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Roundup
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The big blue marble

This view of the Earth was seen by the Apollo 17 crew as they traveled toward the Moon on their NASA lunar landing mission. This outstanding translunar coast photograph extends from the Mediterranean Sea area to the Antarctica south polar ice cap. This is the first time the Apollo trajectory made it possible to photograph the south polar ice cap. Note the heavy cloud cover in the Southern Hemisphere. Almost the entire coastline of Africa is clearly visible.

To learn more about ISS Earth observation photography, see pages 4 and 5.

In This Issue

From the desk of Lt. Gen. Jefferson D. Howell Jr.

Director's Message

Seize the moment

President Lyndon Johnson could have been called a "momma's boy" because he was very close to his mother. She played an important role in everything he did throughout his childhood and into manhood. However, he also had great respect for his father, who was a prominent political operative in Texas during the early 1900s.

President Johnson used to say that the best advice he got from his father was how important it was to "seize the moment." His father told him that in the dynamics of business, or politics or human social activity, opportunity is very fleeting. He said that if one didn't take advantage of opportunity when it arose, he would lose it very quickly. President Johnson did just that when he pushed through the civil rights legislation in the post-Kennedy assassination period.

Randy Stone seized the moment when he came to work at NASA. As a young graduate of the University of Texas, he had opportunities to work in the very robust petro-chemical and oil businesses in Texas, but he decided to come to work for NASA at the new Johnson Space Center in Houston. By taking advantage of that opportunity, for the next 37 years he played a significant role in our nation's history by being a part of the Gemini, Apollo, Space Shuttle and International Space Station programs. Randy Stone made history because he seized the moment as a young man.

Our President has given us a great opportunity with his new vision for space exploration. This will not be easy to do. However, if we don't do it, it won't get done. Therefore, all of us, if we are going to succeed at this, have to come together. First, we must help convince our fellow citizens of how important this is. Secondly, we must be willing to embrace change, whether in the way we do things or in our jobs themselves, while always striving for excellence.

You and I have a great opportunity to make history by participating in one of the noblest endeavors in the history of humankind. We are starting the journey into the cosmos.

LET'S SEIZE THE MOMENT!

It's great to be alive and in Houston. Beak sends.

Just when you thought it was safe to go back in the water...

Beak's BEACH BASH

Featuring The Flightline Follies

Coming Soon!

Guest Space

William Gerstenmaier
International Space Station Program Manager

The integrated International Space Station Team – including the ISS Program office team, ISS teams at other NASA centers, the International Partners and the ISS contractor teams – has done a remarkable job maintaining the hardware and crew onboard the Space Station. The teams have also been planning and preparing new hardware and equipment for flight.

We have begun 2004 with our first-ever spacewalk where no crewmembers were left inside the Station. The preparation for this spacewalk helped us to learn more about Space Station systems and improve operational interfaces with our Russian partners. The execution of the spacewalk was phenomenal. The teams were on top of their game and watching the execution of the spacewalk was exhilarating. This was spaceflight at its best. The suit cooling problem was handled professionally and well coordinated. Watching the Russian and U.S. teams perform this joint activity showcased the strength of our partnership. We each are learning from each other.

On January 14, 2004, the President unveiled his new mission for the Agency. Space Station is accomplishing many things to prepare for the new exploration vision. We're learning how to operate in space for long durations. Without the Space Shuttle operating in this time frame we're learning how to get by with minimal supplies and how to do maintenance on board. ISS processes, analytical tools, lessons learned and skill bases could provide a significant jump-start for exploration and reduce costs. Our robotic operations and science investigations will also play a key role in exploration.

The future is bright for Space Station. We are doing today what others are dreaming and planning. We are developing the people, techniques and hardware that will be used for further exploration of the universe.

Expedition 6 Science Officer Don Pettit took many nighttime photos of cities from the International Space Station. This photo of star trails over Earth at night is one of his favorites. "You're in a place that has amazing beauty that offers a perspective that's completely different from when you live on the surface of the planet," Pettit said, "to be in that environment and not be able to take pictures would be a cruel act. It would be like being in a candy store and not being able to sample any of the candies."

The crew of Expedition 9

Same passion, different paths

By Kendra Phipps

By all rights, the Expedition 9 crewmembers may seem like the odd couple. One is American; the other, Russian. One dreamed of flying in space at the age of 3; the other didn't give space much thought until later in life. One is a space rookie; the other has spent nearly 200 days in orbit.

Despite these differences, the pair has much more important things in common: a strong friendship and a love for their work.

Soon, Astronaut Mike Fincke and Cosmonaut Gennady Padalka will be rooming together in the International Space Station. Expedition 9 is scheduled to launch April 18 from the Baikonur Cosmodrome in Kazakhstan.

Though they were assigned to this mission less than three months before it was scheduled to launch, Fincke and Padalka have trained together for the past two years.

"It was very much a surprise," Fincke said of the last-minute crew change. "But on the other hand, I knew that Gennady and I were ready to go. … We know each other's strengths and each other's weaknesses. We know how to motivate each other, and we're both really excited."

Padalka agreed that they are a compatible crew.

"I know Mike very well," he said. "He is a very sociable man, and he has a good sense of humor, which is very important in space. We are very, very comfortable with our friendship."

This crew change was not the first for Expedition 9. The original commander, Astronaut Bill McArthur, Jr., was replaced by Astronaut Leroy Chiao mid-January due to a temporary medical issue. Then, NASA and its partners decided it was optimal to keep the existing Expedition teams together. Since Fincke and Padalka had trained together for years, as had Chiao and Cosmonaut Salizhan S. Sharipov, the partners modified the crew assignments, bumping Fincke and Padalka to Expedition 9. Chiao and Sharipov are the Expedition 9 backup crew and the Expedition 10 prime crew.

The situation "shows the wisdom of Space Station planning that we have backup crews," Fincke said, "and that we have a pool of astronauts and cosmonauts who are ready to fly."

Same passion, different paths

Fincke and Padalka share a love for aviation. Fincke, who will be the mission's Flight Engineer and Space Station Science Officer, attended college on an Air Force ROTC scholarship, became a test pilot and has now flown more than 30 types of aircraft.

Padalka, Expedition 9 Commander, has logged more than 1,500 hours of flight time through his years with the Russian Air Force and is also a General Parachute Training instructor. He said he knew early on that he wanted to be a pilot.

"I was fascinated with aviation, and that is why I entered the Eisk Military Aviation College," he said. While Padalka entered the aviation college and the Russian Air Force for the sake of flying, for Fincke, the U.S. Air Force was more of a means to an end. He had dreamed of becoming an astronaut since he was 3 years old.

"For me (the Air Force) was a stepping-stone to work at NASA, but also, I always wanted to serve my country, so it was very much a win-win situation," Fincke said. He later studied cosmonautics in Russia and attended the Air Force Test Pilot School as an engineer.

"I can't tell you how thrilling it was," he said. "Getting a chance to see how we humans put aerospace vehicles together, and how to make them better … enhances my ability to be a good Flight Engineer for the ninth Expedition."

Cosmonaut Gennady Padalka

Astronaut Mike Fincke

…it shows what human beings can do when we work together constructively and not destructively.

While Fincke pursued spaceflight throughout his life, Padalka arrived at his current career in a different way. It could even be said that spaceflight came to him.

"I met our famous Cosmonaut Aleksei Leonov – he participated in the Soyuz-Apollo project, he was the first man who performed a spacewalk – and he suggested that I become a cosmonaut," Padalka said. At the time, Leonov was the head of a medical commission on a cross-country cosmonaut recruitment trip.

"To a larger extent it was by chance," Padalka said. He became a test-cosmonaut in 1991 and made his first flight, as Commander of the Mir-26 mission, in 1998.

Padalka's and Fincke's paths converged in 2002 when they began training together as a Space Station crew.

'A hectic life' for six months

Padalka has one space mission under his belt, but Expedition 9 will be Fincke's first journey into space. To put it mildly, the rookie is looking forward to the mission.

"In life, I don't think we always get a chance for our dreams to come true. But I can tell you, right here and right now, that I'm living my dream," Fincke said. "And not only that, but I've always really had an affinity for the Russian space program. It's such an honor to get a chance to fly aboard the Russian Soyuz spacecraft."

After the crew takes off in its Soyuz capsule – along with European Space Agency (ESA) Astronaut André Kuipers – a whirlwind of activity awaits them.

"It's a hectic life during handover operations," Padalka said. He explained that the crew will be busy conducting experiments and learning the nuances of the Space Station from the Expedition 8 crew before that crew's farewell ceremony. Kuipers will spend about a week aboard the Space Station conducting scientific experiments under a commercial agreement between ESA and Russia and will return to Earth with Expedition 8 crewmembers Mike Foale and Alexander Kaleri.

During the rest of Expedition 9, Fincke and Padalka have their work cut out for them in the form of two spacewalks and about 100 science experiments. There will be many life sciences experiments to further study the effects of long-term space travel on the human body, along with experiments on materials science and fluid mechanics.

"There are fundamental fluid mechanics problems that we're solving with ingenious contraptions that are easy to operate and give real-time data back to the scientists on the ground," Fincke said.

Padalka, who also has a background in ecology, said he is looking forward to the Russian star spectrometer experiment, which is associated with both astronomy and ecology.

"Only recently did I actually start to think how really exciting that is – to be alone in the cosmos without a spacecraft around me except for this suit that was put together by human hands," Fincke said.

Padalka expressed his certainty about the mission's success.

"I am deeply convinced that our mission will make us take steps forward," he said, "and eventually it will help us to solve many problems on the ground."

When the time comes to leave the Space Station, Fincke expects it to be a bittersweet moment.

"I'll be so excited to go home and see my family. I'll have a new baby girl waiting for me, my little boy who's 3 years old is going to have missed me, and of course I want to see my wife's beautiful smile – so, that'll be the sweet part," he said. "The bitter part is leaving our home of six months."

But even that bitterness should be sweetened by the knowledge that their mission may have inspired children on Earth – the same way Fincke was inspired during the Apollo era – and that the Space Station continues to serve as a "great example of peaceful cooperation," as Padalka said.

"I think this is a great example of how our life can be established on the ground in the ideal," Padalka said.

Fincke agreed: "It's not just for the glory and nationalism, but it's also for all of humanity," he said. "And that's why we're working on the International Space Station: it shows what human beings can do when we work together constructively and not destructively."

Putting the pieces together

More than 100,000 pictures have been taken from the Space Station

By Debbie Nguyen

Photographed by an Expedition 7 crewmember onboard the International Space Station, this image shows the limb of the Earth at the bottom transitioning into the orange-colored troposphere, the lowest and most dense portion of the Earth's atmosphere. The troposphere ends abruptly at the tropopause, which appears in the image as the sharp boundary between the orange- and blue-colored atmosphere. The silvery-blue noctilucent clouds extend far above the Earth's troposphere. The sliver of the setting Moon is visible at upper right.

ISS007e10974

The mysteries of life can be thought of as an extraordinary puzzle with missing pieces. Our innate curiosity creates a network of questions, each trying to answer "Why?" and "How?" and fill in the gaps in human knowledge.

Thanks to the photographs taken by crews aboard the International Space Station, more than 100,000 of those puzzle pieces have been located, furthering us in our quest for answers.

The number of photographs of Earth taken by Space Station astronauts recently crossed the 100,000 mark. These images are not only breathtaking but also support all three objectives of the NASA Mission.

'To understand and protect our home planet'

Space provides an unequalled vantage point for observing and tracking changes on Earth. Pictures of the planet from space can greatly increase understanding of Earth's ongoing transformations – both natural and human-caused.

In order to get high-quality, useful images of Earth, astronauts must know what to look for. To accomplish this, Kamlesh Lulla, Chief Scientist for Earth Observation at Johnson Space Center, coordinates Earth Observation training for Space Station astronauts.

The astronauts are trained to become "Earth smart" so they can be our "eyes and ears in orbit," Lulla said.

Aboard the Space Station, astronauts are equipped with commercial Kodak professional digital cameras and take their photos through the optical-quality window in the Space Station's Destiny module.

One application of these Earth photographs is urban development. For instance, photos of cities at night can tell engineers and researchers how populated an area is and how functional the local transportation systems are.

Expedition 6 Science Officer Don Pettit took many nighttime photos of cities from the Space Station, which were highlighted by Lulla in a technical publication article.

Environmental events can also be studied more effectively with photography from space. For example, pictures from the Russian space station Mir helped scientists explain natural events like El Niño and biomass burning.

The Earth's environment is dynamic and ever changing. From the vantage point of the ground, these changes can be nearly undetectable. With a view from space, the world looks a lot different: the vastness of hurricanes and the paths of forest fires can be seen in a blink of an eye, and dust storms and the movement of glaciers can be tracked more easily.

'To inspire the next generation of explorers…as only NASA can'

On December 7, 1972, Apollo 17 astronauts captured the first full image of Earth from space – the famous shot called "the Blue Marble." Since then, it has become the most requested space image, igniting humanity's curiosity.

The following Earth photography outreach efforts help to inspire and educate the public:

- http://eol.jsc.nasa.gov: "The Gateway to Astronaut Photography of Earth," the Earth and Imaging Department's premiere online collection of astronaut photos

A mass of storm clouds was captured with an electronic still camera (ESC) from the International Space Station (ISS) by the Expedition 1 crewmembers. The picture was the first Earth observation still image downlinked by the three-man crew.

iss01e5011

On July 15, 2003, the Expedition 7 crew had a great seat from which to observe tropical storm Claudette as she became a hurricane and blew ashore with high winds and heavy rains that drenched their Houston home base and other Texas areas.

iss007e10244

■ "Costa Rica from Space": NASA scientists and EARTH University from Costa Rica's compilation of pictures taken by astronauts from space that records Costa Rica's geography

■ Lewis and Clark Expedition Project: NASA partnered with Geographic Communication Systems Research in an effort to create a map of Lewis and Clark's 3,700-mile expedition across North America in the early 1800s.

'To explore the universe and search for life'

The Vision for Space Exploration takes us to the Moon and Mars. These pictures can help get us there.

"We are at the forefront of this new vision," Lulla said. "To understand what's happening on Mars, you have to understand what's happening on Earth." For instance, scientists at NASA's Jet Propulsion Laboratory use what they know about rocks, minerals, erosion and water on Earth to figure out the geology and history of Mars.

"If you look at the bigger picture, even though we are going to the Moon and Mars, there is always going to be an intense interest by the public on what's happening on the surface of Earth," Lulla said. "NASA will always have to have an active program where we are looking back on Earth and creating awareness of our own planet, our own habitat, our own home."

These planetary portraits have shed light on some enigmas and can serve as a platform for new visions. With each click of the camera, we get closer to unveiling the big picture and closer to quenching humankind's insatiable thirst for knowledge.

The dark area near Earth's horizon at center frame is actually a shadow cast by the Moon during the total solar eclipse of Dec. 4, 2002. The shadow obscures an area of cloud cover. The station, with three Expedition 6 crewmembers aboard, was over the Indian Ocean at the time of the eclipse. The out-of-focus object in the foreground is part of the frame for the viewing port.

iss006e05070

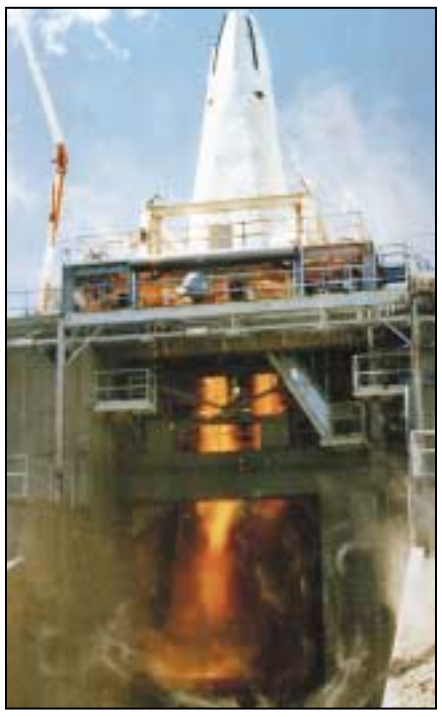
As geomagnetic storms cause beautiful displays of aurora across the United States, astronauts onboard the International Space Station also have the opportunity to take a look. Green colors of the aurora are dominant in this image captured by a digital still camera on October 4, 2001. Auroras are caused when high-energy electrons pour down from the Earth's magnetosphere and collide with atoms.

iss003e6152

White Sands Test Facility Overview

By Ray Melton

Water-cooled probes measure exhaust characteristics of 100 lbf attitude control thruster.



Static firing of DC-X with 4 LOX/Hydrogen RL10-A5 engines.

Precision-cleaning Viking soil sampler that landed on Mars in 1976.

Nestled in the foothills of the San Andres mountains in southwestern New Mexico, the NASA White Sands Test Facility (WSTF) is a remote component of Johnson Space Center. The facility was constructed early in the Apollo era specifically to conduct tests involving spacecraft rocket propulsion systems, toxic or highly reactive chemicals and potentially hazardous materials that could not safely be performed in more heavily populated areas such as Houston.

The WSTF capabilities for space-simulated vacuum firings of solid and liquid rocket propulsion systems are among the best in the nation. The sophisticated laboratories used for evaluating potentially hazardous materials and components for both Earthly and aerospace applications are similarly outstanding. Although most of the work at WSTF is done for NASA, many other fascinating test projects are conducted for customers such as the U.S. military, other government agencies and private industry.

The people at WSTF test rocket engines, resolve space mission anomalies and investigate new materials and components. They also refurbish Space Shuttle propulsion and life support system components for reflight, design and fabricate spaceflight hardware, and perform tests to validate new components to enhance mission safety and extend the operational life of existing spacecraft systems.

At WSTF, there are some fascinating and unusual jobs, such as:

- Working with special light-gas guns, which can propel 1-inch-diameter projectiles 10 times as fast as a rifle bullet. This simulates the impact of micrometeoroids or orbital debris on components for the International Space Station, Space Shuttle Orbiter or other spacecraft.
- Conducting tests to see how various materials, including metals, burn and how fires propagate in the microgravity environment of space.
- Testing new components that must operate in corrosive or highly reactive environments, such as pure oxygen, where even stainless steels and titanium alloys burn violently.

WSTF also operates the White Sands Space Harbor (WSSH), an alternate orbiter landing site with 7-mile-long laser-leveled pure gypsum runways. The WSSH is where Space Shuttle astronauts are trained to perform the critical final approach and landing phase of the mission, using specially modified aircraft that simulate the response and aerodynamic behavior of the orbiter.

WSSH is equipped to accommodate an Orbiter landing if an emergency should develop in flight, or if adverse weather conditions were to render the primary landing facilities at Kennedy Space Center or Edwards Air Force Base unsuitable.

The current WSTF workforce of about 690 people is comprised of 54 NASA civil service personnel and 633 contractor employees. The installation is certified to the quality management standards of ISO 9001 and ISO 14001 and was declared an OSHA Star site in recognition of its excellent programs dedicated to ensuring workplace safety.

A scientist operates an x-ray photoelectron spectroscopy instrument for molecular analysis of surface effects such as corrosion and contamination.

Stardust

Interstellar dust samples to end multibillion-mile trek at JSC

By Bill Jeffs

Billowing clouds of ice, dust and gases; surveyors of the solar system; voyagers from places only dreamed of by humans – these are comets. The keys that unlock the mystery of the early formation of Earth may be found in them.

"Comets are believed to be the oldest, most primitive bodies in the solar system, possibly composed of some of the basic building blocks of life," said Mike Zolensky, NASA Space Scientist in JSC's Office of Astromaterials Research and Exploration Science. "They contain the remains of materials that formed our solar system. Striking Earth over billions of years, comets contributed to our atmosphere, at the same time introducing carbon-based molecules, a fundamental element to life on this planet. In our investigation of these returning samples, we expect to find evidence that comets brought water to the Earth, Mars and other worlds, making life possible."

Samples from deep space to be returned to the Johnson Space Center in fewer than two years will help scientists determine how life formed on Earth and how water was delivered to the inner solar system.

The Stardust spacecraft's precious cargo of cometary samples and interstellar dust will be delivered to the Curatorial Facility at JSC in January 2006, concluding a journey of billions of miles. There scientists will make the first analyses of the particles, searching for clues that may for the first time reveal the true nature of comets, their role in the early history of the solar system, and, possibly, the origin of water and organic matter on Earth and Mars.

Having traveled two billion miles across cold, interstellar-dust-swept space in just under five years, NASA's Stardust spacecraft encountered its target, comet Wild 2, on Jan. 2. Telemetry data gathered during Stardust's 12-minute flight through a storm of cometary particles at six times the speed of a bullet indicate that the spacecraft encountered several high-speed jets of particles. The spacecraft took images of the comet nucleus with unprecedented detail, which will revolutionize the study of the geology and history of these icy bodies.

The spacecraft is now on its two-year, 708-million-mile trek back to Earth, where it will drop off a capsule containing the samples at the U.S. Air Force's Utah Test and Training Range in January 2006. The capsule will be immediately taken to JSC where the samples will be examined and then stored.

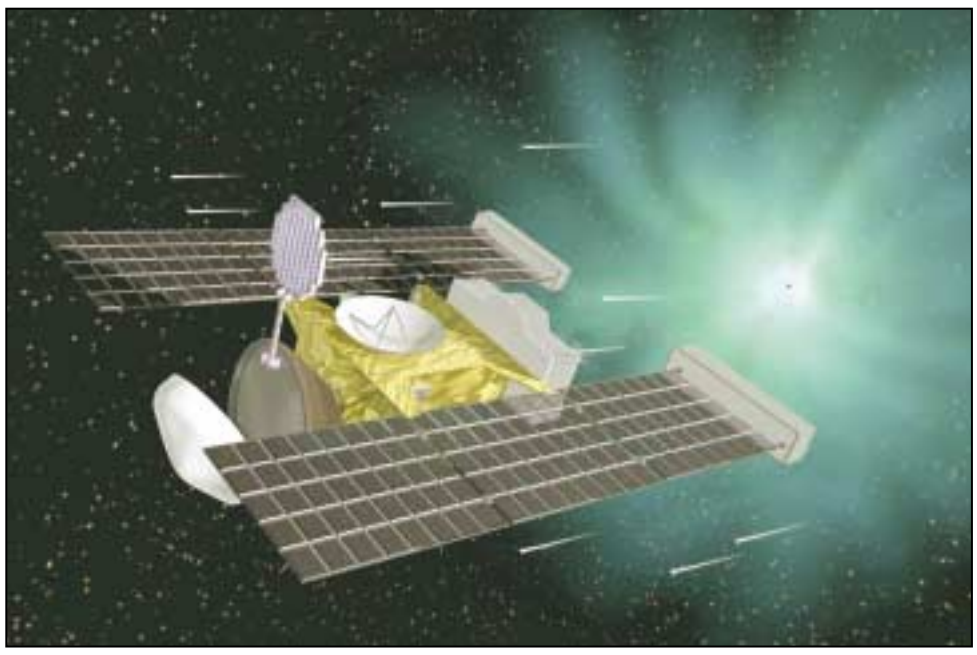
ARES scientists are key members of the Stardust science team. Fred Horz and Zolensky, co-investigators on the mission, helped design and test the silica aerogel, the magic material that captured and now holds the comet grains. They also developed many of the techniques that will be used to extract the cometary and interstellar grains from the aerogel.

In addition to capturing samples of cometary material for return to Earth, Stardust will collect and return grains from a newly discovered stream of particles from interstellar space. These samples may provide a window into the distant past, helping scientists around the world unravel some of the mysteries surrounding the birth and evolution of the solar system and distant stars.

Over the next year, a dedicated handling and curation lab will be built in Building 31 at JSC. The samples will arrive in January 2006 for initial characterization and ultimate curation. Horz and Zolensky are sample analysis leads for this effort. Zolensky will become the sample curator.

"This is a real time of change at ARES," said Gordon McKay, manager of the Astromaterials Research Office. "We are adding several major state-of-the-art instruments for analyzing the Stardust samples at nearly the atomic-scale." Curation efforts will undergo a similar metamorphosis in order to process samples invisible to the naked eye.

The Stardust spacecraft was launched in February 1999. Stardust is the first sample return mission launched in 30 years and the first to collect material from deep space.



The Stardust spacecraft was launched on February 7, 1999, from Cape Canaveral Air Station, Florida, aboard a Delta II rocket. The primary goal of Stardust is to collect dust and carbon-based samples during its closest encounter with Comet Wild 2 – pronounced "Vilt 2" after the name of its Swiss discoverer.

CLOCKWISE FROM LEFT

This photo illustrates the excellent insulating properties of aerogel. The crayons on top of the aerogel are protected from the flame underneath, and are not melting.

Aerogel and Dr. Peter Tsou, JPL scientist. Though it has a ghostly appearance like a hologram, aerogel is very solid. It feels like hard Styrofoam to the touch. The aerogel used by Stardust is specially manufactured at JPL.

In an experiment using a special air gun, particles are shot into aerogel at high velocities. A close-up of particles that have been captured in aerogel are shown here. The particles leave a carrot-shaped trail in the aerogel.

RETURN OF THE SPACE COWBOYS

The space cowboys and cowgirls of Johnson Space Center took part in the 2004 Houston Livestock Show and Rodeo in March. The Texas Independence Trail Ride made its way through JSC on Feb. 24, and NASA was this year's featured community organization at the rodeo itself. NASA treated rodeo-goers to a moving video tribute to space exploration each evening before the concerts began. On March 2, the rodeo's opening night, the STS-114 crewmembers were treated with Southern hospitality and a standing ovation as they were introduced to rodeo fans. Commander Eileen Collins was joined by her crew of Pilot James Kelly and Mission Specialists Soichi Noguchi, Steve Robinson, Andy Thomas, Wendy Lawrence and Charlie Camarda.

In addition to the NASA tributes in Reliant Stadium, the NASA exhibit was the center of attention at the rodeo's exhibit area in Reliant Center. The interactive exhibit at the rodeo was a huge hit with rodeo visitors both young and old. Teachers and parents lined up with their students and children to get pictures taken in a life-size spacesuit mock-up. Another section of the exhibit, called the Shuttle Launch Experience, gave visitors the feeling of being at a Space Shuttle launch. A life-size mock-up of a Mars Exploration Rover was on hand to inspire and educate visitors. The exhibit also included a three-panel wall series entitled "Returning to Flight... To the Moon... To Mars and Beyond." Visitors could read about NASA's new exploration vision, take an interactive tour of the International Space Station and find out what they would weigh on other planets.

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Roundup

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