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Dutch Slager / JPL Photo Lab

Los Angeles Mayor Antonio Villaraigosa, left, joins JPL Director Charles Elachi and Los Angeles DWP General Manager David Nahai in signing a memorandum of understanding at JPL.

JPL to help L.A. DWP on energy, water solutions

JPL and Caltech have announced a partnership with the City of Los Angeles that will help provide a pipeline for innovative energy and water solutions directly to the city's Department of Water and Power. The partnership will leverage JPL's intellectual assets directly to the DWP to reduce water usage and greenhouse gas emissions and, in the process, stimulate green job growth.

JPL and Caltech will apply their extensive expertise in climate change science, remote sensing, environmental engineering and systems design to assist the city and the DWP in developing, maturing and deploying innovative technologies to improve energy efficiency, increase the use of renewable energy sources, conserve water and reduce greenhouse gas emissions.

"We are proud that JPL technology and expertise will be part of this collaboration to help improve energy efficiency and protect our water supply—one of our most precious natural resources," said JPL Director Charles Elachi.

The three-year agreement calls for the participants to collaborate on developing water- and energy-effi-

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Dutch Slager / JPL Photo Lab

Many of the JPLers contributing to the Lab's Constellation efforts gather for a family portrait.

Lab's Constellation work key for human program

By Alex Abels

"The next giant leap has begun." So says the slogan for Constellation, NASA's current human exploration program for the moon and Mars.

When Constellation first began in 2004, JPL was seen as a center whose focus was solely on robotic exploration. But with approximately 150 JPLers now engaged in Constellation and exploration technology programs, the Lab has shown it can contribute to human spaceflight as well.

"JPL leadership strongly supports the Lab being an active partner in NASA's human spaceflight activities," noted JPL's Brian Muirhead, Constellation's chief architect. "It's also recognized by NASA that JPL has unique skills and experience that are extremely valuable to the development and the ultimate success of the Constellation Program."

Throughout Constellation's development process, JPL has provided technical and leadership talent involved with program-level system engineering; software, test and evaluation; Altair system design; and mission operations system engineering.

Constellation's integrated architecture calls for the use of an Ares I rocket to launch a four-person crew in the Orion capsule into a low-Earth orbit, where it will rendezvous with the Earth departure stage and the Altair lunar lander vehicle, launched by an Ares V. The Orion docks to the Altair lander and the pair is sent on a trajectory to the moon by the Earth departure stage. The Orion/Altair vehicles enter low-lunar orbit, from which the Altair then descends to the moon surface with the crew. After the crew completes their tasks, they are carried back to the orbiting Orion by an ascent stage, much like Apollo. A second, uncrewed version of the Altair is capable of carrying a 15-metric-ton payload to the moon's surface for building up an outpost.

Constellation is the largest-scale architectural project NASA has been involved in for decades, and with it comes large-scale engineering problems that JPLers are eager and ready to solve, according to John Baker, ascent abort phase system engineering lead. "The issues are very different than what we typically run into on our space missions," he said. "It's broadened our engineering exposure." The Lab is providing leadership in solving some key Ares I rocket ascent issues, according to Baker.

In addition, JPL is assisting with the guidance, navigation and control of the Altair landers and is running operations integration for lunar surface systems. JPL is also working on landing risks and safety, including making recommendations for better parachute systems. Many designs have come about after carefully studying the Apollo missions and assessing the risks their engineering teams were both aware and unaware of at the

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Constellation *Continued from page 1*

time, noted Michael Sander, manager of JPL's Exploration Systems and Technology Office.

Another part of NASA's human spaceflight effort is the Exploration Technology Development Program, where JPL is leading the team for the All-Terrain Hex-Limbed Extra-Terrestrial Explorer (or ATHLETE), a cargo transporter for the moon capable of carrying up to 15 tons. A vehicle with six wheeled legs designed to stand 8 meters tall, Athlete would serve several functions on the moon: removing cargo—primarily habitats—from landers, transporting cargo, relaying communication, providing power through solar arrays and repositioning landers to better locations.

JPLers are currently advancing ATHLETE by essentially cutting the hexagon-shaped vehicle into three pieces—a center rectangle that becomes an interchangeable cargo pallet and two triangular wings, each of which has three legs with a wheel. The two "tri-ATHLETEs" can pick up a cargo pallet on top of a lunar lander and carry it to any desired place, even setting it down on the lunar surface.

Part of what makes ATHLETE so unique is its mix of wheel and leg technology, according to principal investigator Brian Wilcox. ATHLETE's small wheels are designed to navigate normal lunar terrain and cannot traverse the small percentage of very soft or very rocky ground—that's where the legs come in. Ames Research Center is developing the software for walking.

This mixed structure actually creates a lighter—and therefore slightly less expensive—overall system than a purely wheeled or a purely legged vehicle, Wilcox said. All-wheel vehicles like the Mars Exploration Rovers and Sojourner used bigger wheels and wheel actuators, which helped them get through extreme terrain but also weighed about six to eight times more than Athlete's smaller wheels and wheel actuators. "The savings in mass actually pays for the whole rest of the leg, with savings left over," Wilcox said.

A field test is scheduled for September to demonstrate the tri-ATHLETEs' ability to lift cargo. And while no decisions have been made, most scenarios for the Constellation architecture call for anywhere from one to four pairs of these vehicles. "We serve a role in the architecture that no other system can compete with at this time," said Wilcox.

Also through the technology program, JPL is leading the development of a new generation of space-qualified lithium ion batteries, doubling their specific capacity. The Lab is testing other developments too, notably actuators that can operate at minus 230 degrees C (minus 382 F).

Photo courtesy of Brian Wilcox

Lead system engineer Jaret Matthews, who stands about 6 feet tall, is shown with Tri-ATHLETE, which is about twice the size of earlier ATHLETE prototypes. A field test in September will include a cargo unloading task, carrying a habitat mockup off a half-scale Altair lunar lander. The entire device, including habitat, will stand about 20 feet tall.

The International Space Station is another part of the human spaceflight program that JPL is engaged in, including proposing new ideas for payloads. Out of 20 ideas, 11 were picked for initial discussion and seven were formally presented for consideration, Sander said. The Lab's ideas have been well received and the prospects for the various payloads are hopeful, he added.

"A lot of this activity is starting up now because the ISS is within two years of being completed, and even at its current state has many sites to accommodate payloads," said Sander. "The point is that ISS has a lot of payload accommodation capability. JPL engineers and scientists have identified some really good ideas, and we think the well is far from being dry."

Indeed, JPL is no stranger to the space station, having previously developed the Electronic Nose and Vehicle Cabin Atmosphere Monitor.

Currently, the Lab is partnering with Johnson Space Center in creating an avionics subsystem, called the ISS to the Crew Exploration Vehicle Communications Adaptor (or ICCA), which will enable reliable, autonomous communication between the ISS and Orion during proximity and docked operations. The device is like a "router in space," adapting the newer communication methods of Orion to the older communication of the station, said JPL Project Manager Caroline Racho. The adaptor is still in its formulation phase, but the development of its hardware is based on a heritage design used in other flight payloads such as the Moon Mineralogy Mapper and Electra radios.

Another exciting prospect for the ISS is the High Definition Television Testbed, a next-generation, high-definition camera put in a pressurized cylinder and remotely operated from the ground. Although the final decision for the go-ahead on funding is pending, JPL is still optimistic, said Sander.

The future direction of Constellation may be impacted by the options being developed by the federally chartered Review of the U.S. Human Space Flight Plans Committee. The advisory body, headed by Norman Augustine, former Lockheed Martin CEO, is looking at all aspects of the human spaceflight program including NASA's exploration architecture and future utilization of the International Space Station beyond 2016.

"Norm Augustine is a very thoughtful person to run this committee, and that says something about its credibility and hopefully its results," said Sander.

The Augustine Committee is holding public meetings throughout the summer. It is expected to release a report by mid-August, and Sander indicated that the committee's decisions could affect NASA's FY10 budget.

"We're planning in 2010 and beyond to engage in even more strategic ways how JPL can provide more discernable deliverables in areas such as software, test and verification, and mechanical systems," Muirhead added.

Energy *Continued from page 1*

ciency solutions and renewable energy technologies. The participants will work with other local universities such as USC and UCLA to make energy and water technology assessments, develop models and testbeds, perform technology demonstrations, and provide data on global change from Earth science satellites, airborne platforms and ground-based instruments to assist the city in making informed decisions.

One project already being investigated under the collaboration could have immediate applications to Southern California's current critical water shortage. Much of the DWP's water supply comes from the Eastern Sierra Nevada, from Mono Lake and the Owens Valley via the California Aqueduct. The department's vast land holdings include Owens Lake, an ancient dry lakebed whose blowing dust can impact air quality for Owens Valley residents. To help reduce dust on Owens Lake, the department and its team of contractors is installing one of the world's largest shallow flooding systems, which is a computer-controlled network of sprinklers that currently covers more than 14 square miles of the ancient lakebed. But this flooding system consumes significant water—water that is consequently unavailable to help satisfy the city's residential and industrial needs.

Under the collaboration, JPL and Caltech are investigating the development of a remote sensing instrument that would measure the lakebed's surface moisture in order to precisely predict when water needs to be applied. Such an instrument would permit more efficient use of the Owens Lake sprinkler system, thereby conserving precious water resources.

In addition, participants have already submitted a series of joint proposals to the Department of Energy to develop and deploy advanced energy technologies. These proposals involve projects to reduce agricultural energy and water consumption; develop models for predicting the availability of solar, wind and wave energy resources; develop robust communications architectures for smart grid applications; and develop efficient technologies for pre-processing food waste used to produce biogases and renewable energy.

Heated up about climate change

By Mark Whalen

Researcher Willis to receive honors from Obama

Carol Lachata / JPL Photolab

This fall, JPL climatologist Josh Willis will visit the White House to receive the Presidential Early Career Award for Scientists and Engineers, the highest honor bestowed by the U.S. government on young professionals in the early stages of their careers. Willis, recently named one of 100 researchers to win the honor, has been with JPL since 2004. He studies the role of the oceans in the Earth's climate system and tracks ocean warming and sea-level rise on regional to global scales. Here he discusses his award as well as his passion for helping spread the word on climate change.

Did you even know you'd been nominated for this prestigious honor?

I did know. Eric Lindstrom, my program manager at Headquarters, told me my name had been submitted for nomination. I owe a lot of my success to Eric; he has always supported me in my work.

When you found out you had won, what was your reaction?

I was ecstatic. I was actually at a meeting in Edinburgh, Scotland at the time. When I got the e-mail, I danced around my hotel room for a little while; it was really cool. The most fun thing was telling my parents. They were very excited about it—of course, they watched me go through many long years of graduate school—so it was a big deal for them too.

It's a great honor. It's a vote of confidence but there are also a lot of expectations attached to it. What President Obama said about the recipients was "with their talent, creativity and dedication, I am confident that they will lead their fields in new breakthroughs and discoveries and help us use science and technology to lift up our nation and our world." So it's a pretty tall responsibility.

To be recognized by the president is very inspiring — especially this administration, which places a very high value on science, particularly Earth science. That's very exciting to me, and a lot of fun too.

Was this field of study something you've always wanted to do?

Well, that's a funny story. I got a bachelor's in math and physics—and minored in theater, which was quite fun—then started to work on a Ph.D. in physics at UC San Diego. But physics didn't agree with me all that well. So I ended up nearby at the Scripps Institution of Oceanography, where they said I didn't have to pass the physics departmental exam to get a Ph.D (laughs), and it turned out to be a great career move.

So I came to oceanography through physics, and it was a good choice because I found out I was interested in things that are part of people's daily lives.

In the big picture, what is the most significant contribution science can make in the battle against climate change? Is it government action? Public awareness? What will come about as a result of what climate researchers do?

I think the sense of urgency that's required is not going to happen unless we understand the science. That includes understanding what changes are going to happen as well as how they're going to impact people.

Where has your research had the biggest impact, or might sometime later?

One of the big impacts we'll see from this type of climate science is better predictions of sea-level rise. As the planet warms, the oceans rise, and you have to understand the causes of that rise in order to be able to predict them. With the warming, it's expected that there will be changes in the oceans' circulation; these changes can impact sea level.

Why is this so important?

Sea-level rise brings a multitude of problems. The first one you usually think about is things getting flooded. But there are a lot of other pieces as well. Sea-level rise causes more rapid coastal erosion so our beaches and cliffs will erode more quickly; this is most important for beach management decisions or if you have a home on the cliffs over Malibu—you're going to care a lot about the sea level rising, even if it doesn't put water at your doorstep.

Another good example is a big, slow-moving set of ocean currents that carry heat northward and help moderate the climate in the north Atlantic, particularly in Europe, where a lot of fairly mild winters can be attributed to this overturning circulation. As global warming changes the circulation, it'll impact the climate in Europe but will also have an impact on sea level throughout the north Atlantic.

And it turns out that in predicting future sea levels, we've seen that the rates of rise along the Atlantic coast of the United States are probably going to be bigger than the ones along the Pacific coast.

This is important for planning how we're going to adapt to sea-level rise in some of our major cities. There are a lot of cities on the eastern seaboard that are pretty close to the current sea level, and they're going to have to make big adjustments in the future. How big? Well, that's one of the questions we're trying to help answer.

What are your thoughts about those who deny global warming, who believe the science you're performing is either skewed, unreliable or unimportant?

These folks are very energetic. But it's disheartening to see people discredit out of hand the enormous amount of data we have that points toward the reality of global warming. There's really a mountain of evidence. You don't need complicated computer models or fancy tools to say that global warming is happening and to say that it's caused by people.

It's not just one data set; it's hundreds. And anybody who takes a serious look at what the data is saying will come to the same conclusion. For instance, the data showing sea-level rise is really robust—sea level has gone up by 20 centimeters over the last 100 to 120 years, and it's also accelerating. How do you explain 2,000 years of no sea-level rise, followed by 100 years of rise at a rate we haven't seen since the end of the last ice age?

Some would discount the severity of sea-level rise, say it's not that bad, this is what the planet does.

It's true that the planet has gone through major climate changes in the past, but the last time it went through a climate change this size we didn't have civilization.

Civilization grew up over the last 10,000 years, when we had a very stable climate, and our society is a product of that stable climate. However, we're now in the regime of an unstable climate. So the simple question is, how is our society going to survive this? We weren't able to evolve societies 20,000 years ago when there were two miles of ice covering North America. If we change the climate that drastically again, how are civilizations going to survive? To what extent will they survive?

The gist here, in terms of climate science, is that climate is definitely changing. We have to first recognize it, then decide what to do about it.

News Briefs

Panel releases OCO report

A NASA panel that investigated the unsuccessful Feb. 24 launch of the Orbiting Carbon Observatory has completed its report.

The JPL-managed satellite to study atmospheric carbon dioxide launched aboard a Taurus XL rocket from Vandenberg Air Force Base but failed to reach orbit.

The mishap investigation board led by Rick Obenschain, deputy director at NASA's Goddard Space Flight Center, verified that the launch vehicle fairing failed to separate upon command. The fairing is a clamshell structure that encapsulates the satellite as it travels through the atmosphere. The failure to shed the fairing mass prevented the satellite from reaching its planned orbit and resulted in its destruction.

The board identified four potential causes that could have resulted in the fairing not separating:

• A failure of the frangible joint subsystem. A frangible joint is an explosive device that provides instantaneous separation of flight vehicle structures while maintaining confinement of explosive debris.

• A failure in the electrical subsystem that prevented sufficient electrical current to initiate the required ordnance devices.

• A failure in the pneumatic system, which supplies pressure to thrusters that separate the fairing.

• A cord snagged on a frangible joint side rail nut plate.

The panel also provided recommendations to prevent any future problems associated with the four hardware components that could have caused the accident.

The six-member board, which began its investigation in early March, conducted hardware testing; performed and reviewed engineering analysis and simulation data; reviewed telemetry data; collected and secured more than 2,000 documents; and conducted 78 interviews of critical personnel associated with the mission.

The official report of the board contains information restricted by U.S. International Traffic in Arms Regulations and company-sensitive proprietary information. As a result, the board has prepared a summary of its report, which provides an overview of publicly releasable findings and recommendations regarding the OCO mission failure. The summary is available at *http://www.nasa.gov/oco.*

JPL proposals selected

Two JPL projects have been selected for the 2009 NASA Innovation Fund, which advances work from innovators on novel technologies and concepts that have the potential to revolutionize the way NASA performs its missions, such as enabling new capabilities in space flight, science, aeronautics or exploration.

Each project is funded for a maximum of $50,000, with work to be completed by the end of September. The JPL projects: "Concentrated Solar Power Array for Ground and Space," Tom Cwik, principal investigator; and "Silicon-Immersed Waveguide Spectrometer for Spaceborne Far-Infrared Astrophysics and Earth Climate Studies," Charles Bradford, principal investigator.

Ninety-one proposals were received for the Lunar Advanced Science and Exploration Research Program, and 21 were recently selected for funding, including two from JPL.

"The Ultraviolet Moon," from principal investigator Amanda Hendrix, proposes to focus on lunar observations from the International Ultraviolet Explorer and the Galileo Ultraviolet Spectrometer. James Williams is principal investigator for "Improving Lunar Ephemeris, Orientation and Model." Based on the Lunar Laser Ranging Experiment, the effort is designed to obtain an improvement in the model and computer code by an order of magnitude to analyze new lunar range observations of recently improved accuracy and to give more accurate solution results; and should demonstrate improved fits and science results.

On the air

KLOS radio's "Spotlight On the Community" host Cynthia Fox (left) joins JPLers Randii Wessen, Julie Townsend, DC Agle, Gorjian Varoijian and Erik Conway. All recently appeared on the hour-long show to discuss JPL's history as well as its current and future missions.

Passings

Derek Slye, 41, a software systems engineer in the Multimission Integration Test and Deployment Group, died April 14.

Slye had worked at JPL since 1993. He is survived by his parents, Richard and Terry Slye. Funeral services were held in Virginia and a memorial service was held at All Saints Church in Pasadena.

Fritz Krug

Friedrich (Fritz) Krug, 53, former lead propulsion engineer for the Galileo spacecraft, died April 16.

Krug, from the Propulsion Group in the Propulsion and Materials Engineering Section, worked for the German Space Agency while a resident at JPL. The German government contributed the propulsion subsystem for Galileo, along with personnel to help prepare and work flight operations.

Krug is survived by his wife Christine and sons Timo and Kevin.

Jerome Abraham

Jerome Abraham, 82, a retired electronics engineer, died May 27.

Abraham, who worked at the Lab from 1962 to 1996, contributed to Topex/Poseidon and JPL scatterometer projects.

He is survived by his wife, Earlene; children Bruce, David, Gaye and Donald; and 11 grandchildren. Services were held at Riverside Military Cemetary in Riverside.

Shuh-Ren (Randy) Lin, 55, a member of the technical Staff in Section 343, died June 24.

Lin worked at JPL from 1985 until his passing, providing dedicated support to Galileo and Cassini spacecraft attitude and articulation control subsystem ground software development, sequence generation and flight operations.

Lin is survived by his wife, Florence, daughter Katrina and son Brian. Memorial services were held July 18 at Mandarin Baptist Church of Glory in La Puente.

Robert Sutherland, 84, retired manager of the Personnel, Security and Plant Protection Division, died July 2.

Sutherland joined the Lab in 1977. Among his career honors is the NASA Exceptional Service Medal, awarded in 1990. He retired in 1992.

Sutherland is survived by his wife, Marilyn; son Brad and his wife Danita; daughter Heather Deutschlander and her husband Chip; and grandchildren Chelsea and Cody.

Robert Sutherland

Retirees

The following JPL employees retired in July:

Thomas Gavin, 47 years, Section 333G; **Albert Kirk,** 46 years, Section 5125; **Saturnino Lopez,** 34 years, Section 3170; **Kent Volmer,** 29 years, Section 5126; **Edward Kieckhefer,** 19 years, Section 2680; **Mary Dejong**, 11 years, Section 2632.

Letters

I would like to thank my JPL friends and colleagues for your kindness and sympathy during the recent passing of my stepmother. Also, thanks to the JPL ERC for the beautiful orchid, which we will nurture as a living reminder of her.

Alix Kneifel

To my colleagues at JPL, I would like to thank you all for the condolences that I received on the passing of my mother. My "JPL family" has been a great support to me, so please accept my thanks for your sympathy as well as the beautiful plant.

Randy Dodge

On behalf of my father, sister, brother, nieces and nephews, as well as my daughter Veronica and I, I would like to thank every single one of my JPL family for your words of kindness, your hugs, your prayers and your expressions of sympathy during my mother Anita's illness with pancreatic cancer, and at her death. I love each and every one of you for your support during very trying times, and for your understanding. You will never know how important each and every one of you are to me. My heart was broken and empty with the loss of my mother, but you have filled it with light, and love, and for that I can never repay you. Special thanks to 4X Directorate, NMP office for the beautiful orchid; JPL for the beautiful plant that my daughter and father will plant in the garden. Just know that the smallest kindness makes the biggest impact.

Vicky Martinez

JPL RETIREES:
FOR ACCESS TO CLASSIFIED ADS AT JPL'S ONLINE NEWS SOURCE

http://dailyplanet

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