

SPACE CENTER

Roundup

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Eye on the future

Stephen Miller, a mechanical engineer in the Advanced Space Propulsion Laboratory, makes adjustments on the Variable Specific Impulse Magneto-plasma Rocket, which is more commonly known as VASIMR. Astronaut Franklin Chang-Diaz, who directs the laboratory, believes the VASIMR will revolutionize space travel.

For more about the VASIMR project, see pages 4-5.

Director's Message



Putting on our 'game face'

Some things you never forget. One of those times for me was at 2 o'clock in the morning on January 2, 1964, at Camp Schwab, Okinawa, Japan. Second Lieutenant Howell had rolled out of the rack early to listen to the Cotton Bowl

game featuring the Texas Longhorns and the Midshipmen of Navy. Undefeated Texas was touted by several polls to be National Champions. Navy, led by Heisman Trophy winner Roger Staubach, had lost just one game and made a lot of noise in the weeks prior to the Cotton Bowl – saying that after they defeated Texas, they, and not the Longhorns, should be crowned as the champions.

Right before the game, the radio announcer (there was no satellite TV in those days) interviewed both coaches on the field. Wayne Hardin of Navy went into a long dissertation about how the challengers would become the new champions. After hearing this and being asked for his response, Texas coach Darrell Royal simply stated, "We're ready." Five thousand miles away I had a vivid picture in my mind of Coach Royal with his teeth clenched and his chin jutting out. I thought to myself, "DKR has his game face on!"

There comes a time in any situation when you have to stop all the rhetoric and put on your game face. In football parlance, that's when you put on your pads and start blocking and tackling people. In other words, you knock off the talk, come together as a team and take action.

That's our situation here at Johnson Space Center. The Columbia Accident Investigation Board's report is published. It is critical, credible and spells out recommendations for us to implement before we return to flight (RTF), as well as recommendations for us to improve our organization beyond RTF. The NASA leadership, with our participation, has drafted a comprehensive implementation plan to follow in fulfilling our compliance with the CAIB's recommendations. It's time to stop discussing what should be done and to take appropriate action according to our plan.

Keep in mind that we are not just "checking a block" with our compliance. We are not going to go back to business as usual. We intend to go well beyond the CAIB recommendations in raising the bar of professional excellence: we will redefine our engineering and safety processes and checks and balances, make additional improvements to the Shuttle, and improve our teamwork and communications at all levels. That last item might well be the most difficult and will take everyone's commitment to effect successfully. It is absolutely imperative that we do this, and I will be introducing several initiatives to help us improve in this regard.

We have significant challenges to overcome but together, working as a team, we will succeed. Let's put on our game face and go for it!

Beak sends...

APPEARING THIS MONTH IN OUR

Guest Space

Stacey Menard

Voluntary Protection Program External Coordinator



EDITOR'S NOTE: Now that the mishap investigation board has released its report regarding the tragic onsite death of a coworker last year, JSC's Voluntary Protection Program (VPP) External Coordinator Stacey Menard has provided an account below of the incident in an effort to keep the JSC community informed and to help prevent a similar event.

On August 29, 2002, Johnson Space Center lost a coworker due to severe electrical injuries sustained in a mishap on site. He was a construction contractor working to reconnect backup power generators for Building 37.

Here is what happened that day: Building 37 was receiving upgrades to its electrical system. The victim, a journeyman electrician, and his apprentice arrived at the job site mid-morning. They checked in with the foreman, who told them he had checked the junction box and it was "cold," meaning there was no electricity present. What the foreman didn't know until after the mishap was that he had used a painted conduit as a ground. That paint was enough of an insulator to give a false zero-current reading. The two electricians went to work without checking for voltage themselves or going into the building to lock the circuits closed.

Shortly after the journeyman and apprentice began working, the apprentice was shocked forcefully. He went into Building 37 to regroup while the journeyman finished connecting the wires in the generator. Soon after the apprentice came back outside, the journeyman was shocked severely. Emergency help was summoned immediately and arrived within minutes. The journeyman was taken to the hospital where he died of his injuries.

A Type A Mishap Board, chaired by Peter Allen from Marshall Space Flight Center, was formed to investigate the accident. The board's findings stated the dominant root cause of this mishap was the lax safety culture of the company. The culture allowed the journeyman and apprentice to feel comfortable without lockout/tagout protection, work on energized circuits without protective equipment and fail to report the unexpected hazard to their supervisor. The Occupational Safety and Health Association agreed, and gave the company seven serious safety violations and monetary penalties.

The board also found documentation shortcomings in contract deliverables and other drawings and a weak NASA construction contractor oversight process. Further, it determined that NASA's policy of treating short-term construction contractors as transient employees was not adequate.

JSC Center Director Jefferson D. Howell, Jr., called this event an unacceptable, preventable tragedy. He asked the Center Operations Directorate (COD), Procurement and Safety to implement the changes necessary to keep this from happening again. The JSC VPP flag that flies in front of Building 1 means that we work together as a community to keep these tragedies from happening.

How is JSC responding to improve these weak areas?

First, we have hired more inspectors to oversee the field work of construction contractors, and we have elevated the reporting of safety and health plan violations. In cases where the safety violation is severe, some individuals have been asked to leave the site.

Two Continuous Improvement Teams, chaired by COD, are in place. The first team's charter is to bring construction contractors into JSC's VPP-driven safety and health culture. COD construction contractor workers now receive a mandatory safety briefing before getting their JSC badges.

The second team was formed to look at improving our configuration control process to ensure that all facility drawings are correct, updated and input into the system in a timely manner.

Public Affairs Office

Your Communication Source

PAO has been busy building new products and enhancing our services for you – our ambassadors to the public.

Stay Tuned: You'll be hearing more about our tools in the weeks and months ahead, including a message from our Public Affairs Director Dan Carpenter in the next issue of the *Roundup*.



CAIB releases its final report

On Tuesday, Aug. 26, 2003, The Columbia Accident Investigation Board (CAIB) presented its final report on the causes of the Feb. 1, 2003, Space Shuttle accident to the White House, Congress and NASA. The report can be viewed at: <http://www.caib.us/news/report/default.html>

The Board made 29 recommendations in the 248-page final report, including 15 return-to-flight recommendations for implementation before the Space Shuttle launches again. The report was the result of a seven-month-long investigation by the CAIB's 13 board members, more than 120 investigators, 400 NASA and contractor employees and more than 25,000 searchers who recovered *Columbia's* debris.

“If this board had set out to spend seven months listing all the good things that NASA does, the report would be thicker than this. Unfortunately, that’s not what our task was. And the nature of these investigations, it causes all of the good work and all of the wonderful things that are accomplished to get lost. And I think it’s worth that we take a second and say that we are impressed by the workforce. We are impressed by the people. And we are impressed by what NASA has accomplished.”

Adm. Harold W. Gehman Jr., Columbia Accident Investigation Board Chairman

“On the first of February, we pledged to the families of the Columbia Seven that we would find the problem, fix it and return to the exploration objectives that their loved ones dedicated their lives to. ... As we begin to fulfill the second commitment to the families to fix the problems, our first step must be to accept the findings and to comply with the recommendations. This report should serve as a blueprint, as a road map to that second objective to fix the problems.”

Sean O’Keefe, NASA Administrator

“The JSC team is fully committed to complying with the board’s recommendations and improving the safety of human spaceflight. We are driven in that task by an unshaken deep belief in the value our efforts hold for our nation and the world. I am confident that from these difficult days will come a better future for human spaceflight.”

Lt. Gen. Jefferson D. Howell Jr., Johnson Space Center Director



Chairman of the Columbia Accident Investigation Board, retired U.S. Navy Admiral Harold Gehman (right), presented the results of the panel's investigation to NASA Administrator Sean O'Keefe.
20030825_caibreport_01_bw Photo by Bill Ingalls



Administrator O'Keefe speaks in the main auditorium during his first press conference following the release of the CAIB Report and NASA's Return to Flight efforts. O'Keefe has pledged to return the Space Shuttle to safe flight when the Agency demonstrates it's 'fit to fly.'

20030827_okeefe_caib_pressc Photo by Renee Bouchard

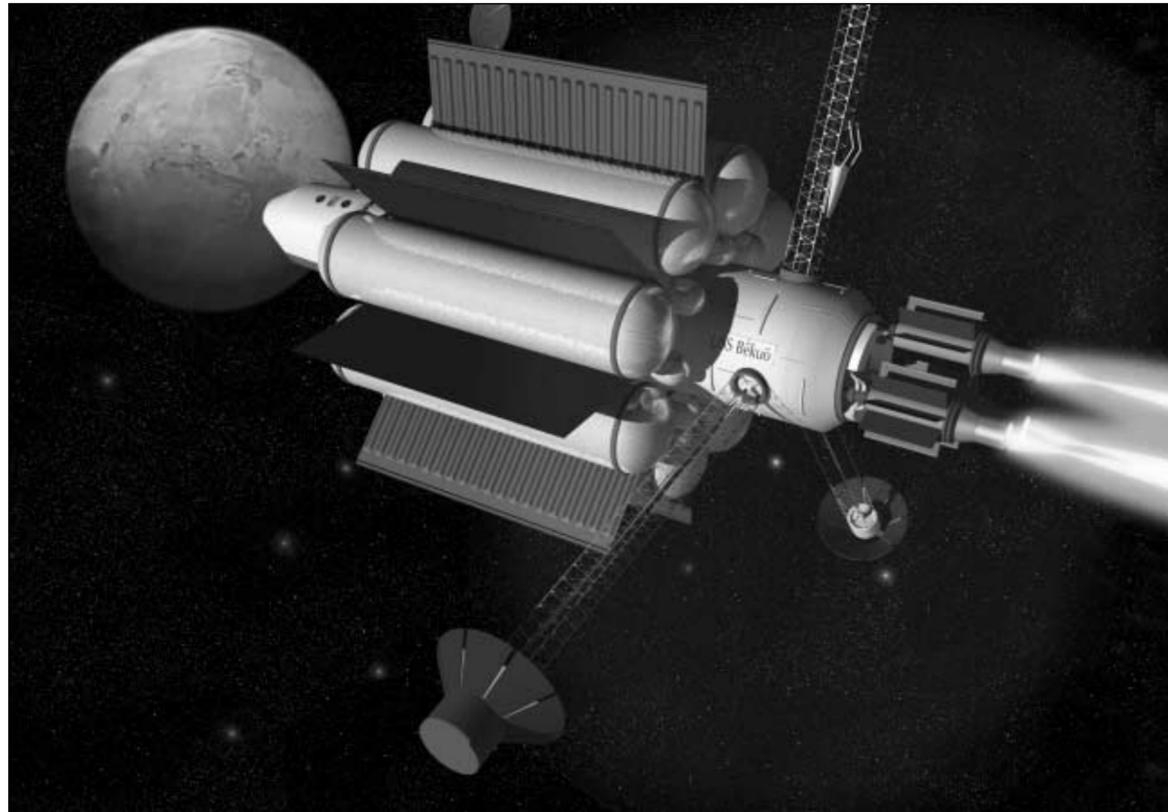


Lt. Gen. Jefferson D. Howell, Jr., Center Director for Johnson Space Center, displays a copy of NASA's Implementation Plan for Return to Flight and Beyond as he speaks to Center employees. To his left is Shuttle Program Manager Bill Parsons and to his right is International Space Station Program Manager Bill Gerstenmaier.

JSC2003e55787 Photo by David DeHoyos

The potential of plasma

By Lisa Tidwell



Artist's concept of plasma-powered space vehicle

Plasma-powered engine could be 'ticket to interplanetary travel'

Tucked away in the Sonny Carter Training Facility, down a long bare hallway and through a nondescript entrance, is a laboratory. Resembling a warehouse, the laboratory has one distinct difference – it is home to some revolutionary research that might just be the ticket to human exploration of Mars and beyond.

The Advanced Space Propulsion Laboratory (ASPL) at Johnson Space Center is actively developing a new type of rocket technology: the Variable Specific Impulse Magneto-plasma Rocket (VASIMR).

Unlike conventional rockets, VASIMR does not use chemical reactions to drive the engine but rather ionized gases, or plasma, accelerated by electric and magnetic fields.

Astronaut Franklin Chang-Diaz directs the laboratory and has been working on the plasma rocket since 1979. Chang-Diaz, a veteran of seven Space Shuttle flights, holds a doctorate in applied plasma physics and fusion technology from the Massachusetts Institute of Technology.

"We are severely limited by today's rockets," Chang-Diaz said. "We are building a whole new generation, which will increase the speed of travel by orders of magnitudes."

"There are two fundamental barriers we have to overcome to explore space with humans," he said. "First there is a propulsion challenge: chemical rockets do not have the capability to deliver the propulsion needed for interplanetary travel."

Power is the other major barrier that must be overcome. "Nuclear power has the potential to change the way we power rockets," he said.

Overcoming those barriers is critical. "If we don't get those figured out, we will not be going anywhere," Chang-Diaz said.

While conventional chemical rockets continue to provide excellent surface-to-orbit transportation, they are still considered by some the "covered wagon" of rocket technology. New technologies that overcome the fundamental barriers such as VASIMR are needed to transport humans and cargo in the long journeys to the planets and ultimately the stars.

The next steps in the VASIMR research are both ambitious and exciting. "The next step is to take (VASIMR) to a large-scale vacuum chamber and measure the thrust," said Tim Glover, a post-doctorate research associate from Rice University working at the ASPL, "but the ideal environment for this type of research is space."

The team hopes to test a small-scale VASIMR engine on the International Space Station.

"Station is an ideal platform for developing (electric propulsion) technology," Glover said.

Looking into the future, the research being done in connection with the VASIMR engine could be the key to further human exploration of Mars and beyond. It is important to reduce the crew's exposure to weightlessness and solar radiation; it is therefore important to shorten the trip duration.

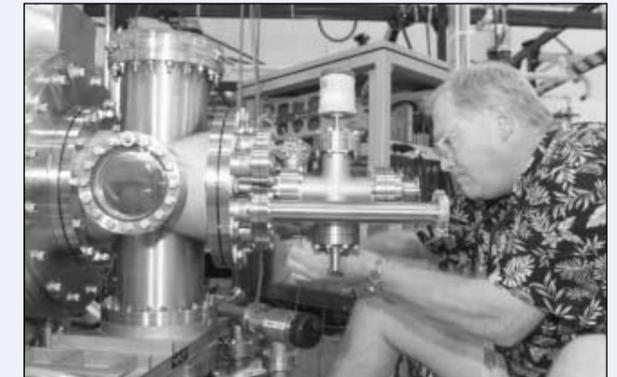
Chemical rockets today would take about 10 months to reach Mars; however, with VASIMR the trip time could be reduced dramatically. After being inserted into orbit by a traditional chemical rocket, a spacecraft with a VASIMR engine could deliver an exploration crew to Mars in as little as 39 days.

"We feel this technology is the way, our ticket, to interplanetary travel," Chang-Diaz said. "It will completely revolutionize space travel."



Astronaut Franklin Chang-Diaz, Director of the Advanced Space Propulsion Laboratory, works on the VASIMR engine.

jsc2003e49523 Photo by James Blair



Scott Winter, from Safety, Reliability & Quality Assurance, makes adjustments on the VASIMR.

jsc2003e49525 Photo by James Blair

AT A GLANCE

HOW THE VASIMR ENGINE WORKS

The VASIMR engine works through a set of three linked magnetic cells.

The forward cell handles the main injection of the propellant gas. The researchers are currently working with helium but have done research with deuterium and hydrogen.

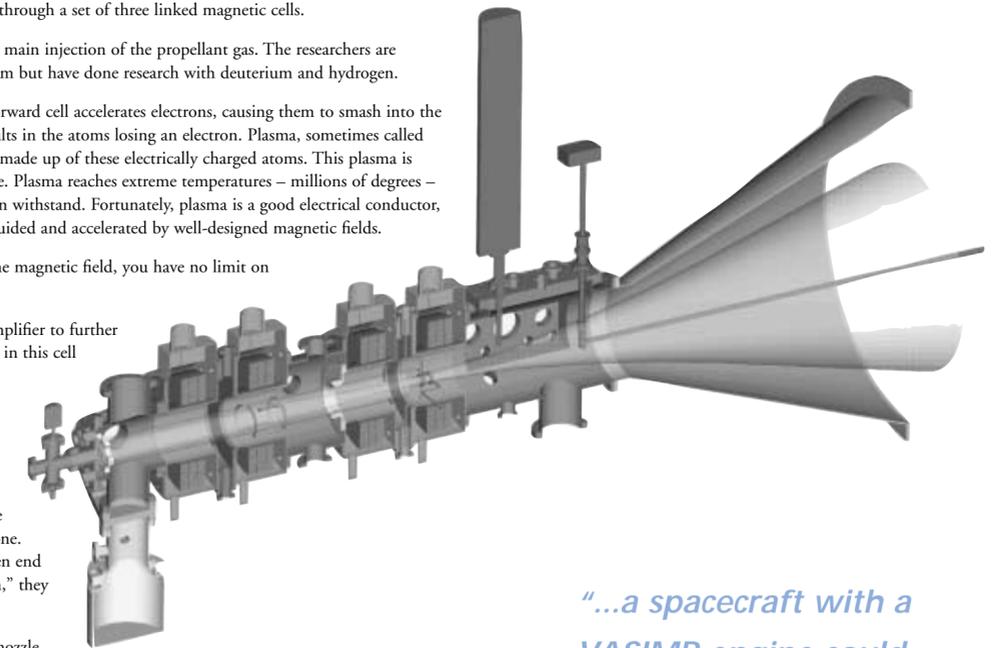
A Helicon Antenna in the forward cell accelerates electrons, causing them to smash into the propellant atoms, which results in the atoms losing an electron. Plasma, sometimes called the fourth state of matter, is made up of these electrically charged atoms. This plasma is what drives the rocket engine. Plasma reaches extreme temperatures – millions of degrees – which no known material can withstand. Fortunately, plasma is a good electrical conductor, which allows it to be held, guided and accelerated by well-designed magnetic fields.

"By holding the plasma in the magnetic field, you have no limit on temperature," Glover said.

The central cell acts as an amplifier to further heat the plasma. An antenna in this cell creates an electric field that adds energy to the plasma. The energy accelerates the ions, causing their velocity and orbit to increase, which creates a path resembling a chocolate swirl from the base to the top of an ice cream cone. When the ions reach the open end of their "ice cream cone path," they transition into the third cell.

The third cell is a magnetic nozzle, which converts the gyro-spinning motion around the "ice cream cone" into a linear motion through the magnetic nozzle. The magnetic field that has guided the plasma through the engine and protected the stainless steel structure from the extreme temperatures of the plasma now is formed into a shape equivalent to the bell-shaped nozzle used in standard chemical rockets. This final portion of the engine, with its magnetic nozzle, ensures maximum thrust by making certain that the plasma efficiently detaches from the magnetic field.

Several universities and organizations contribute to the VASIMR engine, including the Massachusetts Institute of Technology, the University of Texas, the Los Alamos National Lab, Marshall Space Flight Center, Rice University, the University of Houston, the University of Michigan and the Oak Ridge National Lab.



"...a spacecraft with a VASIMR engine could deliver an exploration crew to Mars in as little as 39 days."

Expanding on-orbit care

Human patient simulation can help train flight surgeons, astronauts for medical emergencies

By Andrew Zehr

Thanks to a computer-connected, lifelike mannequin known as the Human Patient Simulator (HPS), NASA astronauts and flight surgeons have a chance to make and learn from mistakes before they ever reach space.

"Wouldn't it be nice if life had a rewind button? If you mess up you could stop what you were doing, rewind and try it again," said Dr. Kira Bacal, NASA Medical Informatics and Health Care Systems (MIHCS). "That is what the HPS allows us to do."

The HPS fulfills NASA's need for an efficient way to train crew members for the host of medical emergencies that could occur in space.

The HPS, which was developed as an offshoot of flight simulator technology, consists of a lifelike high-fidelity mannequin that can breathe, have a pulse, open its eyes and be given any emergency drug necessary to treat or correct a medical condition. These mannequins are manufactured by Medical Education Technologies, Inc., and are currently used in medical schools and allied health programs around the world to train health care professionals.

The technology's versatility persuaded NASA to adopt the HPS for training medical flight control teams – including flight surgeons, biomedical engineers and crew medical officer astronauts – for medical emergencies on International Space Station and Space Shuttle missions.

Dr. Hal Doerr, the principal investigator of NASA's Medical Operational Support Team (MOST), said the simulator can mimic 30 different patients with 40-50 medical scenarios that feel very realistic to those in training.

"We can simulate various patients that range from a young, healthy 22-year-old active non-smoking male up to a 90-year-old, less-active diabetic female," said Doerr, who is also the head of the Houston Center for Advanced Patient Simulation at Baylor College of Medicine. "There are over 200 physiological combinations we can work with."

The MOST is a joint multi-specialty project of the National Space Biomedical Research Institute, MIHCS and Wyle Laboratories. Doerr said that collaboration between these organizations works well because members of the groups have worked together previously on space medicine projects and are able to combine and learn from their previous experiences.

The MOST uses the simulator's physiological possibilities to program "patients" that mimic the altered physiology of astronauts either during or after a flight. Doing so enables medical flight control teams to have a hands-on platform to practice management of medical conditions either on orbit or within 24 hours of return.

To maximize the utility of the HPS, NASA can also use it to evaluate medical hardware.

"It has multiple functions," said Dr. Victor Hurst IV, MIHCS Project Scientist with Wyle Laboratories and a member of the MOST. "We're expanding on-orbit health care by developing, testing and validating medical equipment and procedures with the HPS."

Although these products have been thoroughly tested on Earth, there is no guarantee that they will handle the same in space. Sending medical hardware into space can be expensive and dangerous; the HPS can minimize the risk by duplicating how a patient in space might react during a medical emergency.

"If MIHCS needs to evaluate the commercial, off-the-shelf ventilator they are modifying for use aboard the ISS, they can use the HPS as a test bed to see how it would function in a simulated space environment," Hurst said.

Minimizing the danger of testing new products in hazardous situations is a priority not only for NASA but for a variety of groups. Doerr has used patient simulators to train nurses, respiratory therapists, pharmacists, firefighters and military personnel. They are also used to prepare for situations that occur away from a health care network.

"The HPS allows education to be the focus of attention rather than the patient," Bacal said. "High-fidelity human patient simulation allows participants to learn from their mistakes until they are confident in their skills."

By using human patient simulation, the MOST expects to provide the NASA community with hands-on exposure to space-relevant medical scenarios. In doing so, the MOST anticipates this project will have an impact on present and short-term medical projects, including medical training, and facilitate long-term planning for expanding space medical care for future long-duration missions.

Medical Operational Support Team members work on the Human Patient Simulator. From left are Dr. Victor Hurst IV, Dr. Hal Doerr and Dr. Kira Bacal.

Jsc2003-00096 Photo by Bill Stafford



A long-distance chat, NASA style

Co-ops talk to Expedition 7

By Sarah Milstead and Joanne Hale

Ten NASA cooperative education students from Johnson Space Center, Boeing and other local aerospace contractors had the unique opportunity to interact directly with Expedition 7 crew members Commander Yuri Malenchenko and NASA International Space Station Science Officer Ed Lu via a live downlink to JSC's Teague Auditorium on Aug. 6.

The crew appeared on a screen by way of satellite from the International Space Station and answered questions posed by the group. Seven student interns supporting space operations at Goddard Space Flight Center in Greenbelt, Md., also participated in the out-of-this-world event.

"Speaking to the crew was a surreal experience," said Lindsay Croughn, Boeing intern. "It was very motivational – I can't wait to come back and work for the space industry."

Questions to the crew included the importance of the ISS, the effects of life in space on bones, brain chemistry and emotions, and the best ways for the next workforce generation to find jobs in the space industry.

"It's an unbelievable experience to be able to talk to someone in space in real time," said co-op Chris Thompson. "This was a great way to wrap up my summer with Boeing."

Following the hour-long chat with the ISS residents, students participated in a question-and-answer session with Expedition 7 lead Flight Director John McCullough and former NASA Chief Scientist Astronaut Shannon Lucid, Ph.D. McCullough gave a brief presentation on the makeup and future construction of the ISS, and Lucid presented an overview of the NASA organization.

"I thought the Expedition 7 co-op event was a great opportunity to reach out to the men and women who represent the future of NASA," McCullough said. "One of the great opportunities you get while you are a co-op or intern is to have diverse work experiences and see how NASA works. Speaking with the crew and hearing about our mission on the ISS first hand is truly a unique experience."

"I think that talking to the Expedition 7 crew live from orbit was a very inspiring event for the co-ops to be involved in," Lucid said. "Talking with the crew on ISS emphasized to the co-ops the importance of their endeavors at NASA."

McCullough said the bright future of NASA and the great opportunity that the event provided demonstrated the exceptional accomplishments that have taken place in the space program.

"NASA is a large family working together to achieve great things, and working with our international partners further enlarges this circle," McCullough said. "Sometimes the magnitude of our achievements is overshadowed or missed in our daily efforts, but when you step back and look at it, it is truly amazing. I think this event with the Expedition 7 crew helps remind us of the great things we are doing right now and will do in the future."



Co-op students take part in a live Q&A session with the Expedition 7 crew onboard the ISS.

Jsc2003e52159 Photo by David DeHoyos

Astronaut Dr. Shannon Lucid and Deputy Director of Education Phil West address the audience during the ISS downlink.

Jsc2003e52168 Photo by David DeHoyos

A co-op asks a question during the event, which was held in the Teague Auditorium at JSC.

Jsc2003e52170 Photo by David DeHoyos

Hispanic Heritage Month



DEBORAH ACOSTA CONDER

TIME AT JSC 20 years

ORGANIZATION Human Resources and Education Office

POSITION TITLE Manager, Exchange Operations

EDUCATION Bachelor of science in accounting from New Mexico State University; M.B.A. from University of Houston - Clear Lake; Executive Certificate in public administration from Syracuse University, Maxwell School

PLACE OF BIRTH Silver City, N.M.

HOBBIES Spending time with my husband and son, golf, home improvements, reading fiction and business books, listening to contemporary jazz music, church activities

WHAT DOES HISPANIC HERITAGE MONTH MEAN TO YOU? Honoring the many contributions of Latinos certainly helps build self-esteem and pride in those of us who identify ourselves as Hispanic Americans. Even more important, though, is the honoring of all ethnic diversities that make us a great country. By celebrating the many rich cultural and ethnic heritages that make us who we are, we encourage respect and appreciation for the uniqueness of others.

FAVORITE WORDS OF WISDOM After a particularly difficult past personal year, two sayings have come to have significant meaning for me. One was given to me by a wonderful friend and colleague, quoting Mother Teresa: "I know God won't give me anything I can't handle. I just wish He didn't trust me so much." I don't know the author of this other one: "I can handle anything that life throws at me – I may not be able to handle it well, or correctly, or gracefully, or with finesse, or expediently – but I will handle it." Good stuff to remember in times of challenges.



ROBERTO S. GALVEZ

TIME AT JSC 23 years

ORGANIZATION Space Shuttle Program Office, Flight Operations and Integration Office

POSITION TITLE Flight Manager

EDUCATION Bachelor of science in electrical engineering from Louisiana State University

PLACE OF BIRTH Panama City, Panama

HOBBIES Restaurant hopping, traveling and spending quality time with my family

WHAT DOES HISPANIC HERITAGE MONTH MEAN TO YOU? An opportunity to reflect on where we came from. Even though we have a different cultural background, we are able to live and work together and experience the great American dream.

FAVORITE WORDS OF WISDOM You control your future. Take advantage of the wonderful opportunities that you have each day and don't worry about circumstances that you cannot control. You'll sleep better at night.



DR. CHARLES RICHARD JUSTIZ

TIME AT JSC 23 years

ORGANIZATION Aircraft Operations Division of the Flight Crew Operations Directorate

POSITION TITLE Research Pilot

EDUCATION Bachelor of science from the U.S. Air Force Academy; master of science and doctor of philosophy from the University of Houston

PLACE OF BIRTH Miami, Fla. (I was born in the off-season)

HOBBIES Family, flying (of course), writing, biking, water sports

WHAT DOES HISPANIC HERITAGE MONTH MEAN TO YOU? We live in a country that is a richly seasoned brew with ingredients from all over the world. Hispanic Heritage Month allows us to become familiar with just one of the spices in our country's brew. We then come to the realization that even that spice is made up of many wonderful and exciting flavors.

FAVORITE WORDS OF WISDOM "Live as if you were to die tomorrow. Learn as if you were to live forever." – Gandhi



MIGUEL J. MAES

TIME AT JSC Seven years

ORGANIZATION White Sands Test Facility - Laboratories

POSITION TITLE AST Flight Systems Test Engineer

EDUCATION Bachelor of science in mechanical engineering; currently working on a master's in chemical engineering

PLACE OF BIRTH Santa Fe, N.M.

HOBBIES Horseback riding, hiking, fishing, camping, shooting, martial arts, playing the guitar, playing any sport, computer gaming and many other activities

WHAT DOES HISPANIC HERITAGE MONTH MEAN TO YOU? I think it's an opportunity to share the history, diversity and richness of all the people it takes to make a Hispanic culture. We are brown, we are black, and we are white. What makes us unique is that our culture is what binds us. It's an interesting thing to learn about!

FAVORITE WORDS OF WISDOM "Defeat never comes to any man until he admits it." – Josephus Daniels



MARIA R. TELLES

TIME AT JSC 12 years (started in El Paso)

ORGANIZATION Aircraft Operations Division Engineering Branch

POSITION TITLE Engineering Branch Secretary

EDUCATION Pursuing a business degree

PLACE OF BIRTH Cd. Juarez, Chih, Mexico

HOBBIES Tennis, restoring vintage war planes, being a volunteer counselor at the South Houston Crisis Pregnancy Center

WHAT DOES HISPANIC HERITAGE MONTH MEAN TO YOU? Hispanic Heritage means to me the enjoyment of the richness of life from the heart and soul. We are family-oriented and enjoy gathering with our families and loved ones to celebrate special events with the good flavors of food and music. Our colorful and unique culture can be seen all over the United States. The blending of our Hispanic ancestors has given us wisdom, compassion and feelings for our families and for others.

FAVORITE WORDS OF WISDOM Proverbs 3:5-6 – "Trust in the Lord with all thine heart; and lean not unto thine own understanding. In all thy ways acknowledge him, and he shall direct thy paths." (intuition, perception and discernment)

SPACE CENTER

Roundup

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