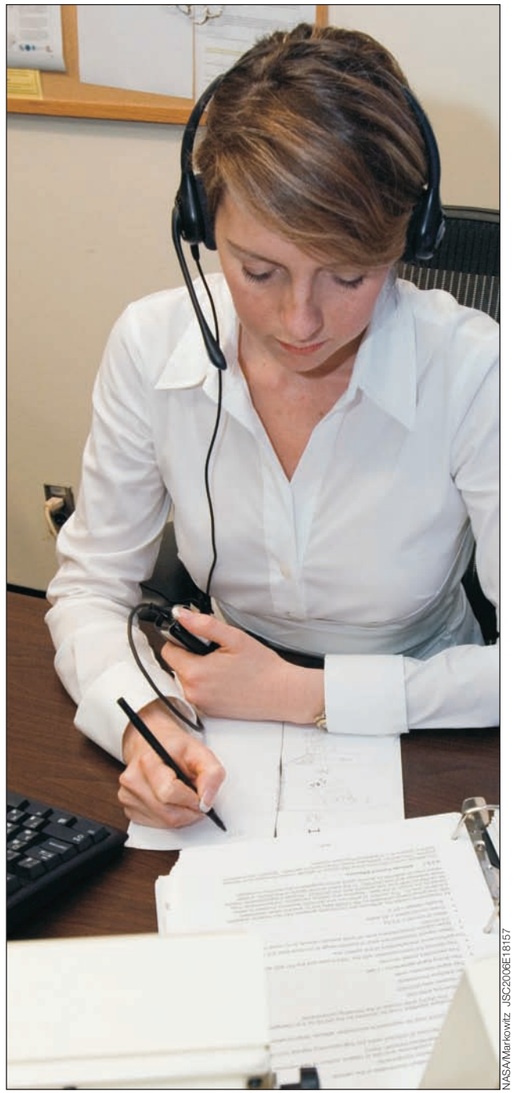
"I once received a call from my manager telling me that I needed to be in the Teague Auditorium to support a Public Affairs Office event with a cosmonaut at 4," she said. "I asked if it was 4 a.m. or 4 p.m. and wasn't even surprised to find out that it was 4 a.m."

When Russian cosmonauts are on site to fulfill training requirements, translators are extremely involved in their classes and are very familiar with the material and literature that astronauts and cosmonauts are given. Spradley said she was so close to one cosmonaut's training experience that the cosmonaut's crew members joked that Spradley was ready to fly with them.

Training as a translator doesn't end with the first few years on the job. Spradley said she is always familiarizing herself with the materials that crew members are given, and constantly researching new terms and tasks with which cosmonauts must become proficient.

Although not everyone enjoys reading material and literature and spending a great deal of time learning while on the job, Spradley said she wouldn't trade her job for any other in the world.

"I have been at JSC for six years now and can't imagine what could be better than the job I have now," Spradley said. "I get to work with all kinds of people, travel to Kennedy Space Center and perform new duties, and I am always doing different things. The work astronauts and engineers perform here is fascinating."



NASA/Markowitz JSC2006E18157

Alina Spradley is part of the team that helps JSC's Mission Control Center communicate with its counterpart in Moscow.