AEROSPACE Orbiter

Print June Article Archive

Article Archive for June 1st to June 30th.
Generated on July 2, 2013, 12:02 am

NOAA and NASA Officials Visit Aerospace

Photo: Elisa Haber

Aerospace technical staff member Andrew Mollner demonstrates equipment in the Lidar and Atomic Clocks lab to Douglas Brauer, left, and Harry Cikanek, of NOAA.

Posted June 27, 2013 · Feature

On Tuesday, June 25, officials from the National Oceanic and Atmospheric Administration (NOAA) and NASA visited the facilities of Aerospace.

Representing NOAA were Harry Cikanek, Douglas Brauer, and Timothy Hall; representing NASA was Marcus Watkins.

The purpose of the tour was to show how Aerospace capabilities have helped the Joint Polar Satellite System (JPSS) program in the past, and indicate how Aerospace can be of value in the future.

The officials were toured around several of the A6 labs, and the Concept Design Center, as well as the Spacelift Telemetry Acquisition and Reporting System (STARS) lab where they were given a presentation by Dr. Ed Ruth, principal director, Launch Systems Engineering.

NOAA and NASA are both customers of Aerospace.

This article was prepared by Constitutional Rights Foundation interns Shariee Newman and Roxana Ruiz.

Aerospace executives with visitors in A1 lobby on Tuesday, June 25. From left, John Langer, principal scientist, Strategic Planning and Development, Technical and Laboratory Operations; Timothy Hall, principal director, NOAA Programs; Dr. Dave Gorney, senior vice president, Space Systems Group; Dr. Gary Hawkins, principal director, Space Materials Laboratory; Harry Cikanek, NOAA JPSS director; Douglas Brauer, NOAA JPSS external relations; Marcus Watkins, director, NASA Joint Agency Satellite Division. (Photo: Eric Hamburg)

Sometimes, Smaller is Better

Posted June 25, 2013 · Feature · By Matthew Kivel

Photo: Elisa Haber

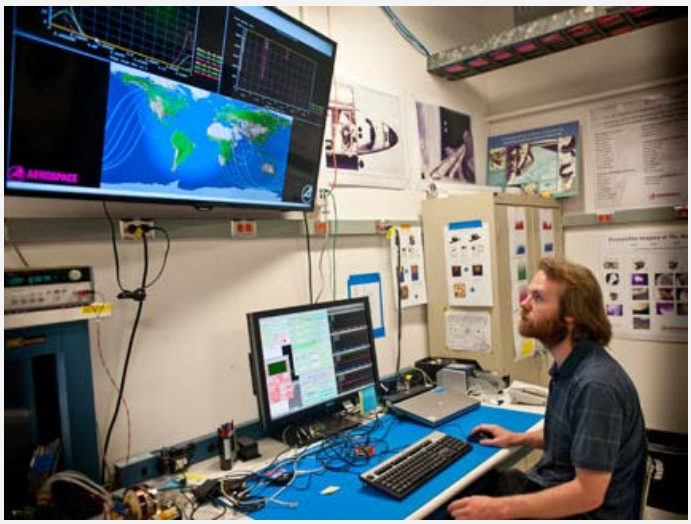
Geoff Maul works on AeroCube-5.

As far as buzz words are concerned, “picosatellite” has certainly enjoyed a prolific run in recent years— both inside and outside of the aerospace industry. Small satellites are all the rage in a budget-constricted climate that has forced its brightest minds to innovate and find creative, cost-effective alternatives to the slow-moving, prohibitively expensive processes of the past.

From early on, Aerospace has been on the front lines of this minimalist movement, leaning on the remarkable work of its picosat lab to produce breakthroughs in the design and construction of small satellites. Over the years, Aerospace’s picosat lab has grown from a tiny operation comprised of a few engineers, to a more complex network of colleagues with its own ground control network, a burgeoning list of contracts, and a heightened public profile.

Picosatellites — for those still unfamiliar with the term— are small satellites that weigh anywhere from .1 to 1 kg. They were initially designed as simplistic research vessels for university students to test, build, and explore in a real-world setting. Over time, the technology evolved and scientists and engineers have rapidly improved the capabilities of the once-austere picosats. CubeSats are a cubic form of picosat or nanosatellite that conforms to the CubeSat Standard of California Polytechnic State University at San Luis Obispo and are launched from a Poly-Picosatellite Orbital Deployer (P-POD). The P-POD is the most widely used interface for American launch vehicles and its design is responsible for the CubeSats’ cubic shape. Aerospace’s particular line of CubeSats is known as the AeroCube.

Aerospace’s David Hinkley, senior projects leader, Mechanics Research Department, has been a driving force behind the picosat lab’s upward progression since its nascent days. Without infrastructure or suppliers for materials, Hinkley and a small group of colleagues began building picosatellites in the Aerospace offices. The aim was to make cheap, small satellites that could provide some measure of technological innovation, while securing available rides on rocket launches. With its first three CubeSat designs— AeroCubes 1, 2 and 3— Aerospace took a number of small, but essential steps in manufacturing a truly dynamic and versatile satellite. “The first ones [Aerocubes] were just simpler,” said Hinkley. “Each flight had a set of goals that, when achieved, was a milestone. In retrospect, you look at the technologies and you’re not impressed. But at that period of time, each was a big deal.”



Dr. Brian Hardy operating the AeroCube-4 from mission control in A6. (Photo: Elisa Haber)

AeroCube 1 was battery-powered and designed to last for a brief two weeks on orbit. Unfortunately, it was destroyed in a 2006 launch failure and never flew. AeroCube 2 introduced solar cells and photographic capabilities into the model, but failed almost immediately after its 2007 launch — though it was able to photograph another CubeSat during its brief period of activity in space. AeroCube 3 boasted a redesigned power system, an upper-stage tether, photographic capabilities and a host of new sensors to boot. It was successfully launched in 2009 and completed a number of experiments while on orbit. This pioneering trio of AeroCubes slowly built upon the innovations of its predecessors while ironing out technical flaws and efficiency issues. By the time AeroCube 3 successfully completed its space mission, the Aerospace picosat lab was preparing to fly Aerocube 4— which would prove to be its breakthrough development.

AeroCube 4— which is technically a constellation of three AeroCube 4s; AeroCube 4a, AeroCube 4b and AeroCube 4c— was launched in September of 2012 and will remain on orbit for a number of years. The AeroCube 4s all have three-axis attitude control with 1 degree pointing capability, deployable solar panels that also act as variable drag devices, and a custom transceiver. The AeroCube 4c maintains a launch vehicle environment data logger, which measures launch vibration in-situ, and contains a deorbit drag device that will be deployed at the end of its primary mission. Hinkley views AeroCube 4 as a breakthrough development, an archetype for all future AeroCubes and a proven design that has helped to generate demand for the next wave of AeroCubes.

Catherine Venturini, project engineer, Space and Ground, Development Planning and Architectures, works consistently with the picosat lab as a liaison between the scientists and SMCXR— the developmental planning directorate. Essentially, Venturini tries to keep the creatively minded picosat lab synched up with the more practically constrained vision of the customer. It can be a complex logistical process, but Venturini understands that in order for the AeroCube program to flourish, there must be a healthy blend of pragmatism and innovation. “Our goal is to push the envelope,” says Venturini. “And really try some innovative and exciting things where others in the community might not be willing to take that risk. The CubeSats might be a viable option for the military in the future, especially with tight budgets, and the work the picosat lab is doing is paving the way to show us that these CubeSats can actually do real missions and provide military utility.”

AeroCubes 5 through 9 map out an ambitious agenda for the program’s future. Each of these CubeSats are in various phases of production and pre-production and they are the primary

The AeroCube-5 picosat. (Photo: Elisa Haber)

focus of the picosat lab. This new wave of CubeSats will tackle a host of different mission objectives and technological hurdles while incorporating many of the techniques and designs used to develop the previous models. With Aerocube 4, the picosat lab came of age and developed a fully mature realization of its initial goals. Now, the aim is to take things to new heights of innovation and functionality.

AeroCube 5 slightly modifies and upgrades the basic structural components of the AeroCube 4. Its primary mission will be to test its pointing and tracking capabilities while on orbit. Aerocube 6 will represent another major leap forward for the program as it incorporates a host of technical upgrades and a groundbreaking suite of micro dosimeters for measuring radiation in the space environment. Much like the redesigns that auto manufacturers introduce for specific car lines, AeroCube 6 represents the program's first "model year" redesign since 2002. "Since 2002 we haven't changed our form factor and now we're changing it and we're fixing a whole bunch of stuff we've found in the past has been difficult to work with," said Hinkley. In addition, the micro dosimeter will emphasize the functionality and versatility of miniaturized instruments as both an auxiliary and primary observational tool.

As the most ambitious AeroCube to date, AeroCube 7, a NASA Edison selection, is set to introduce a breathtaking list of new features including a high-speed laser communications system, a low-cost automotive radar, and optical flow sensors. The laser communication system will exponentially increase the communicative capacity of the traditional CubeSat and add a truly innovative level of functionality to the typically minimal satellites. Aerocube 8's centerpiece is the development and integration of a scalable ion electrospray propulsion system. This will introduce a more advanced level of maneuverability and control while manipulating a CubeSat on orbit.

Aerocube 9, a NASA invest selection, will demonstrate a cooled infrared avalanche photo diode that will be capable of conducting measurements within the 1 ½ to 2 micron range while on orbit. The data it collects will be used in future remote sensing missions to develop a sharper understanding of the space environment and the Earth.

As a program, it is not simply the individual achievements of the AeroCubes that are so impressive, but the overall benefit of the accrued knowledge and technology that they create. After this new fleet of AeroCubes flies, the future models will undoubtedly incorporate many of the earlier technologies into a CubeSat that will be capable of functioning at an incredibly complex level. Perhaps someday in the not- so-distant future, the skyway will be populated with constellations of buzzing, humming CubeSats in addition to the monolithic satellites of today.

Old Instruments Gather New Data

Photo: NASA

RAIDS as viewed by an astronaut on the ISS.

Posted June 20, 2013 · Feature · By Laura Johnson

An Aerospace team took a set of instruments that had been sitting unused in a clean room for more than a decade, sent it up to the International Space Station (ISS), and used it to collect helpful data about a region of Earth's atmosphere that up till this point has been largely unstudied.

"This was really a groundbreaking mission even though it was 15 years old," said Dr. Rebecca Bishop, a research scientist in the Space Sciences Department.

Instruments on the ground only measure atmospheric properties up to about 110 km and instruments in space don't measure below about 160 km. This leaves a tricky-to-measure area in the middle.

"This region within our community is affectionately known as the 'ignorosphere,'" Bishop said.

The team of Bishop, Dr. James Hecht, Dr. Andrew Christensen, and Dr. Paul Straus used the Remote Atmosphere/Ionosphere Detection Sensor (RAIDS) Sensor Suite to combat that ignorance.

"The purpose of this project was to measure the temperature, density, and composition of a region of the atmosphere from about 80 km up to about 200 km," Bishop said.

RAIDS, which is a joint mission with the Naval Research Laboratory (NRL), is a set of eight instruments (five of which were built at Aerospace) on a scanning platform (also designed and built by Aerospace).

The eight instruments are three photometers, a near-infrared spectrometer, a far and extreme ultraviolet spectrograph, and a near and medium ultraviolet spectrometer.

RAIDS was built from 1989 to 1991, but it had trouble getting a ride into space. It was scheduled to launch in 1994 and operate on a TIROS satellite, but was replaced with a higher priority payload.

This turned out to be a trend, and 11 potential domestic and foreign launch opportunities didn't work out for RAIDS. However, after camping out in an NRL clean room for years, its time finally came.

An opportunity arose for it to ride to the ISS on a Japanese HTV cargo vessel. The Aerospace team pulled RAIDS out of storage, refurbished it, and it launched Sept. 11, 2009.

RAIDS surpassed its one-year minimum mission life by providing 13 months of excellent data, after which the scanning platform's power system failed. RAIDS still provides data, but it is more limited.

The data that the team collected can help with atmospheric drag calculations and space weather models, and determine the environment's impact on communications and radar systems.

"We believe this has been a very successful flight of something that otherwise was just going to become a museum piece," Bishop said.

Leadership Series With Bernard Chau

Posted June 20, 2013 · Article

In this Senior Leadership Series video, Bernard Chau, vice president of National Systems Group, discusses his role as chair of the Aerospace Diversity Action Committee (ADAC) and its impact on the business of Aerospace.

CEO's Report: Weathering Sequestration

Photo: Eric Hamburg

Dr. Wanda Austin presents her quarterly CEO's Report to Employees.

Posted June 18, 2013 · Feature · By Lindsay Chaney

During her start-of-summer quarterly report to employees, Aerospace CEO and President Dr. Wanda Austin provided an update on how the company is managing through the effects of sequestration, recapped launches and program accomplishments for the quarter, and presented the annual corporate Excellence in Diversity Award.

Delivering her address from the Titan IV meeting center in El Segundo, Austin first noted that a number of Aerospace employees in the Colorado Springs area have been affected by the wildfires in the region and at least one employee has lost a home to the blaze. She urged other employees to be patient and empathetic with those in Colorado as they deal with fire-related personal issues.

Austin noted that the effects of sequestration — the across-the-board federal spending cuts — were less severe in fiscal year 2013 for Aerospace than they could have been, and as a result the company is now facing the challenge of meeting contract deliveries for the year. This is being accomplished with surge techniques, including Extended Work Week (EWW) overtime for many technical employees, casual labor, and other temporary measures to help meet deliveries.

Sequester Hits Air Force Civilians

However, although Aerospace employees are not being greatly affected this year by sequestration, Austin noted that civilian employees for many of our government customers and especially those at the Space and Missile Systems Center (SMC) are facing furloughs. She said government civilians are not allowed to do any work on their furlough days, even using their BlackBerrys for any work purpose. The furloughs will be stressful for the civilian government employees, Austin said, and will slow down the work they do. Furthermore, she cautioned, Aerospace employees are not allowed to fill in on any jobs that would normally be the responsibility of a furloughed civilian, including giving work instructions or direction to contractors.

Austin also reported that Aerospace is in the midst of developing a new five-year contract with SMC, and in response to a question, said the new contract will show level staffing through the five years, from fiscal 2014 through 2018. She warned, however, that staffing levels are adjusted every year to meet the customer needs, so although the plan is to keep staffing level, circumstances will require changes in the future.

Turning to technical highlights of the quarter, Austin reported three successful launches, all from Cape Canaveral: the Space Based Infrared System satellite, SBIRS GEO-2, launched aboard an Atlas V on March 19; the GPS IIF-4, launched on an Atlas V rocket on May 15; and, the Wideband Global SATCOM satellite WGS-5, carried on a Delta IV on May 24.

Aerospace will be participating in four launches in July, August, and September, as well as monitoring the SpaceX Falcon 9 launch on Sept. 5, which is one of three launches required for certification to compete for Air Force EEVL missions.

“No matter what economic challenges the country is facing, the need for supremely capable space systems continues, as will the need for our commitment to 100-percent mission success,” Austin told employees.

New Feedback Process

Austin reported that in addition to the standard report card from Aerospace customers, Lt. Gen. Ellen Pawlikowski, SMC commander, has initiated a new, informal process involving a face-to-face meeting between Austin and SMC leadership, and well as representatives of the NRO and other customers to discuss the report card feedback. Austin said she found this meeting very helpful and said it also provided a forum to discuss strategic points regarding the relationship between the government and the FFRDC. One of the takeaways from the meeting was that Aerospace must continue to nurture relationships across the national security space community, work with other FFRDCs where appropriate, and continue to improve communications between Aerospace and government counterparts.

In facilities news, Austin reported that over the past weekend Aerospace employees moved from Rosslyn to new offices in Crystal City. In addition to being more centrally located to key customers in the Washington D.C. metro area, the new offices are expected to save at least $170,000 per year in lease costs.

Austin announced the winner of this year’s Program Recognition Award — the Space Based Infrared System, or SBIRS, team, a part of the Space Based Surveillance Division of Space Systems Group. The award was given at the board of trustees meeting last week by board chairman Peter Teets. Scott Gustafson accepted the award on behalf of the SBIRS team. A recognition dinner for the team will be held in August.

Dr. Wanda Austin with Sonia Henry, recipient of the 2013 Excellence in Diversity Award. (Photo: Eric Hamburg)

After taking a few questions from the audience, Austin presented the 2013 corporate Excellence in Diversity Award to Sonia Henry, engineering manager of the Software Systems Assurance Department, Computer Applications and Assurance Subdivision, Engineering and Technology Group. Henry was cited by the Diversity Awards Committee for her “leadership and promotion of diversity, inclusion, and excellence at Aerospace and in the community.”

In particular, Henry was cited for her work with the summer intern program and ensuring a group of diverse participants in the program. In her acceptance speech, Henry compared the ideals of the Olympic movement to the goals and attitudes of Aerospace.

Click below to view a video of the complete CEO’s Report to Employees.

SpaceX on Trajectory to Launch Air Force Payloads

Posted June 13, 2013 · Feature · By Lindsay Chaney

In a signing ceremony on Friday, June 7, the Air Force officially launched SpaceX on the path to orbit for national security payloads.

The ceremony, attended by Air Force, SpaceX, and Aerospace executives, was held at the SpaceX headquarters building in Hawthorne. The 200-page document is titled “United States Air Force Cooperative Research and Development Agreement Between the Space and Missile Systems Center Launch Systems Directorate and Space Exploration Technologies Corporation.”

Aerospace worked extensively with the Air Force New Entrant team and SpaceX representatives over a 15-month period to develop the comprehensive certification plan for the Falcon 9 v1.1 launch system. As part of the evaluation set out in the plan, the involved parties will look at the Falcon 9 v1.1’s flight history,

Martin Berman/SpaceX

Elon Musk, left, CEO of SpaceX, talks with Dr. Wanda Austin after the signing ceremony.

vehicle design, reliability, process maturity, safety systems, manufacturing and operations, systems engineering, risk management, and launch facilities. SMC and Aerospace will monitor at least three certification flights. Once the evaluation process is complete, the SMC commander will make the final determination whether SpaceX has the capability to successfully launch national security space missions using the Falcon 9 v1.1. At that point, SpaceX will be certified for potential award of national security launches for the Air Force.

Currently, the only certified launch provider for the Air Force's Evolved Expendable Launch Vehicle program is United Launch Alliance, a joint venture between Lockheed Martin and the Boeing Co., which uses the Delta IV and Atlas V launch vehicles.

The signatories to the document were Lt. Gen. Ellen Pawlikowski, SMC commander, Elon Musk, SpaceX CEO, Col. Bob Hodgkiss, director of the SMC Launch Systems Directorate, and Gwynne Shotwell, SpaceX president. Distinguished visitors were Dr. Wanda Austin, Aerospace CEO, and Scott Correll, Air Force PEO for Space Launch. Members of the SMC/Aerospace New Entrant Certification Team were also in attendance. (Photo: Martin Berman/SpaceX)

The first stage of the Falcon 9 v1.1 launch vehicle is powered by nine Merlin 1D engines that each produce 147,000 pounds of thrust on takeoff or a total of more than 1.3 million pounds. This is more powerful than either the Atlas V or Delta IV main engines which deliver 860,000 pounds and 663,000 pounds of thrust respectively at launch. However, both of those launch vehicles can be equipped with solid rocket motors that supply additional liftoff power.

At Friday's ceremony, Elon Musk, CEO of SpaceX, noted that in addition to the Falcon 9 v1.1 rocket, his company also plans to obtain certification for the Falcon 9 Heavy, a triple-barrel configuration with 4 million pounds of takeoff thrust.

Collaboration Suite Selected

Posted June 12, 2013 · Article

In this Leadership Series video, Dr. Willie Krenz announces which collaboration platform will be used at Aerospace. For more information about the new software, which will be called OurSpace, visit the OurSpace website.

United in Diversity: Aerospace Lambda Alliance

Posted June 6, 2013 · Article

June is Aerospace Lambda Alliance (ALA) month. This FY13 United in Diversity affinity group membership campaign highlights how its members are valued business partners within the corporation.

Urgency or Emergency?

Posted June 5, 2013 · Article

Learn how Anthem Blue Cross PPO participants can continue to become better health care consumers. Watch this video for guidance on when to use urgent care centers versus emergency rooms.

Three Contenders Seek Edge for Email Job

Posted June 3, 2013 · Feature · By Lindsay Chaney

Three contenders are vying to provide email, calendaring, instant messaging, and document-sharing for The Aerospace Corporation.

The three contenders have each presented their cases, and one will be chosen.

Who will it be? Google Apps for Government, IBM SmartCloud, or Microsoft Office 365?

One of the contenders may eventually replace Lotus Notes, the company's email and calendaring system.

The final choice will be made by Aerospace Vice President and Chief Information Officer Dr. Willie Krenz, but he is getting plenty of advice.

"We want people to be using tools that are available now, not what was available in the 1990s," said Krenz, explaining the motivation to upgrade the email system.

The search for a replacement for Lotus Notes began more than a year ago, although the idea has been percolating through the company since at least 2008, when a study was conducted and concluded that a business case did not exist for replacing Notes, which was introduced in 1995.

Most recently, three technology teams were formed to evaluate each of the three options. The idea is to buy a basically off-the-shelf system that does at least email, calendaring, and instant messaging. In the course of evaluating the options, it became clear that all three offered versions of document-sharing, personal workspace, activity streams, and some form of social collaboration among peers, all of which the teams decided should also be a major aspect of the systems to evaluate.

Each technology team has representatives from Space Systems Group, National Systems Group, Civil and Commercial Operations, Systems Planning, Engineering, and Quality, Engineering and Technology Group, Operations and Support Group, and Enterprise Information Services. The contenders each demonstrated the capabilities of their offering via four-hour presentations to the technology teams in the first week of May.

The technology teams have been evaluating the products and will present their findings to a selection advisory board, of which Krenz is the chairman, and he will eventually make a selection.

All three products are "cloud-based," meaning the Aerospace information will reside on servers operated by the service providers and is accessible from any computer or mobile device with internet access. In the cloud means Aerospace does not have to spend money running and supporting its own servers or adding upgrades to the programs operated by the services. The security of Aerospace information in each offering will be a primary consideration in the selection.

Each product also has specific advantages that will have to be evaluated. The IBM SmartCloud product likely will feel familiar to Aerospace employees since Lotus Notes is also an IBM product. The Microsoft product has the advantage of being the cloud version of the Microsoft products used by the Air Force, which could make collaboration between the Air Force and Aerospace easier. Google email is used by many employees on their home computers and Google's search appliance is ubiquitous, providing a familiarity that could lead to easier adoption by the Aerospace population.

Krenz says he expects to choose a product this month. A third-party integrator will be selected to help install the system companywide, and the first employees should be able to experiment with the system early next year.

Employees with opinions for or against any of the competing systems are welcome to leave a comment in the section below, where Krenz has been alerted to watch for input and advice.

Meanwhile, check out Krenz's most recent blog post on "The Mathematics of Collaboration."

June Obituaries

Posted June 1, 2013 · In Memoriam

Sincere sympathy is extended to the families of:

- **Barbara Bowman,** office support, hired Jan. 15, 1973, died June 6, 2012.
- **Robert Bradford,** member of the technical staff, hired April 30, 1979, retired Dec. 1, 1990, died Feb. 7.

- **June Cohen,** project engineer, hired June 29, 1981, retired Nov. 30, 1990, died Feb. 17.
- **Calvin Hecht,** member of the technical staff, hired Jan. 16, 1973, retired Oct. 1, 1992, died April 25.
- **John Jones,** systems director, hired March 19, 1984, retired Jan. 1, 2006, died May 9.
- **Asa Keith,** project engineer, hired Nov. 27, 1986, died May 23.
- **Yum-Cheung Lee,** member of the technical staff, hired April 8, 1985, retired March 1, 1998, died April 13.
- **Jerome Medford,** project engineer, hired Oct. 9, 1978, retired Sept. 1, 1984, died April 12.
- **Eugene Nelson,** member of the technical staff, hired May 16, 1966, retired Feb. 1, 1982, died May 9.
- **Jonathan Pribble,** member of the technical staff, hired June 2, 2003, died March 13.
- **Kenneth Saltzman,** publications manager, hired Feb. 6, 1961, retired Dec. 1, 1986, died March 29.
- **Robert Stroud,** member of the technical staff, hired Oct. 24, 1994, retired Dec. 1, 2010, died April 17.
- **Kathleen Toelle,** office support, hired July 19, 1982, retired Oct. 1, 2010, died May 13.
- **Ruth Watson,** office support, hired Sept. 19, 1960, retired April 1, 1985, died May 28.

To notify Aerospace of a death and have it included in the Orbiter, please contact Cynthia Evans in Human Resources at 310-336-5806.

June Notes

Posted June 1, 2013 · In Appreciation

Sincere sympathy is extended to the families of:

- **Sary Melles,** on the recent passing of her husband, Garmt “Don” Melles.

To notify Aerospace of a death and have it included in the Orbiter, please contact Cynthia Evans in Human Resources at 310-336-5806.

June Anniversaries

Posted June 1, 2013 · Anniversaries

40 YEARS

Operations and Support Group: James Osborne

Systems Planning, Engineering, and Quality: Julia White

35 YEARS

Engineering and Technology Group: Darlene Turner

Operations and Support Group: Mary Graham-Waddell

Space Systems Group: Randolph Sena

30 YEARS

Engineering and Technology Group: George Rossano, Sally Yamashita

National Systems Group: Linda Halle

Operations and Support Group: Marilee Wheaton

Space Systems Group: Barbara Tressel

Systems Planning, Engineering, and Quality: Erick Smith

25 YEARS

Civil and Commercial Operations: Nancy Cline, Blake Kimbrough

Engineering and Technology Group: James Barrie, Arturo Candelas, Kirk Dotson, Stephen La Lumondiere, Veny Viloria

National Systems Group: Yolanda Jacobs

Space Systems Group: Donald Langley, Michael O'Brine, Diane Rader

20 YEARS

Engineering and Technology Group: Joseph Aguilar, Bruce Fry, Delilah Nunez, Mark Polak

Operations and Support Group: Dorothy Wilson

Space Systems Group: Lee Christopher

Systems Planning, Engineering, and Quality: Andrew Bustillos

15 YEARS

Engineering and Technology Group: Christine Camacho, Kenneth Conner, John Quinn, Peter Stephens

National Systems Group: Omar Mian

Operations and Support Group: Joseph Glowacki, Christine Lincoln, Janice Mitsushima, Sharon Moore, Greg Papazoglou

Space Systems Group: Terita Norton

10 YEARS

Civil and Commercial Operations: Bruce Leroy

Engineering and Technology Group: Jonathan Bray, Chung-Tse Chu, Gary Coldren, Robert Colligan, Kelsey Folgner, Andrew Gallagher, Steven Guerrini, Bernard Jefferson, Melissa Jolliff, Nicholas Martin, Geoffrey Maul, Erik Mellquist, Kelly Miller, Antoine Moten, Armando Sosa, Davin Swanson, Grace Wang

National Systems Group: Paul Chang, Iwona Palusinski, John Williams

Operations and Support Group: Gregory Rudolph, Elizabeth Uyeda

Space Systems Group: Jeffrey Michlitsch

5 YEARS

Engineering and Technology Group: Rebecca Glick, Pavel Ionov, Alex Martinello, Yeshe Phang, Jason Shanney, Jae Shin, Bradford Wilkins, Christopher Woods, Carl Yu

National Systems Group: Terry Andy, Thomas Hood

Operations and Support Group: Cherrie Lesher, Floria Ross

Space Systems Group: John Adams, Christopher Fafard, David Stephens

Systems Planning, Engineering, and Quality: John Clarke, Joyce Pedrino

---

End of Archive
