

Article Archive for January 1st to January 31st.  
Generated on February 4, 2013, 10:21 pm

## NASA Launches New Comms Satellite



Bill Uttenweiler

Aerospace and Air Force personnel were "on console" during the launch of NASA's TDRS-K mission.

Aerospace involvement with the launch was short of the full mission assurance it provides on Air Force and national security launches, but still involved critical work: mission assurance verification on the first and second stages of the booster and telemetry monitoring during countdown, liftoff, and flight to orbit.

Posted Jan. 31, 2013 · Feature

The first of NASA's three next-generation Tracking and Data Relay Satellites (TDRS), known as TDRS-K, launched at 8:48 p.m. EST Wednesday from Cape Canaveral Air Force Station in Florida.

The launch attracted a large VIP crowd in Aerospace's El Segundo STARS lab, primarily because of the convenient liftoff time — right after conventional working hours on the West Coast.

The TDRS system provides tracking, telemetry, command and high-bandwidth data return services for numerous science and human exploration missions orbiting Earth. These include the International Space Station and NASA's Hubble Space Telescope.

TDRS-K was lifted into orbit aboard a United Launch Alliance Atlas V rocket from Space Launch Complex-41. After a three-month test phase, NASA will accept the spacecraft for additional evaluation before putting the satellite into service.

## Leadership Series With Ellen Beatty

Posted Jan. 31, 2013 · Article

In this Senior Leadership Series video, Aerospace Chief Financial Officer Ellen Beatty discusses the company's financial performance last year, the current year's outlook and issues, and the financial planning process for upcoming years.

## Charles Daugherty Retires After 51 Years

Posted Jan. 28, 2013 · Feature

Charles Daugherty, a driver/mover in the Facilities Division, has retired after working 51 years at Aerospace. The Facilities Division hosted a retirement celebration for Daugherty on Thursday, Jan. 24 at Paul Martin's on Rosecrans Avenue.

Daugherty is the longest-serving employee in history to retire from The Aerospace Corporation. Prior to retiring, he was one of four employees who started working for the company in 1960, the year it was founded.



Elisa Haber

Charles Daugherty, left, with Shannon Woodland, at Daugherty's retirement celebration Thursday, Jan. 24.

job so much.

In an *Orbiter* interview in 2008, Daugherty recalled driving Gen. James "Jimmy" Doolittle to attend the dedication of the old A1 headquarters building. He also drove Gen. Bernard Schriever, and recalled going to Los Angeles International Airport to pick up furniture for President John Kennedy and delivering it to the Beverly Hills residence where he was staying.

Daugherty's first position with Aerospace was as a driver, and his other jobs over the years included maintenance administrator, dispatcher, move coordinator, and computer operator. He eventually returned to driving because, he said, he enjoyed that



Charles Daugherty, with his wife, Barbara. Photo by Elisa Haber

## Awards and Recognitions January



Posted Jan. 24, 2013 · Feature

**Aerospace employees frequently earn recognition for their professional accomplishments. This *Orbiter* feature will acknowledge those honors and awards, including the publication of books. To nominate someone for consideration in this section, send details of the award in a timely fashion to [orbiter@aero.org](mailto:orbiter@aero.org). Include a photo related to the award, if available.**

Several employees recently received awards for their achievements in the professional and technical arenas, namely from the American Institute of Aeronautics and Astronautics and the International Council on Systems Engineering (INCOSE), while one was recognized by his former high school.

Six Aerospace employees have been elected to the grade of associate fellow by the American Institute of Aeronautics and Astronautics (AIAA).

They are: **Harlan Bittner**, Systems Planning, Engineering, and Quality; **James Chang**, **Dr. Robert Frueholz**, Engineering and Technology Group; **Randy Kendall**, Civil and Commercial Operations; and **Malina Hills** and **Ray Johnson**, both of the Space Systems Group.

The grade of AIAA associate fellow is a distinction reserved for those who have made notable and valuable contributions to the arts, sciences, or technology of aeronautics or astronautics.

The honorees were feted with a pin and certificate at the AIAA Associate Fellow Dinner earlier in January.

**Marsha Weiskopf**, director, Research and Program Development Office, Technology and Laboratory Operations, Engineering and Technology Group, has earned certification as an Expert Systems Engineering Professional (ESEP) from the International Council on Systems Engineering (INCOSE).

According to INCOSE, this achievement, “as it is intended for the organization’s multi-level certification program, refers to someone who has done more than simply pass a test. It is someone who is seen by others as an experienced individual who finds a way to get the job done — no matter what obstacles and complications may arise.”

Certification as an INCOSE ESEP is very selective, according to Marilee Wheaton, general manager, The Aerospace Institute, and one of Weiskopf’s references. “This effort requires a very lengthy application, review, and interview process,” said Wheaton. “Marsha is a most deserving recipient of this distinction. She approaches every job and every task with a systems engineer’s mindset — thoughtful, wide aperture view, starting with requirements, clearly defining process, and following through to solution.

“In addition to successfully demonstrating through work experience the necessary skill set for systems engineering expertise, she has also demonstrated leadership qualities, thus meeting the qualifications for the ESEP certification,” said Wheaton.

**Dr. Andrew Kostic**, senior project leader, Systems Engineering, GEOINT (GeoSpatial Intelligence) Development Office, National Systems Group, received the 2012 Award of Distinction from Rossford High School in Rossford, Ohio, in October.

Kostic is one of only 14 to receive the award, which is presented to Rossford alumni who have been out of high school for a minimum of 20 years and have made “significant contributions to society.” His nomination was reviewed by the school district’s selection committee.

Award recipients are honored at a ceremony as well as during the homecoming football game and are presented with a trophy and lifetime pass to all Rossford School District events.

Kostic is a distinguished author and lecturer and has published more than 40 technical papers and articles on electronic parts, materials, and processes. Kostic holds patents in methods and systems for gathering and disseminating quality performance and audit activity data in an extended enterprise environment.

His hobbies include raising and showing AKC dachshunds, greyhounds, and deerhounds, for which he has achieved more than 120 championships and other titles. He is president of the Metropolitan Washington Dachshund Club.

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## Big Hit at AAPAA Heritage Fest



Elisa Haber

Taiko drummer Taylor Moyer performs as part of a taiko trio during the AAPAA Heritage Festival on Jan. 17.

Posted Jan. 18, 2013 · Feature

The Aerospace Asian Pacific American Association (AAPAA) Heritage Festival on Thursday, Jan. 17, featured hulu dancers, a taiko drumming performance, and a keynote speech by John Fujita, principal director of the Advanced Systems Directorate in the MILSATCOM Division. The event was held in the Titan IV meeting center.

For more information about AAPAA, visit the group’s website at <http://pages.aero.org/aapaa>.

A video of the entire event is also available.



Hawaiian hulu dancers were part of the entertainment at the 2013 AAPAA Heritage Festival. Photo by Elisa Haber



The lunchtime crowd enjoyed the Asian Pacific American Heritage Festival program. Photo by Elisa Haber

## Aerospace CHIRP Group Wins Team of the Year Award



Eric Hamburg

Members of the Aerospace CHIRP group at the luncheon in their honor. At the podium is team member Doug Holker.

teams with a corporate award.”

Later, Austin gave a quick overview of the in-depth selection process and the award selection criteria.

As the recipients posed for photographs with Austin, Senior Vice President for Systems Planning, Engineering, and Quality Rand Fisher spoke briefly about the team’s work and the value of its contribution to Aerospace.

Fisher’s speech was followed by a more specific breakdown of the individual team members’ achievements by Doug Holker, associate principal director of Developmental Planning and Projects. Holker, also a member of the winning team, made special mention of each person’s particular contributions to the success of the group as a whole. The speeches were followed by a catered luncheon.

The 15 members of the award-winning team are: Todd Beltracchi, Doug Holker, Patty Lew, Cary Pao, Steve Hammes, Dan Morken, Pete Carian, Jerry Chang, Jason Fields, Andrea Gilbert, Brian Guernsey, John Hackwell, Todd Kaiser, Aaron Myrick, and Ray Russell.

[See video highlights below.](#)

Posted Jan. 17, 2013 · Feature · By Matthew Kivel

Recipients of the inaugural Aerospace Team of the Year Award were honored at a luncheon in Titan IVA on Tuesday, Jan. 15.

After delivering a warm and complimentary speech, Dr. Wanda Austin presented the “Key Aerospace Contributions to Commercially Hosted InfraRed Payload (CHIRP)” team members with individual plaques commemorating their efforts. CHIRP was the first military payload hosted on a commercial satellite and it provided missile warning, technical intelligence, missile defense, battlespace awareness, and civil/environmental monitoring.

In her speech, Austin expressed the significance of recognizing exemplary teamwork in the workplace. “Our customers, our colleagues in industry, and our co-workers here at Aerospace have long acknowledged the importance and value added of having a team of Aerospace employees addressing the myriad issues that arise in our challenging business,” said Austin. “I’m very proud that we can now acknowledge the contributions of our

## Aerospace Affinity Groups Show STEM Commitment

Posted Jan. 14, 2013 · Article · By Matthew Kivel

Aerospace has a rich and diverse blend of affinity groups, each of which contributes greatly to the overall quality of the company's corporate culture. One of the strategies for the affinity groups is community outreach and recruiting. In 2012, that affinity group strategy intersected with the corporate strategy focused on inspiring the next generation of engineers and scientists.

Corporate Communications provided \$1,000 to each affinity group in 2012 for science, technology, engineering, and mathematics (STEM) outreach purposes.

"We were looking for the affinity groups to bring their insight and engagement in the community to inform our STEM giving to reach a broader range of opportunities," said Sabrina Steele, principal director of Corporate Communications. "Our main focus is STEM education in grades K–12, but we allowed some exceptions for college students who needed a leg-up in their technical education."

To be considered for a sponsorship, a program must be a 501(c)(3) charitable organization and meet the following four criteria: An Aerospace employee currently volunteers with the program; the program has a proven record of inspiring the next generation of scientists, engineers, and technologists; it provides volunteer opportunities for other Aerospace employees; it is located in a community near an Aerospace facility.

While STEM promotion anchored all of the donation decisions, each affinity group used its own tenets and philosophies to inform the specific selection of recipient organizations.

### AAPAA



Yi-Ling Tam of Aerospace speaks to the East Los Angeles College Engineering Club.

After receiving a number of written proposals from various educational entities, the Aerospace Asian Pacific American Association (AAPAA) donated its \$1,000 allotment to the East Los Angeles College (ELAC) Engineering Club's Human Powered Vehicle (HPV) Team. The ELAC Club's HPV Team allows its students to creatively engage in the development of innovative, pedal-powered vehicles. Projects culminate in international competitions, where ELAC — a community college — often competes against a highly competitive field, stacked with four-year universities. Working with limited resources, the HPV Team has done exceptionally well, providing a wonderful example for other schools of its size and the community at large.

### ALMA

The Aerospace Latino Members Association (ALMA) chose to donate the entirety of its \$1,000 allotment to the Lennox Academy — a public, charter high school that emphasizes math, science, and technology. Located in Inglewood, Calif., Lennox Academy enrolls a high number of Latino students and prepares them directly for the pursuit of college degrees. ALMA President DeeDee Madrid-Anzack has specified that the \$1,000 donation will be devoted entirely to helping Lennox students pay the expensive fees that often come with the

submission of college applications. In this way, ALMA can help alleviate some of the financial strain for a number of students rather than a select one or two.

### ATAG

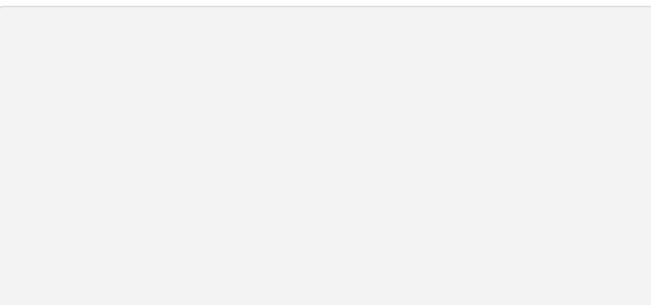
As proud representatives of the disabled community, the Aerospace Totally Adaptable Group (ATAG) worked with California State University Northridge (CSUN) to design a unique scholarship opportunity. The Assistive Technology Engineering (ATE) Scholarship in memory of Murry Glick (a former Aerospace employee), will award one CSUN ATE master's student a \$1,000 scholarship based on the quality of his or her senior project. The project will be judged by a panel of experts including ATAG president Daniel Winton. Utilizing engineering skills to advance the development of assistive technology for the disabled, CSUN's ATE master's program is, as Winton puts it, "a perfect fit" for ATAG.

### AWC

The Aerospace Women's Committee (AWC) chose to honor one of its founders, Shirley McCarthy, by donating its scholarship to the Society of Women Engineers (SWE)— an organization that McCarthy was heavily involved with during her time at Aerospace. AWC President Rachel Morford sees the mission and goals of the SWE to be very much in line with those of the AWC. "The mission of SWE is to stimulate women to achieve their full potential as engineers and leaders" said Morford. "To expand the image of the engineering profession as a positive force in improving the quality of life and to demonstrate the value of diversity." The donation will be distributed directly to the SWE's Los Angeles Scholarship Fund.

### ALA

Models of Pride is a free, one-day conference that provides a wide array of resources and events for LGBT youth in Los Angeles. The Aerospace Lambda Alliance (ALA) has chosen to donate its \$1,000 allotment to Models of Pride — supporting an organization that aims to inspire and guide young people during what is often a very difficult period in their lives. At last year's event, Aerospace set up a booth and spoke with K-12 students about STEM careers and educational paths. ALA believes that it is important to promote education for LGBT students and to provide support systems in order to keep those students in school.





Ed Dowling mans a table with Aerospace literature at the Models of Pride event.

## AMV



Jason Bayonne presents a check from the Aerospace Military Veterans to Dr. Hamid Johari, chair of the Mechanical Engineering Department at California State University, Northridge.

Instead of donating to a single group or fund, the Aerospace Military Veterans (AMV) divided its resources between three

organizations: the Marine Corps Scholarship Foundation, the CSUN veterans in engineering program, and the Wounded Warrior Program. AMV president Michael Fortanbary wanted to find organizations that sought to recognize the efforts of military veterans, while also providing educational resources and opportunities for military children and the vets themselves. The Marine Corps Scholarship Foundation provides scholarship opportunities for children of Marine Corps veterans, emphasizing those children whose parents have been injured or killed in combat action. Both the CSUN veterans program and the Wounded Warrior Program provide injured soldiers with numerous opportunities and resources to advance their education in a variety of fields.

## Liau Gives Status Update on AEHF Program



Posted Jan. 11, 2013 · Feature · By Matthew Kivel

On Thursday morning, Jan. 10, MILSATCOM Systems Director James Liau delivered a detailed, 40-minute presentation on the current state of the Advanced Extremely High Frequency (AEHF) program.

The early portion of the talk dealt with the technical anomaly that hampered the first AEHF satellite (AEHF-1) shortly after its launch on Aug. 14, 2010.

Liau explained that a restriction in the satellite's oxidizer line was found to have contributed primarily to the failure of its liquid apogee engine, with the result that the satellite ended up in a low-earth orbit a few hundred miles above Earth while it needed to be in a geo-stationary orbit more than 20,000 miles above the planet.

As the satellite's bi-propellant thruster system remained inactive, a

Lester Chung

MILSATCOM Systems Director James Liau discusses the Advanced Extremely High Frequency (AEHF) program.

team consisting of employees from Aerospace, the Air Force, and Lockheed Martin devised and executed a 14-month rescue operation of AEHF-1 utilizing its hydrazine system and its Hall Current Thruster electric propulsion system. Liau gave an in-depth explanation of the rescue program and concluded that the anomaly was most likely caused by plugs that had been left in AEHF-1's propulsion manifold.

The second portion of Liau's presentation focused upon the rigorous testing of AEHF-2 and AEHF-3 in the wake of AEHF-1's difficult path to orbit. Since the problematic plugs were used during a rework of AEHF-1, the exonerative tests of AEHF-2 and AEHF-3 focused upon areas where repairs were performed and where plugs were used. After a series of in-depth tests and a pedigree review, the two satellites were both cleared for flight. AEHF-2 was launched on May 4, 2012 and is now on orbit. Further tests and analysis have been, and continue to be, carried out on orbit as well as on the ground to accumulate critical data about the satellites' respective HCT systems for the benefit of future AEHF satellites.

Liau concluded with a status update for AEHF-4, listing the satellite's proposed technical upgrades and its completed components — which include the U-frame and payload wing structures. At the end of his talk, Liau responded to a number of specific questions about the AEHF program from the audience. The presentation was well-attended— approximately 50 people filled the D8 conference room while a number of others joined in via video and teleconferencing.

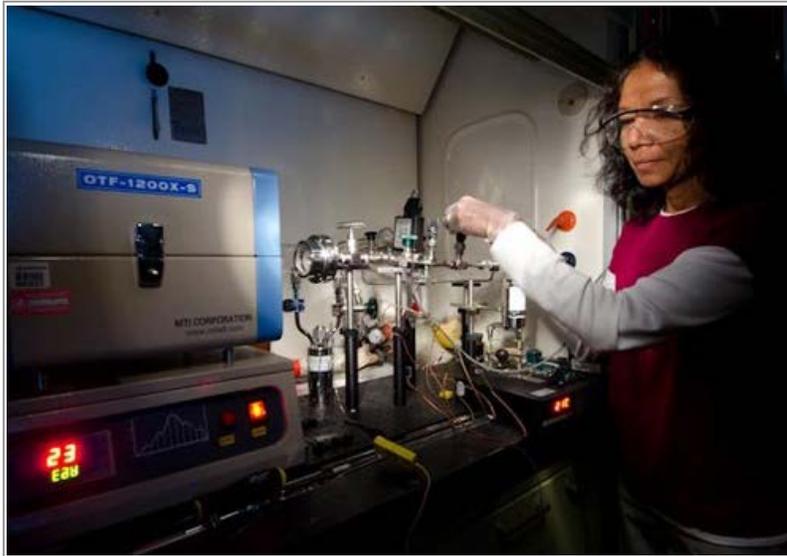
## Collaborate and Go Big

Posted Jan. 10, 2013 · Article

Bill Williams discusses the possibility of Aerospace using Google Apps for Government.

## Aerospace Scientists Work With Single Layer of Carbon Atoms

Posted Jan. 7, 2013 · Feature · By Laura Johnson



Eric Hamburg

Gouri Radhakrishnan uses chemical vapor deposition to grow graphene.

A trio of Aerospace scientists has developed highly successful methods for growing graphene, characterizing it, and applying it toward reducing the weight of space batteries.

"Graphene is a really unique material because it comprises a single layer of carbon atoms," said Dr. Gouri Radhakrishnan, a senior scientist in the Materials Science Department. "It has some exceptional properties, which make it useful for applications in electronics, in batteries, and in solar cells."

Of particular interest is the fact that graphene could be used as the negative electrode (the anode) in lithium-ion batteries.

"The Air Force is calling for a reduction in the mass and the size of space batteries," Radhakrishnan said. "Lithium-ion batteries are a candidate for that and they're transitioning into high-reliability space."

Many people are familiar with lithium-ion batteries in the form of coin cells, which are used in cameras and watches. The anode is usually made of carbon, and graphene, which is a very light form

of carbon with a large surface area, is a good candidate for an anode.

"Our goal was to make high-quality graphene and see if we could convert it into a low-mass battery anode," Radhakrishnan said.

Radhakrishnan has headed the project and the growth of the material, while Paul Adams has been instrumental in characterizing it through transmission electron microscopy, and Dr. Joanna Cardema has been evaluating the material in lithium-ion test cells.

Naturally, there are some difficulties in making graphene, which is 10,000 times thinner than a human hair. The previous method for making graphene was not ideal.

"When it was originally fabricated in 2004, the scientists took a piece of graphite and they peeled it sequentially layer by layer by layer with Scotch tape," Radhakrishnan said.

The process worked — in fact, it led to a Nobel Prize in 2010. However, it was very tedious and generated only small areas of graphene.

“This is an excellent technique to investigate the fundamental properties of graphene as it produces a single crystalline orientation (or grain) of graphene, but it is not suitable for large-area applications,” Radhakrishnan said. “When we started this two years ago, what we wanted to do was come up with a novel method that would not only be scalable, but also hopefully give us large grains.”

Large grains of graphene would be better because, as Radhakrishnan explained, the larger the grains, the fewer the grain boundaries and hence the fewer the defects in the material.

Radhakrishnan used a method called chemical vapor deposition (CVD), which uses heat to break up a chemical compound.

While CVD is not new, the process developed at Aerospace uses methanol as the source, and this resulted in excellent graphene. In this method, Radhakrishnan used argon gas, which is inert, to transfer methanol from a bubbler into a 1050° C furnace.

This process, which has a patent pending, is much simpler than the tape peeling method, and can be used to create large areas of graphene. Methanol is also inexpensive, readily accessible, and safe.

Unlike other CVD methods used for graphene, this method does not employ hydrogen as one of the process gases, which offers a huge safety advantage.

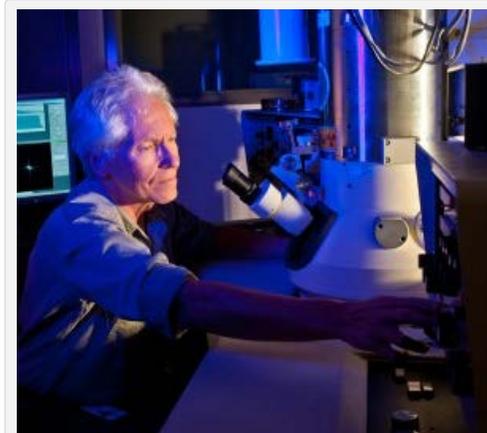
“All of the process parameters were developed by us. There was nothing at all in the literature that said that methanol could lead to graphene,” Radhakrishnan said.

Using transmission electron microscopy, Adams, a senior scientist in the Materials Science Department, measured the orientation of the graphene lattice from which the size of a single crystalline grain could be determined.

“We’ve been successful in fabricating a single layer of graphene with a significant increase in grain size, which was 10 to 30 times larger than what other people were doing at the time,” Radhakrishnan said.

The Aerospace scientists discovered they can also create one layer or multiple layers of graphene by changing the substrate, which is the material upon which the graphene is deposited.

Radhakrishnan explained that when making coin cells for lithium-ion batteries, the substrate has to be conductive. Therefore, the scientists deposit the graphene directly onto copper or nickel substrates. No binding material is used, eliminating another source of weight.



Paul Adams uses a transmission electron microscope to assess and characterize graphene. Photo by Elisa Haber



Joanna Cardema tests the electrochemical performance of coin cells with graphene-based anodes. Photo by Elisa Haber.

Using their method, the team has successfully created a graphene anode that is stable, lightweight, and has a measurable high capacity per weight. Cardema, a senior member of the technical staff in the Energy Technology Department, has been testing the electrochemical performance of the coin cells with graphene-based anodes.

“Although small, when we scale the measured capacity of our graphene cells to the capacity of commercial graphite anodes ... our simple graphene anode is at least 200 times lighter,” Radhakrishnan said. “This makes us hopeful that we can make further improvements towards better batteries.”

Although the team has achieved impressive preliminary results in the area of batteries, their research also has broader implications.

“As a result of our research, we are developing all these scientific techniques that are enabling graphene applications,” Radhakrishnan said. “While our focus has been on anodes, what we’re

really doing is growing high-quality graphene and trying to also push the envelope to hybrid materials so that they can be used for any of the other applications.”

The team is looking forward to how their research can be further improved and used in the future.

“Our research and expertise in graphene technology is really enabling graphene applications and we would like to be in a position—a strong position—in this very quickly developing field to be able to suggest ways that contractors could implement this technology into space systems when it is actually mature for insertion,” Radhakrishnan said.

## Aerospace Employees Help During Holidays

Posted Jan. 4, 2013 · Feature



Elisa Haber

El Segundo employees pose after packing gift and food boxes during a lunch hour.

charitable activities.



Howard Dotson, left, and Wayne Clevenger with the Chantilly angel tree. Photo by Melissa Parsons.

Aerospace offices around the country once again participated in gift and food drives to help individuals and families in need of assistance to have a happier holiday season.

In El Segundo, employees donated a total of 2,142 gifts and enough food for 78 family boxes. The Chantilly office put up “angel trees” and collected more than 150 items of clothing and toys for 26 homeless children in transitional housing, as well as gift cards for their mothers. Also in Chantilly, for the third year in a row, Shelley Brosnan and Corina Birr coordinated an Engineering and Technology Group gift and food collection for two families from Our Daily Bread, an agency that provides food, shelter, and training for people in need.

Chrystal Rodriguez from the Cape office was featured in the Dec. 30 issue of Florida Today helping serve Christmas dinner at a Salvation Army facility. Employees in Albuquerque delivered 60 gift bags to the South Valley Care Center nursing home, while Aerospace workers in many other offices organized similar

## Aerospace Asian Pacific American Association Month

Posted Jan. 3, 2013 · Article

January is Aerospace Asian Pacific American Association (AAPAA) Membership Month. AAPAA provides a forum for employees to enhance their networks, to learn how to grow their careers, and to have fun. View this video to learn more.

## January Obituaries

Posted Jan. 1, 2013 · In Memoriam

Sincere sympathy is extended to the families of:

- Pamela Church, pension analyst, hired Dec. 19, 1960, retired March 1, 2004, died Nov. 29.
- Leonard Stricker, project engineer, hired Dec. 6, 1965, retired Nov. 1, 1990, died Nov. 30.

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

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## January Notes

Posted Jan. 1, 2013 · In Appreciation

Notes of appreciation to fellow employees and Aerospace for thoughtfulness and sympathy have been received from:

- Bryan and Celia Canaan, for the recent passing of their father and father-in-law, Harry Canaan.
- Charlotte Lazar-Morrison, for the recent passing of her mother, Margaret Lazar.

*To submit a note of appreciation to Aerospace, please contact Valerie Jackson in Human Resources at 310-336-0891.*

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## January Anniversaries

Posted Jan. 1, 2013 · Anniversaries

### 40 YEARS

**Engineering and Technology Group:** Manuel Landa

### 35 YEARS

**Engineering and Technology Group:** Gary Steckel

### 30 YEARS

**Engineering and Technology Group:** Jay Culliney, Darryl Williams

### 25 YEARS

**Civil and Commercial Operations:** Randolph Kendall

**Engineering and Technology Group:** Stephen Didziulis, Yaniv Dotan, Michael Hilton, Wei-Ming Huang, Sandy Lee, Daniel Stoffel, Tommy Troup, Scott Turner

**Space Systems Group:** William Freed, Gerald Keller, Don Skinner, Cheng Wu

**Systems Planning, Engineering, and Quality:** Scott Prouty, Catherine Sedam

### 20 YEARS

**Engineering and Technology Group:** Clifford Graham, Kelly Lee

**Operations and Support Group:** Jeffrey Jacobson

### 15 YEARS

**Civil and Commercial Operations:** Richard Pastore

**National Systems Group:** Jabin Bell, Margherita Eastman, John Stacy

**Operations and Support Group:** Linda Nicoll

## 10 YEARS

**Engineering and Technology Group:** Manuel Acosta, Corina Birr, Diana Cannon, Matthew Ferringer, Evan Haas, Arnold Koh, Victor Lin, Jose Linares, Jesse Mierau

**National Systems Group:** Robert Carroll, Timothy Grabowski, Thomas Mackowiak, Michael Weaver

**Systems Planning, Engineering, and Quality:** Michael McAndrew

## 5 YEARS

**Engineering and Technology Group:** Marco Garcia, Marianne Harmon, Lindsay Holmwall, Daniel Houston, Robert Lastra, Adam Loverro, Allen Raines, Karen Sharp, Holly Stewart, Paul Tien, Leslie Wickman

**National Systems Group:** Cedric Mann, Rachel Morford, Hilda Weeks

**Operations and Support Group:** Jeff Chen, Sabrina Steele

**Space Systems Group:** Kathryn Fricks, Phuong Tran

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