

## Aerospace Team Tests Solar Technology at Edge of Space

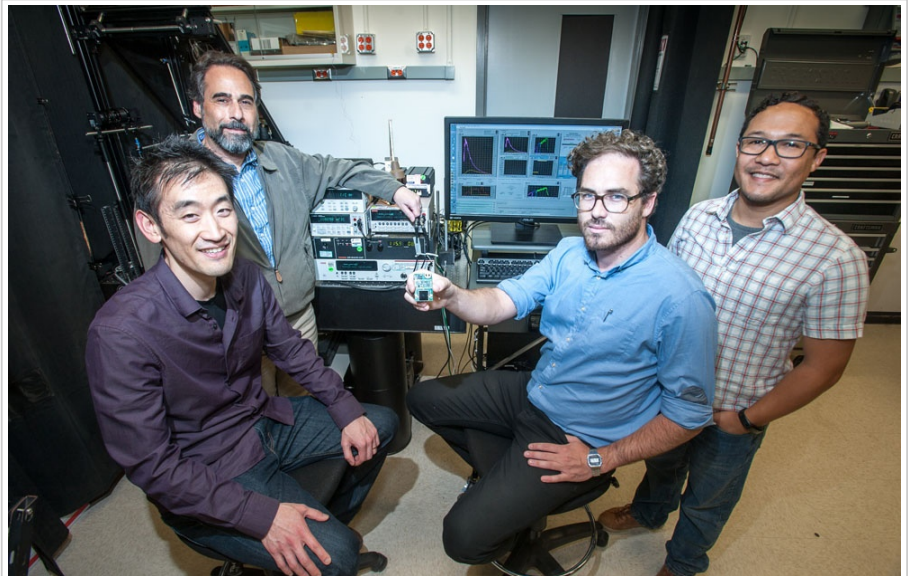
by Kimberly Locke

August 17, 2017

Solar cell testing being led by the Aerospace team of Dr. Justin Lee, Colin Mann, John Nocerino, and Dr. Don Walker, all of the Energy Technology Department, Engineering and Technology Group, represents advancements in the field that are not only innovative, they are also shaping the future.

The four are holders of a solar cell measurement patent and are testing their newly developed technology under a one-year NASA program, which requested demonstration of space technology payloads. "We're taking technology that has been lab tested and testing that same technology in the real space environment," says Lee, who serves as principal investigator for this project.

The Aerospace project calls for the demonstration of an automated solar cell calibration platform, using a device attached to a high-altitude balloon to capture the solar spectrum and characterize the performance of the solar cells at a high altitude up to 22 miles.



*Holding the credit-card-sized Aerospace device known as the Intelligent Solar Cell Carrier, or ISC<sup>2</sup> for short, is Colin Mann, one of four ISC<sup>2</sup> patent holders. The other three patent holders are, from left, Dr. Justin Lee, John Nocerino, and Dr. Don Walker. (Photo: Eric Hamburg)*

The effort is being conducted under NASA's Flight Opportunities program, which chooses promising space technologies to test through relatively low-cost ways that simulate or just reach the edge of space using such vehicles as high-altitude balloon flights.

Aerospace's effort, "Rapid Calibration of Space Solar Cells in Suborbital Environments," involves multi-junction solar cells, which are made up of multiple, monolithic subcells connected in series. The concept is to be able to fly a full multi-junction solar cell accompanied by separate individual sub-cells attached to a test platform that is carried by a high-altitude balloon to the edge of space, or about 120,000 feet up, and pointed to the sun where their performance is measured.

Following the measurements, the balloon flight is terminated and a parachute safely carries the test platform back to Earth's surface. The devices are then retrieved and returned to the lab for follow-up measurement and data analysis.

The Aerospace team's invention, which is currently going through the patent application process, is a compact, credit-card-sized device called the Intelligent Solar Cell Carrier or ISC<sup>2</sup>. This device was created and developed under the Aerospace Technical Investment Program, which is managed by the iLAB Office.

ISC<sup>2</sup> revolutionizes the world of solar cell performance testing in space by eliminating the need for large solar cell calibration platforms that either require a balloon the size of a football field or high-altitude planes such as the NASA Learjet or repurposed U-2 planes, as is the current practice. Large, bulky test platforms are needed to support the size and weight of the test equipment typically used to measure the performance of solar cells. By reducing both the size and weight of the test equipment, the team can use a smaller, cheaper high-altitude balloon that can be flown at any time.

"We've condensed a whole lot of functionality such as electric current, voltage, and temperature measurement instrumentation into one circuit board," explains Lee. The team has also added other functionality such as the ability to integrate with data storage, sun angle sensors, altitude sensors, as well as an easily integrated connection and protocol to allow for it to communicate with other



*Solar cells undergo testing inside a thermal-vacuum chamber while a light shines through. Chamber conditions simulate a space-like vacuum where the solar cells are cooled to a temperature of minus 60 degrees Celsius. (Photo: Justin Lee)*

payloads, all in one package. "This miniaturization translates into reduced cost to fly and opens up flight test opportunities using a variety of vehicles," he adds.

Lee explains that such measurements will aid in calibrating the solar simulator used to test the performance of solar cells in the lab. The simulator is not 100 percent accurate when comparing it to sunlight in space. Reference solar cells need to be flown and measured as close to space as possible and then retrieved so that they can be used to adjust the solar simulator. Currently, however, high-altitude testing involving Learjets or repurposed U-2 spy planes doesn't allow for measurements above the 70,000-foot level.

Why is getting above this level so important? As Lee explains, "accurate measurements require us to test above the ozone layer because in space, where these solar cells will be used, there's no ozone layer. If we want to obtain accurate performance data that is critical for designing the solar arrays powering satellite missions, we need to be testing those solar cells near or in space and be capable of performing accurate simulations of space sunlight conditions in the lab."

Although alternative solar simulator calibration methods are currently in development, space is still where a solar cell's true performance data can be collected and therefore, relied upon.

Balloon solar cell calibration testing was performed annually by Jet Propulsion Laboratory but is now coordinated by an international organization and occurs on an unpredictable schedule at high cost, Lee says. There was a recent effort to revive stateside balloon flights through the Near-Space Characterization of Advanced Photovoltaics Program (NSCAP) and although some instrumentation was built under the NSCAP Program, routine balloon flights did not resume.

In the past few years, Aerospace has continued to investigate methods to reduce the cost and increase the frequency of flight opportunities to support accurate measurements needed for rapid development of solar cell technology.

"We would like to show that there is a rapid and sustainable method for gathering accurate solar cell measurements needed to support future satellite missions," he says. "Manufacturers are continuously producing solar cells using different recipes and each cell type reacts differently to lab-simulated sunlight. It is critical we have low-cost, frequent access to real space sunlight to ensure we can accurately benchmark how each solar cell performs. Frequent solar cell tests on high-altitude balloons are an ideal way to get us accurate numbers," says Lee.

The Aerospace team's efforts don't stop with this NASA proposal. "Following retrievable high-altitude solar cell balloon flights and comparing the flight data to those measured in the lab, we would like to test the same solar cells in their end-use environment, like on a CubeSat in low-Earth orbit," he explains. "We can show that the measurements obtained by each of our testing capabilities are consistent in accuracy."

The team's solar cell testing capabilities are relevant for a growing number of applications, whether they are designed to operate within Earth's atmosphere or in space.

"No one is setting the standards for agile field testing and lab measurement of solar cells, but we're looking to fill that role in the near future," adds Lee.

## Aerospace Team Enters Artificial Intelligence Competition

by Gail Kellner  
August 23, 2017

Aerospace's Dr. Terence Yeoh and Dr. Nehal Desai are competing in a three-year cognitive computing challenge that promises to accelerate the understanding and adoption of powerful artificial intelligence (AI) technologies.

The IBM Watson AI XPRIZE competition aspires to show how AI and humans can collaborate to create advanced applications to benefit humanity. In fact, entrants are encouraged to push the boundaries of human potential by focusing on problems that are believed to be unsolvable.

The creators of the competition believe that the field of artificial intelligence will likely be this generation's greatest achievement, similar to the Internet and personal computing.

Yeoh and Desai are taking on the grand challenge of designing an AI that can dream.

"At Aerospace, we have always applied innovation for the good of the nation, and we thought this was a wonderful opportunity to apply innovation – the DNA of our company – to something that would benefit humanity," Yeoh said.

The teammates are leading this effort through SeedTECH, an after-hours community of interest group that brings volunteer Aerospace scientists and engineers together to develop technology that is aligned with the corporation's interests.

How would their entry push the boundaries of human potential?

The team claims that AI to date is used for assistance, and they are looking to create AI that is more of a colleague to bounce ideas off of or to come up with new ideas.

"The key thing here is to open up the aperture and to be able to look for solutions that are beneficial for everyone," Yeoh said. "Our challenge is to derive an algorithm that is creative, rather than reductionist, by showing increasingly new associations that are resilient to overtraining."

"Today's AI systems are being applied for the purposes of efficiency, but we believe the 'why of AI' should be altruism – to design systems that benefit the greater good of all," Desai said.

He explained that dreaming plays an important role in memory consolidation within the human brain. The ability to create, imagine, and daydream, he said, is linked in some way, for example, to the ability of a child to look at only one or two images of a cat, and through this means, instantly recognize all cats.

"In contrast, artificial neural network-based systems require tens of thousands of images to recognize a cat with high certainty, but can be vulnerable to overtraining and misclassifications," Desai said. "By deriving a new artificial intelligence system from the ground up that is creative in the learning process rather than reductionist, this system provides solutions that will enable higher-order operations that are not achievable with the current reductionist approaches."

The team embodies the "fail successful" philosophy of the SeedTECH COI they lead, as they pave the way for future teams to compete in similar competitions.

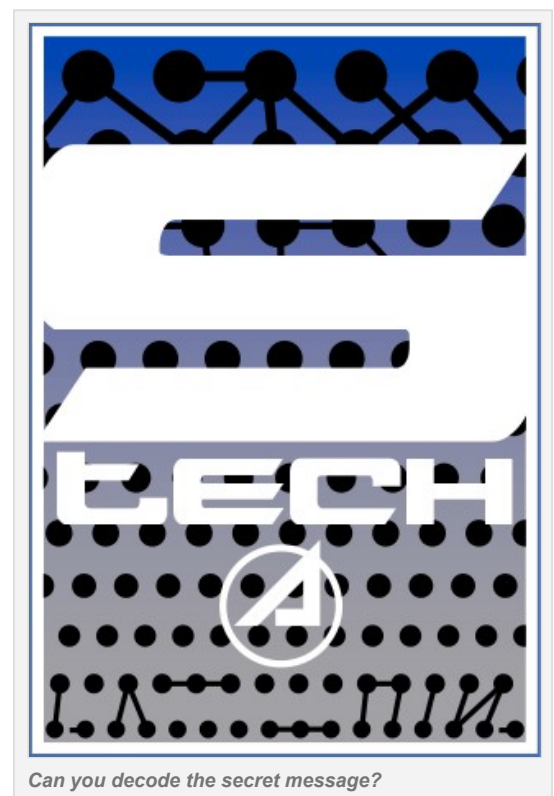
"Aerospace has such a supportive environment – we feel like we are in a startup incubator," Yeoh said. "Where else would you have legal, insurance, and media divisions to help with running the team, enabling us to just focus on the technology development?" he said.

The team is preparing to submit round one results on Sept. 1. There are two more rounds of competition after the first round this year and the grand prize international competition will take place at the 2020 TED Talks with a prize of \$3 million.

NOTE: A secret message is embedded in the SeedTECH logo. If you can decode it, submit the message and how you decoded to [orbiter@aero.org](mailto:orbiter@aero.org). The first five people to submit the correct answer and a brief explanation by 5 p.m. PT, 8 p.m. ET, on Monday, Aug. 28, will receive a ceramic Aerospace-branded water bottle. The answer and any winners will be noted here in an "Update" later next week.



*Dr. Terence Yeoh and Dr. Nehal Desai are taking on the challenge of developing an AI that can dream. (Photo: Eric Hamburg)*





## UPDATE, Aug. 29:

The results are in and it was quite a surprise, at least to some of the Orbiter editors, who had wondered among themselves whether anyone would be able to decode the secret message embedded in the SeedTECH logo. In fact, by the contest deadline on Monday, 10 employees had submitted the correct answer.

The message is “Aerospace” and it is written in Morse code, with the bottom line representing dots and the second line up representing dashes. The vertical lines connect groups of dots and dashes that form letters.

The first person to turn in the correct answer was Dr. Sean Stuart, a member of the technical staff in the Electronic Materials and Devices section of the Electronics and Photonics laboratory.

Stuart, who has been with Aerospace for two years, explained that he looked at the logo and noticed the only part that was not symmetrical was the bottom two lines, so he figured that’s where the message was contained. With two rows, he thought it was some kind of binary code or Morse code and took a guess that an “A” was involved. After finding that “A” in Morse code is dot-dash, he was on his way to deciphering the word “aerospace.”

As specified in the contest instructions, for his accomplishment Stuart has received a handsome Aerospace ceramic water bottle. As a bonus, he, as well as the first five respondents with the correct answer, also received or will receive an Aerospace flashlight and an Aerospace keyring with a changing colored light.

The second through fifth respondents with the correct answer were: Alon Krauthammer, Benjamin Davidson, Michael Graves, and John Scarpulla. Scarpulla, an Aerospace Fellow, commented that he figured out the code while on a teleconference.

Although not the correct answer, a creative and well-explained answer came from Fred Ovia, who concluded, based on analyzing a mirror-image of the logo, that the answer was Ninth European Conference on Artificial Intelligence, an answer that fits perfectly with the topic of the SeedTECH group that is the subject of this article. Ovia will receive an honorable mention prize — a black-cover package of sticky notes sporting an Aerospace logo and map of the world.

Congratulations to the other employees who submitted correct answers and thanks to everyone who took the time to submit an answer, right or wrong.



*Dr. Sean Stuart, the first person to submit the correct answer to the SeedTECH code, unboxes his Aerospace water bottle. (Photo: Heather Golden)*

# Summer Interns Perform Concept Design Center Planetary Defense Study

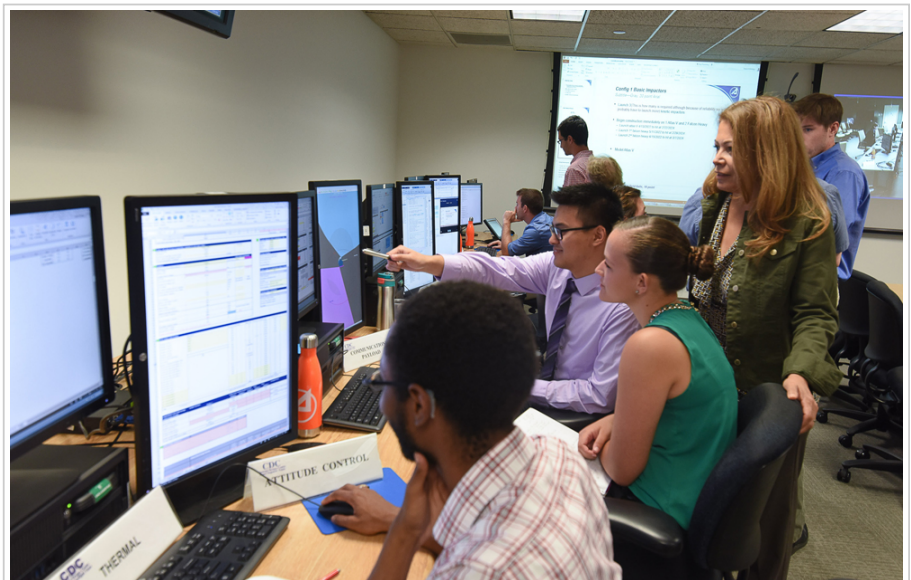
August 01, 2017

Ground- and space-based detections have reported more than 16,000 near-Earth objects (NEOs) within the inner solar system, the portion of the solar system between the sun and Mars' orbit; approximately 9,000 of these have a diameter greater than 100 meters. Although the probability of a major impact with Earth is very small, events like the unexpected 2013 explosion of a 17 to 20-meter NEO over the city of Chelyabinsk, Russia, and the 1908 40-meter asteroid that exploded over Siberia emphasize the need to develop NEO mitigation systems.

This summer, a multidisciplinary team of interns from three of The Aerospace Corporation's locations collaborated to create a feasible design to deflect asteroids that could threaten the Earth. The interns used a hypothetical impact scenario from the 2017 Planetary Defense Conference to design a robust system to deflect an asteroid, with a diameter anywhere between 100 to 250 meters that would collide with Earth in 10 years. The study was conducted in The Aerospace Corporation's Concept Design Center (CDC).

The CDC is an engineering capability for rapid conceptual design of space and ground systems. The CDC employs a concurrent engineering process in which the team creates multiple concept designs and analyses using a network of linked computational design tools. This process allows the team to rapidly explore a wide range of options and then compare the most suitable design solutions.

The Targeted Asteroid Guidance (TAG) intern team developed analysis and final design options using the [NEO Deflection App](#), a web-based interactive tool for planning deflection of earthbound asteroids. Dr. Nahum Melamed, project leader at The Aerospace Corporation, leads the joint Jet Propulsion Laboratory and Aerospace NEO Deflection App development effort. Melamed supports planetary defense conferences and planetary defense exercises, organizing committees where the app is utilized.



*Interns and advisers work in the Concept Design Center on asteroid-deflection plans.  
(Photo: Elisa Haber)*

Using the app, the intern team analyzed key parameters that influenced mission success, including launch vehicles, deflection payloads, transfer orbits, and NEO velocity sensitivities. The team also implemented additional tools for high-quality modeling and design—the Next Generation Concurrent Engineering Methodology and the Portfolio Decision Support Tool. The intern team divided into subsystems/specialties, such as model-based systems engineering, reliability, and statistics, and analyzed major components of various candidate system designs. Design configurations ranged from impacting directly with the asteroid to detonating a nuclear payload near the asteroid. The team also had a “forward engineering” division that trended technology forward to examine how much a mission like this would change 20 years from now.

On Aug. 2 the TAG team is scheduled to present strategies and configurations from each subsystem for the prototypical planetary defense system, as well as technical findings and lessons learned. Briefings to be held in the CDC include vehicle design, launch strategy, operational concepts, high-level requirements, and communications. The briefing also addresses potential impacts to industry launch schedules as well as the associated civil and commercial costs.

# Aerospace Interns Launch Into the Stratosphere with Project GHe

August 21, 2017

Aerospace recently launched two high-altitude balloons in the Mojave Desert to test the suitability of commercially available humidity, temperature, and pressure sensors for weather measurements in the upper atmosphere.

Project GHe (gaseous helium), led by iLab interns Eddie Esquivel and Payton Boliek, was a success, with the balloon flights reaching altitudes of 81,073 and 109,106 ft. respectively. The team launched the balloons in the early hours of the morning and then pursued the recovery of the payloads close to 90 miles away from the launch point.

Aerospace has a long history of studying the interface between the atmosphere and space. Knowledge of this interface is critical to understanding satellite drag, radio frequency signal propagation, and numerous other space system performance parameters. Data collected by these in situ sensors will be compared with the capabilities of current remote sensing systems for this type of weather information in the upper atmosphere.

Project GHe went from concept to design and finally launch in 10 weeks. The team also developed a collaborative sensing experiment to collect images of illuminated targets near the launch point.



*The team launches the balloon in the Mojave Desert. (Photo: The Aerospace Corporation)*

## Awards and Recognitions, August 2017

by Gail Kellner

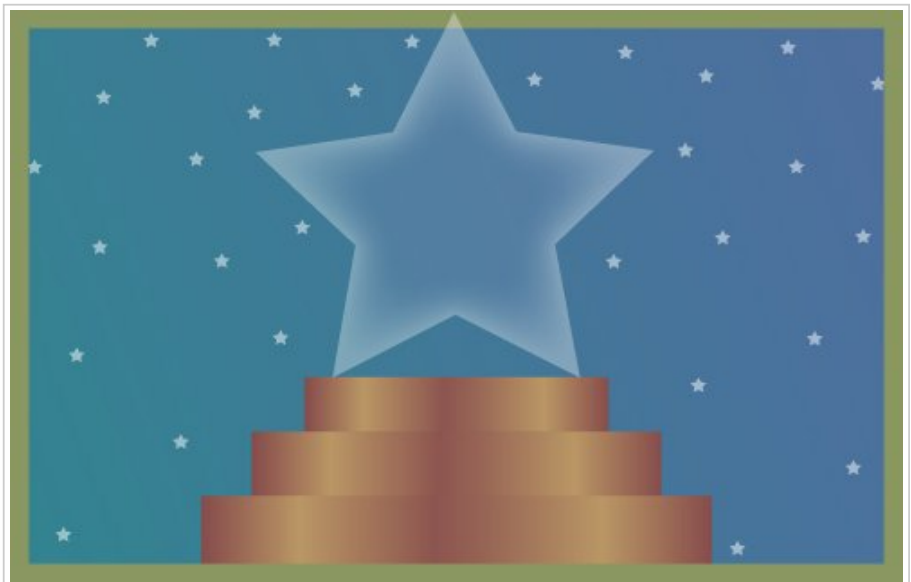
August 28, 2017

**Aerospace employees frequently earn recognition for their professional accomplishments. This Orbiter feature acknowledges 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), or contact Gail Kellner at [gail.d.kellner@aero.org](mailto:gail.d.kellner@aero.org).**

### Dr. David Bearden

Dr. David Bearden, general manager, NASA and Civil Space Division, has been elected a corresponding member for Section 2 – Engineering Sciences of the International Academy of Astronautics (IAA).

The IAA is a non-governmental organization of experts committed to expanding the frontiers of space. The organization works toward promoting the development of astronautics for peaceful purposes, recognizing individuals who have distinguished themselves





in a related branch of science or technology, and providing a program through which members may contribute to international endeavors for the advancement of aerospace science.

Bearden will be recognized at the IAA meeting on Sept. 24 in Adelaide, Australia.

### **Ramesh Rangachar**

Ramesh Rangachar, senior project engineer, NOAA Programs Directorate, has received a certificate of appreciation for his outstanding support as a member of the Integrated Project Team for the National Environmental Satellite Data and Information Services (NESDIS) Mission Science Network (MSN) Infrastructure Design.

The certificate reads that Rangachar “successfully implemented strategies, estimated costs to build and operate the network, and developed notional concept of operations” and “collaborated across NESDIS to provide high-level documents to execute the building and implementation of the MSN which supports mission functions for five federal Information Security Management Act designs.”

### **Danielle Sherrod**

Danielle Sherrod, senior attorney, Office of the General Counsel and Secretary, has been appointed to the Smithsonian Institution’s Los Angeles Regional Host Committee.

As a member of the committee, Sherrod and other members play an important role in advancing the Smithsonian’s mission outside of Washington, D.C. and helping the Smithsonian reach people everywhere by guiding events and raising the Smithsonian’s visibility in and around the Los Angeles area.

## **2017 Women of the Year Award Winners Lead the Way**

by **Wendy O'Dea**  
August 16, 2017

Aerospace kicked off its celebration of Women’s Week on Monday, Aug. 14, by awarding four women with the Women of the Year (WOTY) award, a tradition at the company since 1975.

A number of events are planned to celebrate Women’s Week including a speed mentoring tea in El Segundo on Wednesday, Chantilly speed mentoring on Thursday, and a speaker event with retired Air Force Lt. Gen. Susan Helms being held on Tuesday, Aug. 22. There is also an adult clothing drive all week with donation bins in El Segundo, Chantilly, and Colorado Springs.

This year’s Women’s Week theme, Lead the Way, was chosen to reflect what WOTY winners and other women at Aerospace are doing: serving as positive role models, taking initiative, and doing what’s right in challenging circumstances.

Dr. Anita Polite-Wilson and Jennifer Tanzillo served as co-chairs of the 2017 selection committee. Polite-Wilson, herself a winner of the 2014 WOTY award, spoke to those gathered in El Segundo and those viewing via Skype, about the attributes they consider when selecting winners.

“We faced a challenging task selecting finalists from an outstanding list of nominees,” Polite-Wilson said. The five evaluation areas taken into consideration are job performance; involvement in company activities, clubs, and courses; community involvement; professional, career and academic achievements; and leadership and mentoring roles.

After comments and congratulations from President and CEO Steve Isakowitz, the 2017 winner were presented. A celebratory luncheon for current and previous WOTY winners was also held on Tuesday.

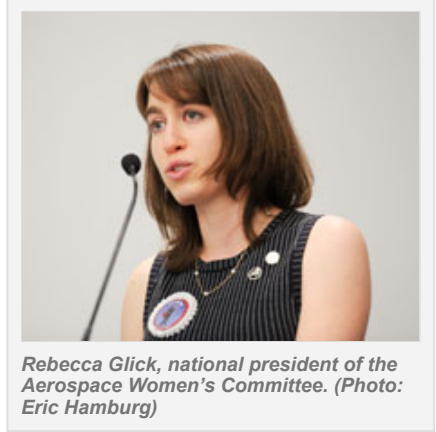


*2017 Women of the Year winners pose with Aerospace President and CEO Steve Isakowitz. (Photo: Eric Hamburg)*

## 2017 WOTY Winners

### Kristine Ferrone

Kristine Ferrone has found great value in education, earning multiple degrees and serving in a variety of roles throughout her career and in her community. After earning a Bachelor of Science degree in physics and astrophysics from Carnegie Mellon University, she went on to earn a Master of Business Administration, Master of Science in sports medicine, and Master of Science in space architecture. She is currently working toward a Ph.D. in medical physics.



*Rebecca Glick, national president of the Aerospace Women's Committee. (Photo: Eric Hamburg)*



*Kristine Ferrone*

Ferrone began her career as a physics associate in particle accelerator operations at Brookhaven National Laboratory in New York. From 2007 to 2011 she worked as a flight controller for the International Space Station and space shuttle programs at NASA Johnson Space Center. She also served as a lead flight planner for the STS-131 and STS-134 space shuttle missions to the ISS. Additionally, Ferrone was selected as the mission scientist for The Mars Society's analog Mars mission at the Flashline Mars Arctic Research Station in Devon Island, Canada in 2009.

Joining Aerospace in 2011 as a senior MTS in the Vehicle Concepts Department in Chantilly, Ferrone went on to serve as project leader for the Civil and Commercial Business Development team before moving back to ETG as the principal investigator for an IR&D project to expand the Concept Design Center's tools to study human spaceflight. She has served as an officer for the Aerospace Asian Pacific American Association and the Aerospace Women's Committee. In her community, Ferrone serves as a STEM speaker and is also a firefighter and an air crew member of the United States Coast Guard Auxiliary. She has a private pilot license and has trained as a commercial astronaut with the nonprofit organization she co-founded, Astronauts for Hire.

### Jeanna Harkenrider

Jeanna Harkenrider has been with the Aerospace Corporation for 11 years, having started as a summer intern. With an undergraduate degree in liberal studies and a master's degree in public policy and administration (both from California State University, Long Beach), she began working full time in the business manager's office of the Facilities Division in 2008 and now serves as business manager for Facilities within the Office of the Chief Velocity Officer.

In 2011, Harkenrider was selected as one of five mentees in the corporation's first 5-on-5 Mentoring Initiative, a program established to create an environment that allows employees to navigate paths to connect, learn, and grow. She was also one of 14 employees recently invited to have lunch and talk with the Aerospace board of trustees.

Active at both Aerospace and in her community, Harkenrider participates in the Aerospace Armed Forces Day 5k run, was a member and officer of the Aero-scrappers club, and has been a member of the Manhattan Beach Hometown Fair Board of Directors since 2011. She currently serves as chief financial officer of this organization, a nonprofit run by volunteers who coordinate events (without corporate sponsorships) in the city of Manhattan Beach. She also served on the Manhattan Beach Centennial Committee, a volunteer board that planned events and activities to celebrate the city's centennial anniversary.



*Jeanna Harkenrider*

### Ginni Machamer

Ginni Machamer loves to learn and loves to teach according to her manager, Jennifer Halford, who highlighted Machamer's accomplishments at the WOTY ceremony. Having earned a Bachelor of Science in Business Information Systems while working full time, Machamer has seized a number of opportunities during her career at Aerospace, which started in 2001. She currently works in EIS Planning and Analysis in the Applications Development Department.

Machamer participated in the Stanford Advanced Project Management program and has been the project leader on two recently completed notable projects, AeroReports and the Vaeros Customer Relationship Management (CRM). According to Halford, both of these projects will change the way Aerospace does business. "The appreciation for her work is reflected in the individual and team achievement awards she has received and the high accolades she receives from her management," Halford said.

A supporter of Aerospace's affinity groups, Machamer has served as the national secretary for the Aerospace American Indian Alaskan Native Council and as its national president for the last two years. She will serve as national treasurer for FY17.





*Ginni Machamer*

Machamer, her husband, and her 17-year old son have volunteered at Westminster Elementary School in Venice since 2005, and she was also a top 100 fundraiser for the Multiple Sclerosis/MS Walk five years in a row. An artist who specializes in glass artwork and jewelry, Machamer also volunteers with A Window Between Worlds, which raises funds to empower individuals and communities to use art to treat trauma.

#### **Rachel Morford**

A native of Southern California, Senior Project Engineer Rachel Morford was awarded a trustee scholarship to attend the University of Southern California where she earned both her Bachelor and Master of Science degrees in electrical engineering. She was also honored with the USC Viterbi School of Engineering Woman of the Year Award, was a Viterbi engineering student ambassador, and was a research and teaching assistant. Morford was also an active leader with the USC chapter of the Society of Women Engineers (SWE) and has been involved with several philanthropic organizations.

After an internship with the Central Intelligence Agency and another at the Jet Propulsion Laboratory, Morford joined Aerospace in 2008 and has held a number of positions of increasing responsibilities. She began as MTS in the Launch Directorate in the National Systems Group and supported a national security agency's launch office. In 2014 she transferred to the Systems Integration and Test Office in ETG and joined the Future and International Programs in the MILSATCOM Division two years ago, working closely with international partners. She directly supports the MILSATCOM International Tactical Branch Chief, leading efforts to develop an international agreement with several nations interested in communications in the Arctic.

Morford has been awarded an Aerospace Corporation Team Achievement Award for her role in the development and implementation of a nondestructive inspection technique to exonerate flight hardware and reduce program risk. She also received a corporate "You Hold the Key" award for her contribution to the evaluation of a new launch site ground system, as well as numerous certificates of appreciation from customers.

Continuing her involvement with SWE after her years at USC, Morford became involved in the local Los Angeles section. She has provided strategic direction to ensure section members received professional development and networking opportunities and, in 2013, was recognized by being selected as one of their New Faces in Engineering.



*Rachel Morford*

## **Winners of West Coast Pingpong Matches Play Corporate Officers**

by **Nancy Profera**  
August 07, 2017

An early velocity win and corporate initiative involved the purchase of five pingpong tables for the El Segundo campus, one for Colorado Springs, and two for the Chantilly campus. This was a direct response to staff suggestions. Proving to be good exercise and great fun, the tables have been quite popular, and led to tournaments among employees.

The winners of the El Segundo and Chantilly tournaments were announced last week following the round four finals. The El Segundo winners were Wei Yang, Mark



*Wei Yang, paired with Steve Isakowitz, prepares to serve to doubles team Kevin Bell, left, and Mark Galves. Wei and Isakowitz clinched the win. (Photo: Elisa Haber)*

Galves, and Dr. Jeff Hall; Chantilly winners were Kangyun Jung, Richard Akel, and Taylor Zarnegar.

On Monday, Aug. 7, two of the West Coast winners played a doubles match, paired with two corporate officers. Wei Yang, engineering specialist, Thermostructures, and Mark Galves, electrical/mechanical technical specialist, Communication Electronics Department, played a doubles game with Steve Isakowitz, president and CEO, and Kevin Bell, vice president, Space Program Operations. Yang and Isakowitz played against Galves and Bell.

As one observer noted, the pingpong has been lots of fun and brings people out to meet and mix with one another. "It's a nice break, offers exercise, and camaraderie," said Ali Estakhrian, Core Computing Services.

Also in attendance and playing matches with employees who were up to the challenge on Monday were Dr. Chuck Gustafson, senior vice president, Engineering and Technology Group, Randy Kendall, vice president, Launch Program Operations, Malissia Clinton, senior vice president, general counsel, and secretary, Office of the General Counsel and Secretary, and Ellen Beatty, vice president, CFO, and treasurer.

The winners of the East Coast tournaments will also get their chance to crush — or play — depending on one's take, the corporate officers at an upcoming date.

## Press Release: Todd Nygren Named Corporate Chief Engineer

August 14, 2017



### NEWS RELEASE

**The Aerospace Corporation**  
2310 E. El Segundo Blvd.  
Los Angeles, CA 90245-4691  
(310) 336-5000  
[www.aerospace.org](http://www.aerospace.org)

EL SEGUNDO, Calif. (Aug. 14, 2017) – The Aerospace Corporation (Aerospace) announced today that Todd Nygren has been named corporate chief engineer and general manager of the Corporate Chief Engineer's Office effective immediately. In this role, Nygren will provide leadership to further evolve and advance mission assurance practices and identify opportunities to facilitate, foster, and implement emerging engineering developments and practices, especially as they relate to the national security space enterprise.

"Todd's new leadership role will support the U.S. Air Force's number one space priority, the Space Warfighting Construct (SWC)," said Steve Isakowitz, Aerospace president and CEO. "Todd and his team bring the technical expertise, deep capabilities, and innovative solutions that our customer needs to this new warfighting domain."

The SWC is the U.S. Air Force's vision of combining transformational and warfighting-focused command initiatives to maintain the nation's space superiority in the 21st century.

Nygren joined Aerospace as a summer hire in 1985. He became a member of the technical staff in 1987, supporting mission planning for military missions on the Space Transportation System for the Space Test Program. Throughout his career, Nygren has excelled in a series of leadership positions. Most recently, he was the general manager of the Systems Engineering Division, leading bicoastal work to support customers in space systems architecture and design, acquisition and planning, mission assurance and system analysis, and simulation. Nygren earned a bachelor's degree in mathematics from Bethel College and a master's degree in system architecting and engineering from the University of Southern California.



#### About The Aerospace Corporation

*The Aerospace Corporation is a California nonprofit corporation that operates a federally funded research and development center and has approximately 3,800 employees. It provides guidance and advice to military, civil and commercial customers to ensure the success of complex, technology-based programs. The Aerospace Corporation is headquartered in El Segundo, Calif., with multiple*

locations across the United States. For more information on Aerospace, visit [www.aerospace.org](http://www.aerospace.org). Follow us on Twitter: @AerospaceCorp.

###

Dianna Ramirez  
Media Relations, The Aerospace Corporation  
Office: (310) 336-2030  
[dianna.ramirez@aero.org](mailto:dianna.ramirez@aero.org)

## Press Release: New Chief of Government Relations

August 07, 2017



The Aerospace Corporation  
2310 E. El Segundo Blvd.  
Los Angeles, CA 90245-4691  
(310) 336-5000  
[www.aerospace.org](http://www.aerospace.org)

### NEWS RELEASE

#### The Aerospace Corporation Announces New Chief of Government Relations

EL SEGUNDO, Calif. (Aug. 7, 2017) – [The Aerospace Corporation \(Aerospace\)](http://www.aerospace.org) announced today that the Honorable Frank A. Rose has joined the company as the new chief of government relations. In this role, he will lead the organization's educational efforts to Congress, the executive branch, and state and local government officials. He will also conduct outreach activities for Aerospace's Center for Space Policy and Strategy, which provides objective analysis and comprehensive research to ensure well-informed, technically defensible, and forward-looking space policy.



Frank Rose

"Frank brings a wealth of knowledge in space policy, defense, and international security to Aerospace," said Jamie Morin, vice president at Aerospace and executive director of the Center for Space Policy and Strategy. "He is a trusted expert on space and strategic issues, with deep credibility across the U.S. government and with key stakeholders engaged in space issues."

Prior to joining Aerospace, Rose served as assistant secretary of state and deputy assistant secretary for space and defense policy in the Bureau for Arms Control, Verification and Compliance at the U.S. Department of State. Previously, he was a staff member for the Committee on Armed Services and for the Permanent Select Committee on Intelligence, U.S. House of Representatives. He also served as a foreign affairs officer for the Office of the Assistant Secretary for International Security Policy, U.S. Department of Defense, and a special assistant in the Office of the Assistant Secretary of Defense for Strategy and Threat Reduction. Rose received his bachelor's degree in history from American University in 1994 and a master's degree in war studies from Kings' College, University of London in 1999.

The Center for Space Policy and Strategy is a specialized research branch within The Aerospace Corporation; the corporation provides objective technical analysis for programs of national significance. The Center for Space Policy and Strategy was established in 2000 as a Center of Excellence for civil, commercial and national security space and technology policy; it examines issues at the intersection of technology and policy and provides nonpartisan research for national

decisionmakers.

#### About The Aerospace Corporation

*The Aerospace Corporation is a California nonprofit corporation that operates a federally funded research and development center and has approximately 3,600 employees. It provides guidance and advice to military, civil and commercial customers to ensure the success of complex, technology-based programs. The Aerospace Corporation is headquartered in El Segundo, Calif., with multiple*



locations across the United States. For more information on Aerospace, visit [www.aerospace.org](http://www.aerospace.org). Follow us on Twitter: @AerospaceCorp.

###

Dianna Ramirez  
Media Relations, The Aerospace Corporation  
Office: (310) 336-2030  
[dianna.ramirez@aero.org](mailto:dianna.ramirez@aero.org)

## Press Release: CubeSat Mission With Brazil

August 03, 2017



**The Aerospace Corporation**  
2310 E. El Segundo Blvd.  
Los Angeles, CA 90245-4691  
(310) 336-5000  
[www.aerospace.org](http://www.aerospace.org)

### NEWS RELEASE

#### The Aerospace Corporation Joins in Brazilian/U.S. Upper Atmospheric CubeSat Mission

EL SEGUNDO, Calif. (Aug. 3, 2017) – The Aerospace Corporation (Aerospace) has been selected by NASA to provide a sensor for an international CubeSat mission that will study scintillation in the ionosphere, a phenomena that affects radio signals, disrupting communications and GPS navigation.

NASA's Marshall Space Flight Center is the lead for the Scintillation Prediction Observations Research Task (SPORT), a joint mission by Brazil and the U.S. that is scheduled to be deployed off the International Space Station in 2019 and will operate for one year.

"The SPORT mission leverages our 40-years of technical expertise in designing, building and launching space environment sensors," said Dr. Rebecca Bishop, Aerospace's lead on this project. "For this mission, we will monitor the background conditions pre-scintillation and determine the presence and evolution of scintillation events. Being able to forecast scintillation is the holy grail of our whole field."

Brazil will build and operate the six-unit (6U) CubeSat and maintain the ground observation network of radars, imagers, and scintillation monitors. NASA is coordinating the launch and the CubeSat instruments, which will be provided by Aerospace, NASA, and university partners. Both Brazil and the U.S. will analyze the data and collaborate on individual studies.

Due to a large part of Brazil being located near the magnetic equator, and a feature known as the South Atlantic Anomaly, Brazil experiences more scintillation than many other countries.

According to the National Oceanic and Atmospheric Administration, "Severe scintillation conditions can prevent a GPS receiver from locking on to the signal and can make it impossible to calculate a position. Less severe scintillation conditions can reduce the accuracy and the confidence of positioning results."

Dr. Luis Loures, head of the Aerospace Department at Brazil's Aeronautical Institute of Technology, gave an example of why the study of scintillation is important to Brazil.

"Brazil has a strong and modern agribusiness, which is always trying to increase the productivity of the crops," he said. "One way this can be accomplished is by the use of precision tools [such as embedded GPS receivers] to work the fields. The knowledge of the correct position is mandatory for the automatization of tractors and fieldsprayers, for instance."

Aerospace's contribution to SPORT is the 0.153 kg Compact Total Electron Content Sensor (CTECS), which is a GPS radio occultation (RO) sensor that Aerospace adapted from a commercial receiver by adding special software and a custom antenna.

"Historically, GPS RO sensors are on the order of 5 kg and 20 watts, which is basically the same size and twice the power of a 3U CubeSat," Bishop said. "We were developing this as a low-cost, low-mass, low-power GPS RO sensor for a CubeSat."

The SPORT mission partners are NASA's Marshall and Goddard Space Flight Centers, Brazilian National Institute for Space Research, Technical Aeronautics Institute under the Brazilian Air Force Command Department, The Aerospace Corporation, University of Texas at Dallas, University of Alabama in Huntsville, and Utah State University.

## About The Aerospace Corporation

*The Aerospace Corporation is a California nonprofit corporation that operates a federally funded research and development center and has approximately 3,600 employees. It provides guidance and advice to military, civil and commercial customers to ensure the success of complex, technology-based programs. The Aerospace Corporation is headquartered in El Segundo, Calif., with multiple locations across the United States. For more information on Aerospace, visit [www.aerospace.org](http://www.aerospace.org). Follow us on Twitter: @AerospaceCorp.*

###

Dianna Ramirez  
Media Relations, The Aerospace Corporation  
Office: (310) 336-2030  
[dianna.ramirez@aero.org](mailto:dianna.ramirez@aero.org)

## August 2017 Obituaries

by Michelle Love  
August 01, 2017

*Sincere sympathy is extended to the families of:*

**George Bendis**, member of technical staff, hired March 30, 1980, retired June 1, 2012, died June 11, 2017  
**Albert Coltin**, member of technical staff, hired Feb. 28, 1961, retired April 1, 1979, died June 9, 2017  
**Robert Fasnacht**, member of administrative staff, hired Sept. 18, 1961, retired Nov. 1, 1986, died July 11, 2017  
**Dorothy Jackson**, member of administrative staff, hired Aug. 19, 1974, retired May 1, 1979, died July 10, 2017  
**Delia Kestler**, office of technical staff, hired March 2, 1981, retired May 1, 1996, died May 28, 2017  
**Harold Klein**, member of technical staff, hired Aug. 25, 1974, retired July 1, 1984, died June 10, 2017  
**Emmet McCray**, member of technical staff, hired Sept. 25, 1962, retired Nov. 1, 1991, died July 14, 2017  
**James Ready**, member of administrative staff, hired Jan. 4, 1961, retired July 1, 1996, died March 5, 2017  
**James Teresi**, member of technical staff, hired Aug. 13, 1964, retired Jan. 1, 1990, died June 13, 2017  
**Eugene Todd**, member of technical staff, hired July 16, 1968, retired Sept. 1, 1996, died May 31, 2017

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

These articles are reprinted from the Orbiter, a publication of  
The Aerospace Corporation  
2310 E. El Segundo Blvd.  
El Segundo, CA 90245-4691

310-336-5000  
[www.aerospace.org](http://www.aerospace.org)

Orbiter Staff: [orbiter@aero.org](mailto:orbiter@aero.org)  
Editor: Lindsay Chaney, 310-336-0961, [lindsay.d.chaney@aero.org](mailto:lindsay.d.chaney@aero.org)  
Assistant Editor: Laura Johnson, 310-336-1179, [laura.m.johnson@aero.org](mailto:laura.m.johnson@aero.org)