Orbiter
May 2017

Upper Atmospheric Mission SPORTs an Aerospace Sensor

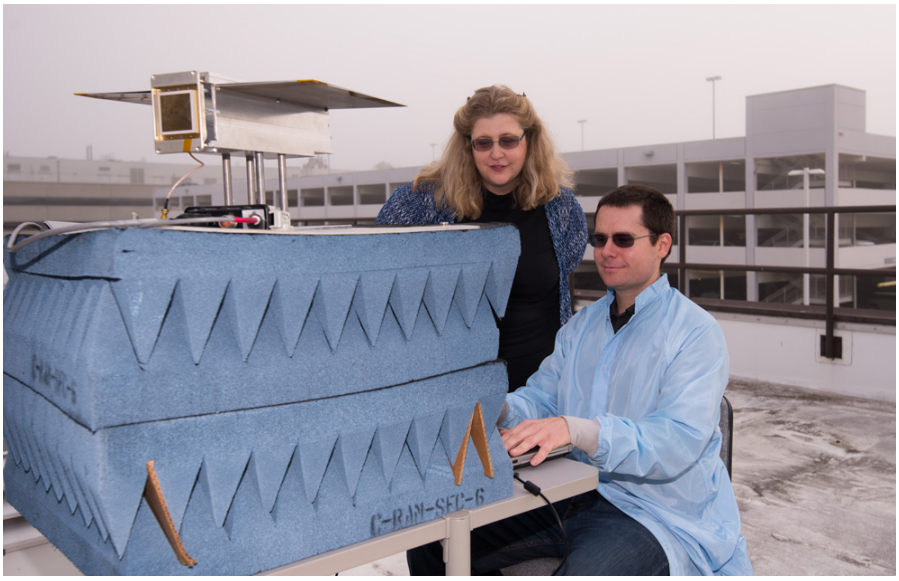
by **Laura Johnson**
May 04, 2017

The U.S. and Brazil are teaming up to study scintillation in the ionosphere, a phenomena that affects radio signals, disrupting communications and GPS navigation.

Aerospace is providing a sensor for this international CubeSat mission, dubbed SPORT, that will be deployed off the International Space Station.

The ionosphere is a portion of Earth's atmosphere where radiation from the sun creates a lot of electrically charged particles called plasma. The density of the plasma varies depending on the season, time of day, and other factors.

Sometimes there are density depletions near the equator known as equatorial plasma bubbles, and rapid changes in the density at the edges of the bubbles are known as scintillation. Radio signals transmitting from satellites to the ground must pass through the ionosphere and may be affected by the scintillation.



Dr. Rebecca Bishop and Steve Bielat test the sensor that Aerospace will contribute to the SPORT CubeSat. (Photo: Eric Hamburg)

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."

Since scintillation can adversely impact everything from GPS signals to communication to over-the-horizon radar, there has been a large amount of research trying to understand what causes scintillation, how to predict its occurrence, and how to mitigate its effects. However, the ability to predict scintillation remains elusive.

SPORT, which stands for Scintillation Prediction Observations Research Task, is an effort to study the formation and evolution of equatorial plasma bubbles which may, in turn, cause scintillation.

"We want to know what are the background conditions pre-scintillation, and can we use that to determine when scintillation will occur?" said Dr. Rebecca Bishop, Aerospace's lead on this project. "That's kind of the holy grail of our whole field."

SPORT Mission Partners

- NASA – Marshall and Goddard 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
- Utah State University

Brazil will build and operate the 6U CubeSat as well as maintain the ground observation network of radars, imagers, and scintillation monitors. On the U.S. side, NASA is coordinating the launch and the instruments that will go on the CubeSat,

including Aerospace's sensor and five other instruments provided by NASA and university partners. Both Brazil and the U.S. will analyze the data and collaborate on individual studies.

"Brazil is very, very interested in scintillation," Bishop said. 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 a lot of other countries.

Aerospace's contribution to SPORT is the Compact Total Electron Content Sensor (CTECS), which is a GPS radio occultation (RO) sensor. It receives the GPS signals and measures how they change as they pass through the ionosphere. From these measurements, the plasma density and a scintillation index can be extracted.

"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."

Aerospace adapted a commercial receiver by adding special software and a custom antenna to create CTECS.

The 0.153 kg sensor will fit nicely on the SPORT CubeSat, and together with the other five instruments, contribute to the valuable data this mission will collect.

Press Release: Planetary Defense Conference in Tokyo

May 15, 2017

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NEWS RELEASE

The Aerospace Corporation leads Asteroid Impact Exercise at IAA in Tokyo

EL SEGUNDO, Calif. (May 15, 2017) – Dr. William Ailor, Aerospace Fellow at The Aerospace Corporation (Aerospace), will lead a realistic asteroid impact threat exercise at the 2017 International Academy of Astronautics (IAA) Planetary Defense Conference in Tokyo, Japan, May 15-19. Aerospace, co-sponsor of this conference, brings together global experts and space agency leaders to discuss asteroid threats, mitigation strategies, and to consider international disaster response plans.

Aerospace's interest began early in 2003 with a challenge given by the U.S. Air Force Space and Missile Systems Center to respond to a hypothetical asteroid threat, and Ailor served on the response team. Shortly after that, Aerospace initiated the current planetary defense conference series and has been a major sponsor for the last six international conferences.

"Astronomers began a serious effort looking for asteroid and comet strikes in the late 1990s," said Ailor. "Since then, observers have discovered more than 600 objects that have a small, but very low probability of hitting Earth this century."

This year's threat exercise was developed by a team of specialists from Aerospace, NASA's Jet Propulsion Laboratory, Sandia National Laboratories, and Lawrence Livermore National Laboratory. Conference attendees will have the opportunity to examine the various options for deflecting a potential threat and make timely decisions as the threat progresses.

Ailor has led three additional exercises that included representatives from NASA, FEMA, and other U.S. government agencies. These events were instrumental in gathering recommendations for reducing the hazard, helping create and shape government policy and actions, and promoting collaboration and coordination among disaster response agencies.

As a representative for the IAA, Ailor has participated in a United Nations-sponsored effort to develop recommendations for how the international community should collaborate on planetary defense. Currently, he serves on the Space Mission Planning Advisory Group (SMPAG), where leaders of national space agencies meet to discuss efforts related to design of planetary defense missions.

Aerospace's New Brand Is Coming Soon

May 23, 2017

Next week, Aerospace will introduce a refreshed look for our brand elements. This will include a more prominent "Circle A" logo and brighter colors that will be included in PowerPoint charts, business cards, and all printed materials produced by the corporation.

Built on a firm foundation of unparalleled mission success, our new brand is designed to help us increase our value and shape the future. Our new branding also helps us support our four strategic imperatives – Shaping the Future, Growth, Innovation, and Velocity.

What makes Aerospace so unique – and so critical to the success of its customers – is its commitment to mission assurance and innovation. Those commitments are unwavering.

We are the FFRDC for space enterprise solutions, and we are also embracing exciting pathways that drive new possibilities, critical solutions, and future opportunities.

Awards and Recognitions, May 2017

by **Gail Kellner**
May 16, 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, or contact Gail Kellner at gail.d.kellner@aero.org.

Dr. Wanda Austin

Past president and CEO Dr. Wanda Austin was honored at the Legacy of Leadership Awards on April 24 at the Omni Los Angeles Hotel.

The Leadership California event celebrates 26 years of "inspiring women to move from success to significance by honoring women who lead the way to better lives through civic, business, technological, and service achievements." The organization is a network of more than 1,600 accomplished women, dedicated to advancing the leadership role of women in impacting business, social issues and public policy.

Austin also received an Alumni Merit Award at the 84th Alumni Gala at the Westin Bonaventure in Los Angeles on April 22 from the University of Southern California (USC). She received her Ph.D from the university in 1988. She has been a member of the USC Board of Trustees since 2010.

Ambassador Barbara Barrett

The Aerospace Corporation's chairman, Ambassador Barbara Barrett, was honored with the Leadership in the Nation's Interest Award in Washington, D.C. on April 19 by the Committee for Economic Development of The Conference Board (CED).

Barrett is a member of CED, and her colleague, Ann McLaughlin Korologos, the former U.S. Secretary of Labor, presented the award to her.

The nonpartisan, business-led public policy organization bestows this recognition "to business executives who lead their companies with the highest integrity and who champion public policies for the common good."

Christopher Clark, Robert Dybdal, and Fei Wang

The team of Christopher Clark, Robert Dybdal, and Fei Wang have been awarded a patent for their invention titled "Circuits and Methods for Reducing Interference That Spectrally Overlaps a Desired Signal Based on Dynamic Gain Control and/or Equalization." The U.S. Patent No. 9,628,122 was issued April 18. This is the 29th patent issued to Dybdal, who holds more patents than any other employee in the history of The Aerospace Corporation.

Aerospace Awards STEM Scholarship to Future Aerospace Engineer

May 04, 2017

Carlos Rivas

The Aerospace Corporation has awarded Carlos Rivas of Verbum Dei High School in Los Angeles the Dr. Wanda M. Austin Science, Technology, Engineering, and Math (STEM) Endowment scholarship. Rivas will receive an annual scholarship of $10,000 for four years with a total value of $40,000. He plans to attend St. John's University in Collegeville, Minnesota to start undergraduate study for physics in the fall.

"Carlos Rivas has aspired to be an aerospace engineer since he was 8 years old, and we're excited to start him on the path that will make his dream come true," said Steve Isakowitz, Aerospace president and CEO. "The Aerospace Corporation is committed to inspiring our industry's next generation of technical geniuses, thought leaders, and game changers. Fulfilling their promise is the reason we invest our time and resources in STEM efforts."

Living in a low-income, single-parent household in the community of Watts in Los Angeles has not been easy for Rivas. Despite these challenges, he discovered a passion for education early on. Taking a second-grade field trip to the Air and Space exhibit at California Science Center, Los Angeles sparked Rivas' interest for astronautics. Throughout middle and high school, he worked on building rocket models and studied advanced math and science courses. His passion for engineering led him to establish the Engineering Club at Verbum Dei High School, where he now serves as the club's president. He often talks about the importance of proving that his circumstances do not define him, but instead empower him to fight to achieve his goals. Rivas will be the first-generation college student in his family.

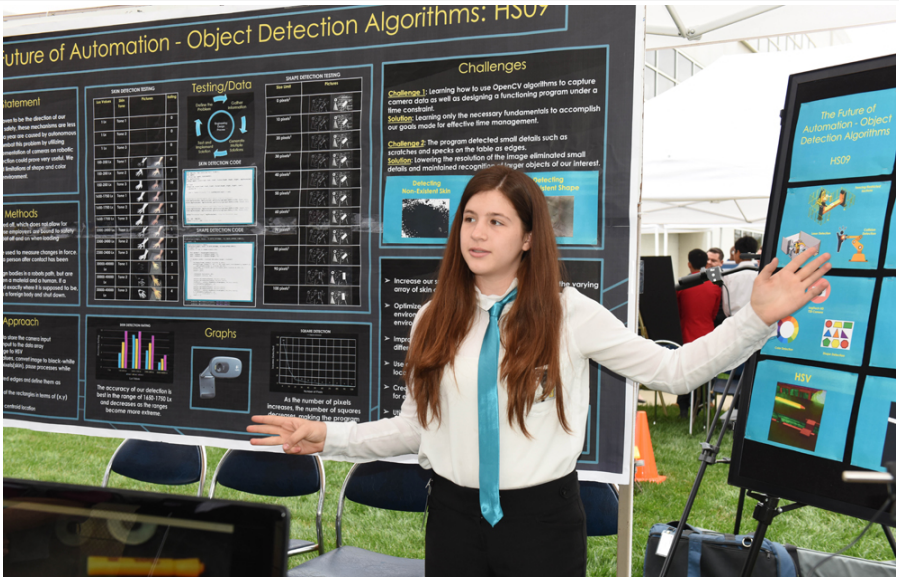
"We are very pleased and excited Carlos Rivas, class of 2017, was awarded the prestigious Dr. Wanda M. Austin STEM Endowment scholarship," said Dr. Brandi Odom-Lucas, chief academic officer at Verbum Dei High School. **"**It is a testament to his hard work and dedication to his vision of becoming an aerospace engineer, as well as the support of our incredible STEM teachers at Verbum Dei."

The Aerospace Corporation established the Dr. Wanda M. Austin STEM Endowment fund in 2015. The fund provides financial assistance to underrepresented and underprivileged high school students who demonstrate academic excellence, strong leadership skills, and intend to pursue undergraduate study in a STEM field at a four-year college or university. The fund is sustained through employee donations, charitable organizations, and estate gifts. More information about the STEM Endowment program and how to donate can be found at www.aerospace.org/education/stem-outreach/stem-endowment-fund.

Aerospace has also been a sponsor of the Verbum Dei High School Corporate Work Study Program for the past 10 years. Every year, four students are given the opportunity to work one day a week as part of their school curriculum.

Impressive Turnout for 40th Annual Herndon Memorial Science Competition

by **Wendy O'Dea**
May 31, 2017



Ava Basileo and team, competing in El Segundo, looked at ways to enhance factory safety by using a camera sensor and algorithms to detect flesh versus objects. (Photo: Elisa Haber)

For forty years Aerospace has demonstrated its commitment to STEM education by hosting the Robert H. Herndon Memorial Science Competition, which takes place annually in both Chantilly and El Segundo.

The competition—the premier STEM event at Aerospace—is named for Robert Herndon, an Aerospace scientist and engineer who passed away not long before the competition was established.

Chantilly

The Chantilly event was held on Thursday, May 11, on the upper and lower concourses. With a theme of *Dream Big: Push the Limits and Accomplish the Impossible,* the fair showcased the technical talents of more than 50 students from 23 different schools throughout Virginia, Washington D.C., and Maryland.

The highest-attended competition to date in Chantilly, the fair began with Allen Compito, general manager of Electronic and Sensors Division, sharing background information about Herndon. Students and attendees also received an enthusiastic welcome from Cathy Steele, senior vice president, National Systems Group.

Forty middle- and high-school students presented experiments to a panel of 17 judges, while the students participating in the essay competition attended technical demonstrations provided by the Engineering and Technology Group. These included cybersecurity and physics demos, as well as a presentation on space debris.

Student project topics ranged from how to naturally soak up oil to efficient gas-detection modules. Several students merged the arts, math, and science into one project. One student from James Madison High School studied the sound spectrum of violins to determine the material with the best sound-transmission properties.

Vince Boles, general manager of the Advanced Technology Division, shared words of wisdom with the students during a keynote address, noting that, despite his parent's desire for him to be a dentist or mortician, he pursued his passion of electrical engineering. He encouraged the students to pursue their dreams as well, and not fear failure.

El Segundo

Dr. Chuck Gustafson, senior vice president, Engineering and Technology Group, welcomed students to El Segundo for the California event held on Thursday, May 24, under cloudy skies. One hundred twenty students from 18 schools participated and 15 exhibits were set up on the lawn of Aerospace's campus.

Young women had a strong representation this year with girls winning first place for both the middle- and high-school essay categories, and an all-female team winning first place for the middle-school experiment category for their invention of a hanging alarm clock. Two out of five members on the first-place high-school team were also female.

The focus of some of the experiments included:

Cleaning water with biological filtration using a hydroponic system
Generation of electricity through the kinetic energy of cars going over speed bumps

The creation of prosthetics for cats
The creation of an interplanetary device for the autonomous support of plant life

After lunch and an impressive game of *Who Wants to Be an Engineer,* Chief Velocity Officer Dr. Willie Krenz gave a keynote address and answered students' questions. He encouraged students to stay focused on learning how to think.

"Science, technology, engineering, and math are more than just fields of study, they are a way of life," Krenz said. "They help you understand how stuff works and why stuff works. They show you how to think, no matter what field you go into. And this will be extremely valuable to you."

A project involving violins sounded like a good idea to James Madison High School student Yousif Hakeem at the Chantilly competition. (Photo: Kelly Hart)

List of Winning Students for 2017

CHANTILLY ESSAY CONTEST

Middle School

First Place:
Kofie Ansong, Glasgow Middle School, *Computer Engineering and its Positive Improvements in Human Lives*

Second Place:
Lidya Demilew, Glasgow Middle School, *Investigating Flint*

High School

First Place:
Turner Bumbary, Thomas Jefferson High School, *Utilizing a Network of Weather Stations to Forecast Weather in Developing Countries*

Second Place:
David Day, Yorktown High School, *Computing the 3-D Optical Properties of Water with Image Processing*

CHANTILLY EXPERIMENT COMPETITION

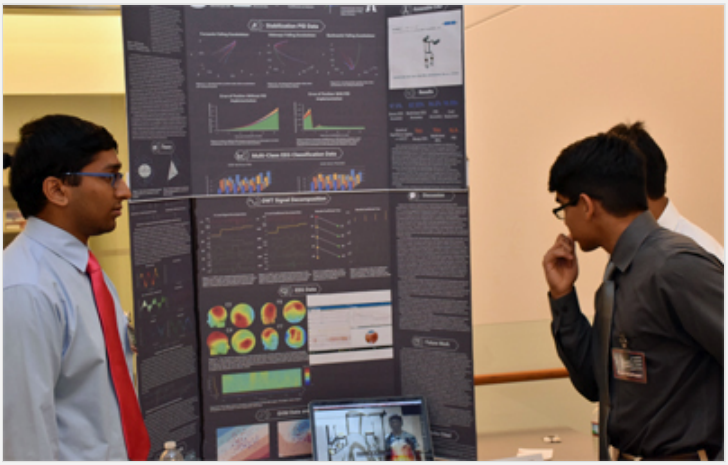
Middle School

First Place:
Alexandra Fall, Swanson Intermediate School, *Smoke Screen*

Second Place:
Delaney Brown, St. Theresa Catholic School, *Soaking Up Oil Spills Naturally*

Third Place:
Sean Harrigan, Gainesville Middle School, *HDPE Brick: Building a Better Tomorrow*

High School



The winning high school experiment team in Chantilly presented research on exoskeletons. (Photo: Kelly Hart)

First Place:
Nithin Dass, Yash Bolisetty, Srinidhi Krishnamurthy, Thomas Jefferson High School, *The implementation of RBF kernel support vector machine classifiers with discrete wavelet transform on an electroencephalographically controlled, finite elementally analyzed, and PID stabilized exoskeleton*

Second Place:
Abigail Wilson, Montgomery Blair High School, *The Effect of Training Dataset Composition on the Performance of a Neural Image Caption Generator*

Third Place:
Alexander Rodriguez, Monroe Technology High School, *Handheld Motorized Grappling Hook*

EL SEGUNDO ESSAY CONTEST

Middle School

First Place:
Khushi Kumra, Bert Lynn Middle School, *Transport to Third-World Terrains*

Second Place:
Rishi Kumra, Bert Lynn Middle School, *Chemical Plants, Our Saviors!*

Third Place:
Anhad Singh, Bert Lynn Middle School, *Unlimited Energy: Illusion or Fusion?*

High School

First Place:
Mahika Lunker, West Torrance High School, *Potential of Graphene-Based Composite Materials*

Second Place:
Mihir Shenoy, West Torrance High School, *Immune Engineering: A New Direction in Fighting Cancer*

Todd Nygren (left) peers at one of the El Segundo projects. (Photo: Elisa Haber)

Third Place:
Jacob Antony, West Torrance High School, The Reach for the Next Closest Star

EL SEGUNDO EXPERIMENT COMPETITION

Middle School

First Place:
Graciela Arancibia, Sofia Arancibia, Kayla Kossoff, Zoe Ramirez, Vaidehi Zala, Sherman Oaks Center for Enriched Studies, *The Hanging Alarm Clock*

Second Place:
Benny Banuelos, Xzavier Roman Padilla, Emma Kate Martin, Maya Waller, Gabrielle Uribe, Dana Middle School, *Warming Up to Solar Energy*

Third Place:
Ty Coleman, Lizbeth Bernabe, Exavier McFarland, Bradon Bur, Jarvis Juarez, Curtiss Middle School, *Automatic Aquaponics*

High School

First Place:
Ariful Rigan, Shannon Lamb, Ray Sakanoue, Ava Basileo, Smit Rajyaguru, Sherman Oaks Center for Enriched Studies, *The Future of Automation: Object Detection Algorithms*

Second Place:
Shrenil Sharma, Carson Doering, Nolan Young, Hayden Crabbs, Matthew Tritasavit, El Segundo High School, *Inter-Plant-etary*

Third Place:
George Contreras, Samuel Hirsch, Daniel Roque, Charlene Suarez, Angel Villa, DaVinci Science High School, *Power Bump*

May 2017 Obituaries

by **Christine T Kato**
May 01, 2017

Sincere sympathy is extended to the families of:

Thomas Bohannan, member of technical staff, hired Sept. 26, 1960, retired April 1, 1988, died April 15, 2017
Sanford Evans, Jr., member of technical staff, hired Oct. 30, 1964, retired Nov. 1, 1991, died March 12, 2017
Elliot Katz, member of technical staff, hired Aug. 15, 1966, retired April 1, 1990, died April 16, 2017
Theodore Reynolds, member of technical staff, hired April 24, 1961, retired Oct. 31, 1990, died April 9, 2017
Martin Shuler, member of technical staff, hired Nov. 14, 1960, retired April 1, 1979, died March 20, 2017
William Wales, member of administrative staff, hired Sept. 11, 1973, retired Oct. 1, 1996, died March 6, 2017

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

May 2017 Notes

by **Christine T Kato**
May 01, 2017

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

Sheryl Williams on the recent passing of her father, George Lister, Jr.

This is the final Notes feature in the Orbiter.

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