Orbiter
January 2019

The Fifth Time's the Charm

by **Randolph L Kendall**
January 21, 2019

A Delta IV Heavy carries a national security payload to orbit on Jan. 19. (Photo: United Launch Alliance)

Sometimes in the launch business, we find ourselves explaining that even though it looked easy, a lot of hard work went in to making it look that easy. That was not necessary this past Saturday, when a national security payload was successfully launched on a Delta IV Heavy launch vehicle from SLC-6 at Vandenberg Air Force Base. This was the fifth launch attempt over the last six weeks for this mission, since the initial attempt on Dec. 7. That first attempt was scrubbed due to a ground system problem and an attempt the next day was scrubbed by a vehicle issue resulting in a delay to Dec. 18. On that attempt, ground winds delayed the launch to Dec. 19, when a hydrogen leak caused the slip to Jan. 19.

Finally, however, the vehicle was ready and after almost a week straight of clouds and rain, Saturday morning dawned clear and beautiful on the central California coast. It was by no means calm during the countdown, however, as the team worked through multiple issues starting with issues moving the mobile service tower, multiple ground and vehicle systems issues, and high ground winds throughout the count. Click here for complete story.

Food for Thought and Safety

January 30, 2019

A new incentive program set up by the Environmental Health and Safety (EHS) Department is designed to recognize employees for showing positive safety behavior. The program is part of an ongoing effort to promote a strong culture of safety at Aerospace.

EHS, part of the Security and Safety Directorate, has delivered safety tokens to managers and supervisors, who are authorized to present the tokens to employees on the spot in recognition of safe practices. A safe practice can also be reported directly to EHS, which will directly award a token, if warranted.

The first employee to win a token was Peggy Pellegrini, who was recognized for quickly pulling together an emergency management Skype training to ensure that Enterprise Information Systems employees, who had moved into new quarters in D9, were properly trained on the emergency procedures for their new work area. Over 100 employees attended the training.

Employees who receive a safety token can exchange it for a meal or beverage voucher worth up to $5 for use in the A3, D8, or Chantilly campus cafeterias. Several employees who have received tokens, however, say they intend to keep the tokens rather than turn them in for food.

“So far we’ve been getting great feedback on this program,” said Joyce Lew, associate principal director of the Environmental Health and Safety Department. “Employees have been really appreciative when they receive a token, and the impact of this gesture goes a long way for shaping a positive safety culture. We encourage all managers to take advantage of this program.”

Joyce Lew, associate principal director of the Environmental Health and Safety Department, right, with Peggy Pellegrini, recipient of the first safety token. (Photo: Aerospace)

Here are a few of the token recipients so far:

- Paul Adams and Eric Johnson for their assistance during X-ray testing at Raytheon. Paul and Eric met with Raytheon safety officials to set up shielding and a perimeter for some X-ray testing in order to assure that nearby personnel would not be exposed to X-rays above the established safe limits for the general public.
- Michael Horn, Justin Ingram, Charles Hanley, Jamie Ashley, Richard Akel, and Edward Johnson for coming in on a Sunday to help clear the snow from the Chantilly campus, ensuring employees would be safe coming to work on Monday.
- Krista Drew for reporting construction housekeeping and air quality concerns in D9. Because EHS was alerted, safety personnel were able to prevent a trip and fall as well as air quality discomfort due to construction.
- Diana Alaan and Chung-tse Chu for their help in identifying alarm issues with the toxic gas monitoring system in their lab. They were proactive in bringing this to EHS’s attention and prompting Security to fix the issues.
- William Cox for inquiring about personal protective equipment and whether EHS could help provide rain jackets to the mail services employees. William was looking out for the safety and wellbeing of other employees at Aerospace, which in turn helps promote a safety culture.

Visit the EHS website for more information on the EHS Employee Recognition Program.

New Leaders Step Up With ADAC

January 28, 2019

Malissia Clinton and Jana Roche have been selected as the chair and vice chair of the Aerospace Diversity Action Committee (ADAC). They succeed Randy Kendall and Michael Tanzillo.

In addition, Marty Whalen has been chosen as executive sponsor of the Aerospace Black Caucus (ABC) and Jay Santee is the executive sponsor of Aerospace Military Veterans (AMV).

“I’d like to thank both Randy and Michael for their term of dedicated service to the ADAC community,” said Courtney Moore, director of the office of Inclusion and Diversity. “And it is a pleasure to welcome Malissia and Jana as we continue our mission of bringing diversity and its advantages to all levels of the Aerospace workforce.”

ADAC comprises representatives of the eight Aerospace Employee Resource Groups, management advisors to the groups, and executive sponsors.

Randy Kendall and Malissia Clinton jointly chaired an ADAC leadership transition meeting. (Photo: Jeff Berting)

Four new management advisors are expected to be appointed within the next few weeks.

AeroCube 4 Featured on New Credit Union Debit Cards

by **Lindsay Chaney**

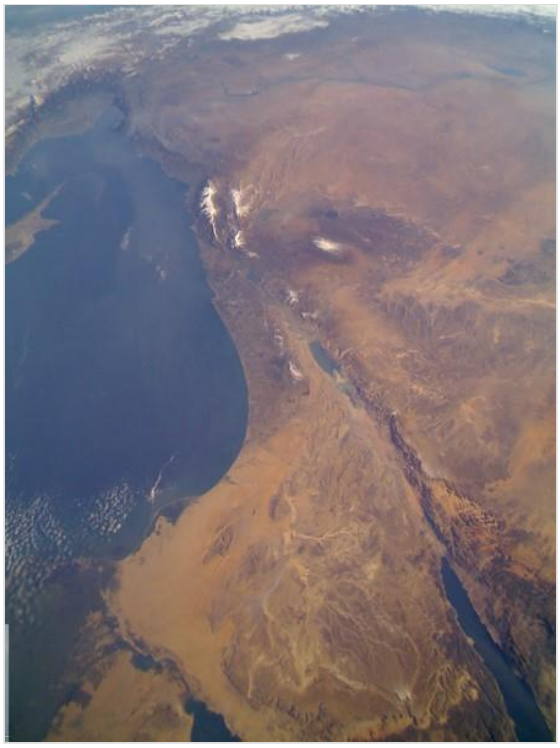
January 24, 2019

The Aerospace Federal Credit Union is rolling out new Visa debit cards that feature a picture of The Aerospace Corporation's most iconic satellite in the AeroCube series, the AeroCube-4.

In conjunction with the new cards, which include an embedded security chip, the credit union is sponsoring a "Win with AFCU" sweepstakes throughout 2019, with $500 monthly prizes and a $2,500 grand prize for using the debit card, which is accepted by any merchant who takes Visa. Sweepstakes entry is open to all AFCU members or non-members in the AFCU field of membership. Full details are on the AFCU website at https://www.aerofcu.org/WinwithAFCU.

The AeroCube-4 — which pioneered many of the systems and technologies that are now being used to address the threats to the space enterprise — launched in September of 2012. It was built in support of what was then the Space and Missile Systems Center/Development Planning Directorate (SMC/XR), the group that built, planned, and conducted demonstrations of new technologies and architectures that could be applied to various SMC mission areas.

AeroCube-4C is a 1U CubeSat (10 x 10 x 10 cm in dimension) that contains what were at the time various "first of a kind" mission technologies including solar panel wings that close and open to tune the ballistic coefficient and enable efficient formation flying; three-axis attitude control to better than 3 degrees absolute accuracy; a 0.3-square-meter deployable deorbit device; sub-miniature reaction wheels; and a launch environment data logger that records ascent accelerations, pressure, and temperature.



At the bottom middle-left is the Suez Canal; the Gulf of Aqaba is at the lower right, pointing upward toward the Dead Sea, the Jordan River, and the Sea of Galilee. (Photo: AeroCube-4)

The deorbit device was deployed in the summer of 2017, and the satellite is in a slowly decaying orbit at present.

AeroCube-4 contains three cameras equipped respectively with wide-angle, medium, and narrow-focus lenses. The cameras are two-megapixel cellphone cameras acquired commercially. The narrow-focus lens (22 degrees) will photograph an area approximately 135 by 180 kilometers. The medium focus lens (57 degrees) will photograph an area approximately 500 by 700 kilometers. The wide-angle lens is a fisheye with a 185-degree field of view, and can see the horizon in all directions when nadir-pointing. From a nominal satellite altitude of 600 km, the region of the Earth seen by the fisheye lens is about 5800 km wide.

The cameras on AeroCube-4 were installed primarily for verifying the attitude-control system of the satellite and Earth observation was originally conceived as a secondary mission. However, because the AeroCube-4 images were so compelling, once the satellite's primary mission was finished in late 2013, the Aerospace picosat team experimented with various observation and operational techniques that led to enhanced technologies on later AeroCube models.

The photos sent back from AeroCube-4 include what might well be the most spectacular photograph of the Mideast ever taken from an unclassified satellite. The single picture shot through the AeroCube-4's wide-angle lens displays the setting for 5,000 years of recorded history from Egypt to Turkey.

Easily identifiable land and water is visible that includes part of Egypt and all of the Suez Canal, the Gulf of Aqaba, the Dead Sea, the historic River Jordan, the Sea of Galilee, all of Israel, all of Lebanon, and large parts of Jordan, Syria, Cyprus, and Turkey, as well as the Mediterranean Sea and a portion of Saudi Arabia.

More than 50 high-resolution photos taken by AeroCube-4 are available at this link. Mouse over a photo to read the caption.

MIT Students Tour Aerospace Facilities

by **Gabriel A Spera**
January 18, 2019

A group of 50 undergraduate students from Massachusetts Institute of Technology (MIT) visited Aerospace on Friday, Jan. 18. President and CEO Steve Isakowitz welcomed the students, reminiscing about his own experience at MIT as an undergrad and grad student in the early 1980s. Isakowitz talked about the importance of establishing social networks, noting that MIT alums are well represented in the space industry. Randy Villahermosa, executive director of Innovation, provided a general corporate overview while highlighting the Aerospace-MIT Space Debris Capture challenge, which started when new chief technology officer Dr. David Miller was on the MIT faculty. Miller also accompanied the students on the tour.

Steve Isakowitz welcomes students from his alma mater, MIT, on a tour of the Aerospace facilities. (Photo: Elisa Haber)

The students were treated to a demonstration of the STARS Mission Operations Center led by Randy Kendall, vice president of Launch Program Operations. Kendall described the recent changes in the launch industry, which has seen a proliferation of new rockets and a remarkable increase in launch cadence. To highlight how far the industry has come, Kendall showed a video of a Falcon Heavy returning to ground, noting “When I started, we didn’t have real-time video.” The presentation ended with a peek at the proposed next-generation STARS lab, which will be redesigned to promote better collaboration and make use of augmented reality, machine learning, and artificial intelligence.

Jackie Tardif traces the evolution of the innovative AeroCube satellites. (Photo: Elisa Haber)

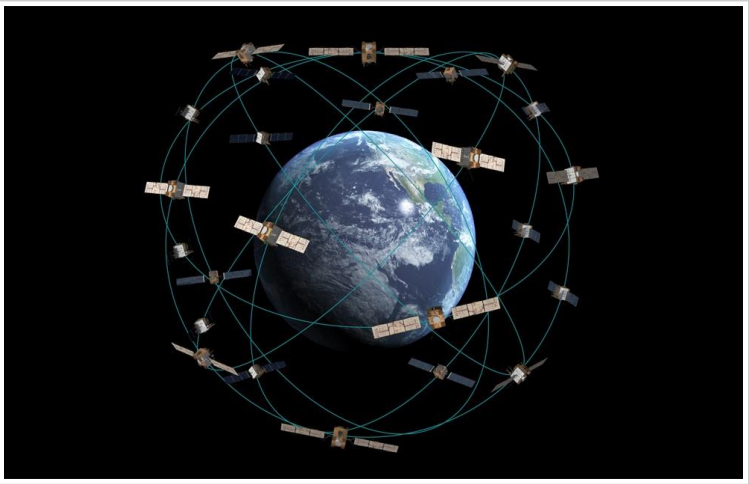
The day also included a tour of the Physical Sciences Laboratories. Gary Stupian of the Electronics and Photonics Laboratory described the application of x-ray computed tomography to investigate microelectronic components. Jackie Tardif of Smallsat Design and Manufacturing described the evolution of the AeroCube satellites, which have performed important technology demonstrations while validating the feasibility of commercial parts for select applications (e.g., repurposing the motor in a dentist’s drill for a miniature reaction wheel).

Steve Isakowitz fields questions from MIT undergrads. (Photo: Elisa Haber)

The tour wrapped up with lunch in the Exploration, Prototyping, and Innovation Center (EPIC), where the students learned about some of the more forward-thinking projects underway. Highlights included the Solar Gravity Lens mission, the Synapse visual interface for future space operators, additively manufactured rocket fuel, and a "Fantastic Voyage" tour through an AeroCube using virtual reality. Isakowitz returned to field a few final questions before officially concluding the event.

Can Satellites Change Their Orbits to Address Changing Goals?

by **Gabriel A Spera**
January 17, 2019



Satellites are launched into predetermined orbits based on specific mission requirements. Once they reach their intended orbit, they tend to stay put, more or less, until the time comes to move them to a disposal orbit. Although this paradigm worked well for many decades, it doesn't reflect the new realities of space. Technology is advancing, space systems are proliferating, and threats are increasing, all at an unprecedented pace. Given this dynamic environment, mission planners and operators would benefit from greater flexibility in managing the orbits of active constellations.

An interdisciplinary team of researchers at The Aerospace Corporation and the Massachusetts Institute of Technology (MIT) are working together to determine how—and under what circumstances—a program might modify the orbits of operational satellites. Their work could give government programs another tool in outpacing the threat to spacebased capabilities.

"Generally, satellites are launched with a specific mission objective," explained Dr. Antonella Albuja of the Astrodynamics Department. "This means that the satellites can address the needs that exist at that point in time, but may not easily be able to address emerging needs." On the other hand, a reconfigurable constellation—or ReCon—can adapt its orbits based on evolving mission needs.

Click here to read entire story.

Crystal City Employees Tour New Development and Visualization Center

January 16, 2019

Last week, employees at the Aerospace Crystal City location received a tour of the Aerospace Development and Visualization Center, or ADVC. Members of the Aerospace Civil Systems Group provided a capability overview and demos of all that the year-old venue has to offer.

With three large backlit flat panels (including one touchscreen), the facility provides an excellent environment for presentation of visualizations, videos, and dynamic modeling/simulation. The lab also has 3D headgear (Oculus glasses), along with high-end processing capability and access to cloud computing.

The ADVC has been used to support several STEM events for middle and high school student and is an ideal space to host internal Aerospace or customer meetings in Crystal City.

For more information on ADVC capabilities, or to book the facility, please reach out to Patrick Bauer or Julie Reiss in the Crystal City office.

Crystal City employees take in the features of the Aerospace Demonstration and Visualization Center.(Photo: Alison Bauerlein)

From left, Darrell Reynard, Steve Isakowitz, and Charles Gustafson prepare to cut the red ribbon. (Photo: Elisa Haber)

D8 Ribbon Cutting Shows Off New Lobby

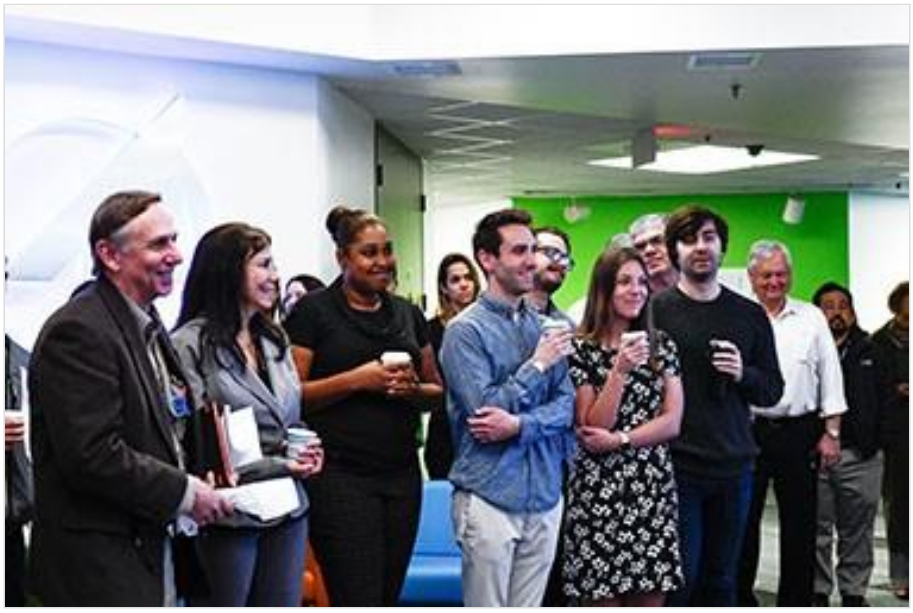
January 15, 2019

The redesigned and updated D8 lobby got its official opening Tuesday morning with a ribbon cutting attended by employees and corporate leaders.

The lobby now features a more open design with new signage, new ceiling, and new colors. The revamp is part of an overall project to make the D8 building more conducive to employee interaction, with social gathering spots, and more attractive to visitors. The building occupants are mostly Aerospace engineers, scientists, and their support staffs.

Cutting the ribbon were Darrell Reynard, Facilities division general manager; Steve Isakowitz, president and CEO, and Charles Gustafson, senior vice president, Engineering and Technology Group.

The new D8 lobby. (Photo: Elisa Haber)



Employees enjoy the lobby-opening ceremony. (Photo: Elisa Haber)

A Super Laser with a Sunny Disposition

by **Gabriel A Spera**
January 11, 2019

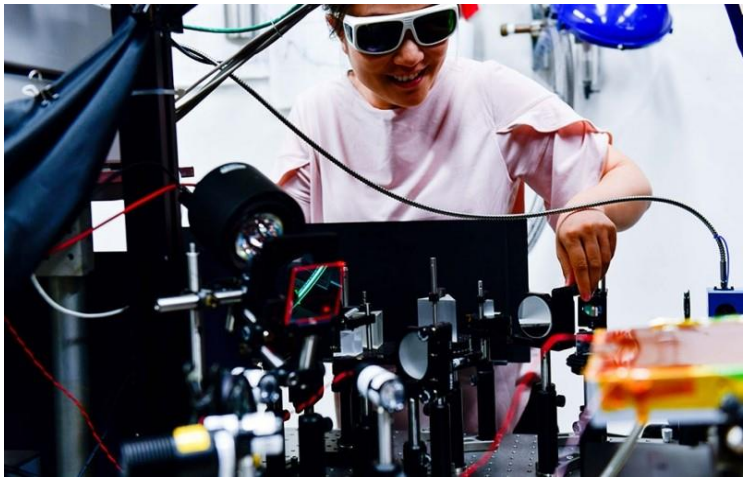
Photovoltaic cells form an essential part of any spacecraft, converting energy from the sun to power onboard electrical systems. Mission designers need to understand the long-term performance of these cells, as that will dictate the available power and influence spacecraft size and weight. Testing these components is a challenging task—largely because of the difficulty of replicating the sun's outer-space spectrum on Earth.

"The sun is an approximately 6000 Kelvin fireball," explained Yao Lao of The Aerospace Corporation's Energy Technology

Department. Reproducing the full breadth and intensity of the sun's solar spectrum is obviously beyond the capabilities of any testing laboratory. Nonetheless, Lao said, "it's critical in testing space photovoltaic cells to match the solar spectrum." Efforts to recreate the sun's spectrum typically involve the use of solar simulators, xenon-arc lamps, or an assembly of different colored LEDs, most of which are calibrated using standards obtained by sending photovoltaic cells high into the atmosphere on balloons.

None of these methods provides the desired fidelity for modeling the long-term effects of operation beyond Earth's atmosphere. However, Lao and her team are applying an innovative new technology—a supercontinuum laser—that could present a major step forward.

Read more about how Lao and her team are developing a supercontinuum laser to model the long-term effects of operation beyond Earth's atmosphere.



Yao Lao tests the supercontinuum laser (Photo: Elisa Haber)

Red Ribbon at Greenbelt

by **Lindsay Chaney**
January 10, 2019

On a windy morning in Maryland, corporate leaders cut the ribbon on Aerospace's new office in Greenbelt, just across the road from NASA's Goddard Space Flight Center.

Ed Swallow, Steve Isakowitz, and Wayne Goodman offered remarks touching on Aerospace's growing presence across the nation, as well as the important work that Aerospace does across all major sectors of space at the ceremony on Thursday, Jan. 10. Floyd Holt, the deputy chief executive of Prince George's County, spoke briefly, welcoming Aerospace to the county and explaining that the county hopes to become an aerospace hub for the region. Holt then joined Isakowitz, Greenbelt Mayor Emmett Jordan, and David Iannucci, the president and CEO of Prince George's County's Economic Development Corporation, to cut the ribbon and officially open the new Aerospace office.

In all, more than 70 people showed up to celebrate the ribbon cutting, including several Greenbelt city leaders, representatives from the county economic development corporation, and a representative from the state of Maryland.

Steve Isakowitz, left, is joined at the Greenbelt ribbon-cutting ceremony by civic leaders, left to right, Floyd Holt, David Iannucci, and Emmett Jordan. (Photo: Alison Bauerlein)

Checking Out the High Rollers

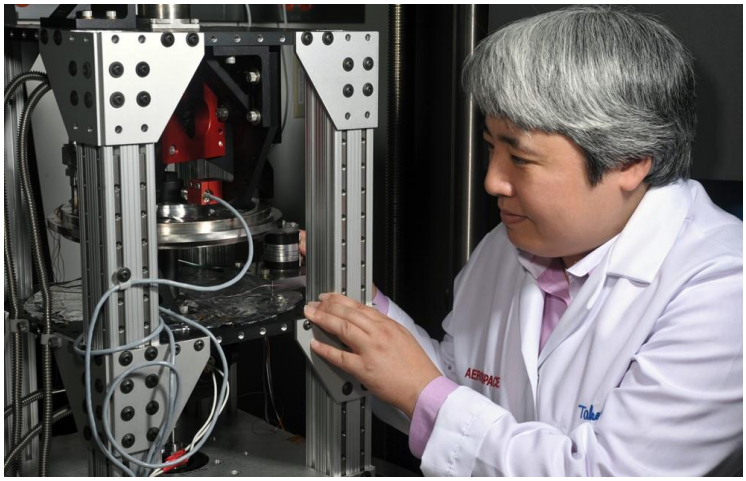
by **Gabriel A Spera**
January 02, 2019

Rotating mechanisms play a critical role on many spacecraft, assisting core functions such as attitude control and sensor pointing. At the heart of these complex devices are simple ball bearings, which must function smoothly and reliably—sometimes continuously, sometimes intermittently. These bearings—just like those in terrestrial applications—require a lubricant to reduce friction and optimize performance. However, bearings and their lubricants behave differently in space. That makes it difficult to determine just how much

lubricant is needed—which is important, because maintaining proper operation of these components can have a direct impact on mission life. Moreover, operators generally can't reapply lubricants to a spacecraft in orbit.

As explained by Dr. Peter Frantz of The Aerospace Corporation's Surface Science and Engineering Department, "With too little lubricant, space components will become depleted before meeting their required lifetime, resulting in premature wear and elevated drag torque due to dry sliding friction. With too much lubricant, components may suffer from high viscous drag, and precision instrumentation can have unacceptable torque noise."

Frantz was part of an interdisciplinary team of Aerospace researchers who applied their collective expertise in space mechanisms and surface science to help system designers better predict the effect of lubrication on ball bearings. The team constructed a specialized testing device and used it to evaluate the performance of bearings in a simulated space environment. Click here to read complete story.



Dr. Yoshimi Takeuchi loads a set of bearings into the testing apparatus. (Photo: Elisa Haber)

January 2019 Obituaries

by **Christine T Kato**
January 02, 2019

Sincere sympathy is extended to the families of:

Edgar Brisson, member of technical staff, hired June 12, 1990, retired Sept. 1, 1995, died Nov. 20, 2018
Norman Goyette, member of technical staff, hired March 3, 1997, died Dec. 7, 2018
William Junge, member of administrative staff, hired Jan. 6, 1986, retired June 1, 2005, died Dec. 2, 2018
Evelyn Ramirez, office of technical support, hired Nov. 30, 1981, died Dec. 28, 2018
Lawrence Raphael, member of technical staff, hired March 20, 1969, retired May 1, 1989, died Oct. 21, 2018
Edward Skomal, member of administrative staff, hired July 1, 1963, retired Aug. 1, 1986, died Dec. 8, 2018 **Elsie Walker**, office of technical support, hired June 23, 1975, retired Oct. 1, 1996, died Nov. 12, 2018

To notify Aerospace of a death and have it included in the Orbiter, please contact People Operations at (310) 336-5107.

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