

Space in Your Place: Aerospace Employees Can Now Host Their Own Local Analog Missions (APRIL FOOLS)

March 30, 2023

After the success of the first all-Aerospace analog mission at the Mars Desert Research Station (MDRS) in Utah, Aerospace is looking closer into the possibility of conducting small-scale, local analog missions at locations across the country. As part of this effort, Aerospace is taking an unconventional approach by enabling employees to offer up spare rooms in their primary residences to contribute to the



Aerospace Analog Mission Program (AAMP).

"Doing analogs like this really does position Aerospace for being better prepared for questions that come down the line from our customers regarding long-duration human space flight," said Ashley Kowalski when discussing her experience in NASA's SIRIUS-21 program and as a member of the MDRS 269 crew. "It ensures that Aerospace really has the full complement of skills to know how to plan an analog mission, how to plan experiments, and how to do crew selections, in addition to also giving us the opportunity to increase the [technology readiness levels] of certain experiments by putting them in these extreme environments."

Analog missions provide scientists and researchers the unique opportunity to experience living and working in a simulated space environment, enabling them to gain a deeper understanding of human

missions for other worlds, including the Moon, asteroids, and Mars. Working with employees across the company to implement a proliferated approach for analog facilities enables Aerospace to accelerate how this understanding can be obtained.

"We wanted to develop an agile approach for this type of project and create more opportunities for employee participation," said Carah Fukumoto, People Acquisition Staff in University Relations and Recruiting. "This new program will allow us to accomplish that."



The Aerospace Analog Mission Program (AAMP) enables employees to provide a truly unique living environment for researchers and scientists.

Aerospace employees can get involved in the AAMP by offering up their spare rooms or living spaces in their homes for future analog mission consideration. Rooms need to be available for approximately 10-12 weeks to allow time to set up each space for the mission with dates varying from May through September. Aerospace is looking for availability at all locations, including El Segundo, Colorado Springs, Albuquerque, Houston, Huntsville, Chantilly and Crystal City.

"We are really excited for all the research that will be happening this summer and this opportunity is a great way for our employees get involved to help us achieve our goals," said Fukumoto.

The deadline to submit living spaces for consideration is Saturday. If you are interested in participating or renting out your space, you can **learn more here**.

APRIL FOOLS: No, Aerospace isn't gearing up to conduct small-scale analog missions at home, but how cool would that be?

What Does Space Warfighting Really Mean?

March 23, 2023

Space is a warfighting domain. Preserving space for future generations is not only matter of promoting safety and sustainability — ensuring security and stability is essential for the nation's space enterprise.

To facilitate a better understanding of what space warfighting really means, Aerospace leaders recently provided a briefing to top journalists at the National Press Club in Washington D.C. on the topic. The unclassified session aimed to inform news coverage on key topics relevant to Aerospace's government customers, such as the ongoing efforts to adapt space systems and operations for resilience and endurance, and the need for expanding collaboration across government, industry and allied partners to advance solutions for the future.

Marty Whelan, Senior Vice President of Defense Systems Group, provided an overview of the current space environment, including how the nation's space enterprise is positioning itself to better address potential threats and adversaries. He also provided clarity on certain terminology used from a warfighting perspective, including that space is defined as 100 kilometers above sea level.

"Warfighting includes the people, the equipment, the training, the education, the tactics, and the knowledge of the threat – and that holds in all domains," Whelan said.



Marty Whelan, Senior Vice President of Defense Systems Group, discussed the importance of space warfighting for the nation's military, which is to deter aggression and maintain peace, and how Aerospace supports government customers to prepare for current and future needs to outpace the threat.

"That's what space is working toward, to better understand the adversary and how they train and organize themselves for the fight. When you put it together, 'space warfighting,' it's just about having those people knowledgeable of the domain because space is different."

He also aimed to dispel the misconceptions of space warfighting due to the <u>different physics involved</u>. Whelan also described how Aerospace is supporting its government customers in adapting for the future, leveraging sound planning, operational speed and the importance of ground systems to strengthen the resiliency, agility and endurance of space systems and architecture.



Dr. Debra Emmons, Vice President and Chief Technology Officer, discussed how Aerospace is supporting the nation's approach in advancing space technologies and capabilities, as well as the corporation's longstanding history of working with government partners to deliver new solutions.

Debra Emmons, Chief Technology Officer of Aerospace, discussed several of Aerospace's ongoing efforts to drive innovation for the space missions of today and tomorrow. Building on the principles of Continuous Production Agility, she explained Aerospace's strategic investments in developing capabilities and advancing rapid prototyping. Emmons also discussed how Commercial Space Futures is creating opportunities for speed and resiliency by leveraging collaboration with industry and innovative startups.

"Over the past decade, we've seen new and more sophisticated capabilities coming onto the scene. There have been space, military and technical capabilities, and some of these are actually starting to challenge U.S. space leadership," Emmons said. "The industry response to this threat has been to actually change the cost and speed equation. This acceleration is really important... with a lot of the direction from the government, it's really been about prioritizing commercial-first approaches for acquisitions and that also means more collaboration and more partnerships." Aerospace's Center for Space Policy and Strategy Robin Dickey from explained that space has a long tradition of competition and concerns of conflict, dating back to the Space Race era. The accelerated pace of activity over the past decade led up to standup of the U.S. Space Force and U.S. Space Command. Dickey also discussed need for establishing norms for space, which enable for better coordination amongst allies and the ability to identify and respond to hostile behaviors, helping to ensure all actors to behave responsibly to ensure the safety, security, stability, and sustainability of the space domain.

"I tend to define norms as generally agreed-upon standards of what behaviors are acceptable or unacceptable, in this case for space, and a number of efforts are being pursued by the DoD today when it comes to space norms," Dickey said. "Norms are not necessarily a shield or a sword that you can use to protect your satellites, but they certainly help in understanding the world around you, what others are doing and how to respond to those behaviors."

This Article Will Take You About 4 Minutes to Read and You Probably Won't Even Finish It

March 21, 2023

Written by guest author Bruce Janousek of the Corporate Strategy Office, mentor of the Value Team.

OK, at least you STARTED reading this article, but the odds are stacked against you reading on. Our senses are overwhelmed in today's contentrich world, and our attention spans continue to dwindle – now measured in seconds, rather than in minute or hours. How can we best communicate with each other in this cluttered and noisy environment?



Back: Hannah Weiher, Bruce Janousek, Alejandro Trujillo Front: Aileen Hui, Erin Hong, Madhu Kannan

Against this backdrop of a content-weary audience, Aerospace faces the continuing challenge of demonstrating our value where the conventional measures of success (e.g., corporate profits) do not exist. For over 60 years, we have been solving some of the most challenging problems for our customers. By its very nature, this work provides highly technical solutions to complex problems. How can we best capture these success stories in a format that will inform and educate our stakeholders? Can complex work be distilled down to a handful of paragraphs that makes our value apparent to a non-specialist?

The Corporate Strategy Office created the Value Team in 2012 to address this challenge. The vision for the team was two-fold: to create and disseminate compelling 1-page value documents, or Value Vignettes, and

challenging early-career employees to polish their writing, leadership, and networking skills in the creation of such documents. The team typically comprises employees from diverse personal and technical backgrounds, enhancing team learning and cross-pollination of ideas and writing strategies.

"The Value Team is sponsored by my organization for a very important reason," said Teri Spoutz, Principal Director of the Corporate Strategy Office. "The Value Vignettes give our employees a window into how we are implementing our corporate strategy and provide the targeted content that demonstrates our strategic and cultural shifts to external leaders and decision-makers."

Creating Simple Stories About Complex Problems

The team works on how best to showcase problems that – as team lead Alejandro (Alex) Trujillo states – "really get customers' heads scratching." He argues that it is a missed opportunity if we do not communicate effectively how Aerospace addressed these tough problems. "We are also deliberate about choosing topics that will help our fellow employees understand our corporate culture and the breadth of our work," said Trujillo, who works in the Space Architectures Department.

"One of the things I like best about the Value Team is that we try to tackle topics that are particularly challenging," said Hannah Weiher of the Civil Systems Group. "Not everyone at Aerospace can be a subject matter expert in *all* technical areas, but we do still want to understand the great work our colleagues do, whether to learn a particular topic for an application or to form collaborations. Maybe we can refer to this as 'enterprise education.' We strive to make subject matter *understanders* of us all by using analogies when describing complex topics. For example, when we tackle the company's efforts in autonomous systems or quantum communication."

For early career employees, the experience gained from being part of the Value Team enables a deeper understanding of Aerospace's role and capabilities as part of the broader space ecosystem.

"For a relatively newer hire, the Value Team has been instrumental in helping me understand the bigger picture behind our corporate strategy and the projects that we lend our expertise to," said newest team member Madhu Kannan of the Information Systems and Cyber Division. "This role has challenged my writing skills and pushed me to really examine how we can communicate our technical excellence to a larger audience without losing the depth and quality that we are known for."

Aileen Hui of the Physical Sciences Laboratories adds that, "The Value Team offers a great environment that provides opportunities not only for learning about the various activities happening at Aerospace beyond my lab, but also for practicing effective ways of communication. The process of writing Value Vignettes has also allowed me to connect with people at Aerospace whom I otherwise would not have had the opportunity to meet."

Educating the Enterprise

Even for the 50-plus Value Team alumni, the unique opportunity working on assignments helped to shape their professional journey.

"It was one of the most wonderful opportunities, and I've had many in my career," said former team member Lael Woods, Systems Director in the Strategic Assessments and Studies Division. "I met so many people who worked together in such a positive and constructive way. Every time I write, I use pieces of what I've learned to be more effective in my communication. It was an incredible experience."

Adapting to the evolving needs of Aerospace and its customers, the Value Team continues to consider new ways to inform and educate stakeholders.

"In addition to the traditional Value Vignettes, we are looking to expand our breadth and bring to light stories that highlight one of Aerospace's desired cultural attributes of 'leading from the front;" said Erin Hong of the Vehicle Systems Division. "We aim to showcase how our everyday engineers and scientists can and have presented inconvenient truths to our customers to ensure mission success."

Congratulations on finishing this article! As a reward, you can see other examples of excellent writing by viewing all previously published Value Vignettes, which can be searched by topic or organization: Value Vignettes - Corporate Success Stories (aero.org)

The Value Team is always looking for new topics to cover. If you have any story ideas, you can submit a vignette draft to valueteam@aero.org.

C&IT Expert Bharat Amin Elected to Aerospace's Board of Trustees

March 16, 2023

EL SEGUNDO, Calif., March 16, 2022 - The Aerospace Corporation elected cybersecurity and information technology (C&IT) expert Bharat Amin to its Board of Trustees. Amin's expertise in C&IT spans more than 30 years working in the aerospace and defense sector and consumer goods industry.

"Our success in space today increasingly depends on the ability to leverage digital tools and capabilities



to drive the greater speed and agility needed to outpace the threats we face," said <u>Steve Isakowitz</u>, Aerospace president and CEO. "I'm thrilled to welcome Bharat to our board, where his extensive expertise in information technology, cybersecurity, and digital innovation will be invaluable as we accelerate Aerospace's digital transformation during this pivotal time."

"We're excited to welcome Bharat to Aerospace's board and look forward to leveraging his deep expertise in the digital domain and his strategic vision to help us tackle the most difficult challenges in space and cyberspace," said <u>Stephanie O'Sullivan</u>, chair of the Board of Trustees. "His wealth of experience across the defense, cybersecurity, and industry sectors will bring new and expanded strategic insight to The Aerospace Corporation."

Currently, Amin is the executive vice president and chief information officer at Huntington Ingalls Industries, Inc. (HII), the largest military shipbuilding company in the United States, where he is responsible for HII's IT and digital strategic direction with a focus on cybersecurity capabilities maturity. He also manages the company's governance and functional oversight, key digital technology partnerships, digital innovation, and risk assessment capabilities of all information systems.

Amin also serves as executive director for the Technology Business Management Council and board director for the American Heart Association – Eastern States. He is a member and former chairman of the Global SAP Aerospace and Defense Industry Advisory Council and a member of the Verizon Innovation Council, the AsianUpward Advisory Board, and the Society of Asian Scientists and Engineers Executive Leadership Group. He is also National Association of Corporate Directors Directorship Certified (NACD.DC).

Aerospace's Board of Trustees has a myriad of backgrounds, representing academic and scientific institutions and public, government, and national security interests. These diverse points of view allow the board members to collectively provide better guidance and oversight of the corporation's activities.

ABOUT THE AEROSPACE CORPORATION

The Aerospace Corporation is a national nonprofit corporation that operates a federally funded research and development center and has more than 4,600 employees. With major locations in El Segundo, California; Albuquerque, New Mexico; Colorado Springs, Colorado; and the Washington, D.C. region, Aerospace addresses complex problems across the space enterprise and other areas of national and international significance through agility, innovation, and objective technical leadership. For more information, visit <u>www.aerospace.org</u>. Follow us on Twitter: <u>@AerospaceCorp</u>.

Aerospace Builds Capabilities for Future Mission Needs with Ironsight

March 14, 2023

The emergence of commercial space capabilities is rapidly evolving how the hardest problems in space can be solved. Adopting innovative thinking and identifying diverse approaches can help accelerate success for the space enterprise. The Aerospace Corporation looks to advance pathways that match commercial solutions that meet and anticipate the needs of its government customers. A case in point is Aerospace's work on Ironsight, a testbed dedicated to supporting the maturation of emerging technologies for rendezvous, proximity operations and docking (RPOD).



Motivated by the industry's rising interest in rendezvous, proximity operations and docking, a team of Aerospace engineers are creating a testbed to support such operations.

Offering Consistent Support Amid Changing Landscape

A noticeable trend in customers' future roadmaps is RPOD, a capability that involves more than one spacecraft to complete a maneuver. To ensure this technology is safe, validated and ready to be utilized for missions, further research is required.

In-development technology has traditionally undergone testbed evaluations and exercises to reach operational maturity. However, Aerospace's current set of tools and testbeds were originally built for single-vehicle missions and are therefore not compatible to assess novel RPOD technology. Aerospace is filling this capability gap by building tools and testbeds designed to test and mature RPOD technology and advance innovative solutions for the space enterprise.

"There are a lot of new emerging technologies that customers want to use, but they're not sure if those technologies are ready, safe or validated," said



Alonzo Lopez, Senior Member of Technical Staff in the Vehicle Systems Division, is leading the effort to develop and mature Ironsight.

Alonzo Lopez, Senior Member of Technical Staff in the Vehicle Systems Division. "Ironsight will help jumpstart the development of tools that can test and validate these technologies. Its symbolic of the evolution of Aerospace's traditional support and research and development role."



Aerospace's Ironsight testbed will support the development and maturation of emerging rendezvous, proximity operations and docking (RPOD) technologies.

Physically, the testbed features CubeSat frames mounted on the ends of two highly dexterous robotic arms. The arms can simulate six-degrees of freedom, fabricating an ecosystem within the lab that resembles the space environment. These tangible aspects allow hardware, like sensors and processors, to be tested. Underlying the physical elements of the testbed is a lab network that enables Ironsight to collect data on the performance of RPOD software.

When constructing the testbed, the team took advantage of combining commercial off-the-shelf parts with Aerospace expertise in robotic system control, rapid prototyping and computer vision.

"Our chief role here in this instance is integrating these technologies," said Lopez. "We're providing integration of software and hardware technologies to actually form a capability."

Getting Ready to Hit the Mark

To verify Ironsight's readiness for investigating customers' RPOD-related technology questions, Aerospace engineers conducted experiments to explore and exercise the testbed's capabilities.

Tests ranged from applying simultaneous localization and mapping (SLAM) to construct a 3D model of the environment and the adjacent CubeSat frame, to examining the functioning of fiducial markers.

Fiducial markers resemble QR codes and relay key data, such as how far the marker is from the camera or target viewing it. In the future, fiducial markers could be incorporated on spacecraft to enable autonomous satellite servicing tasks, such as refueling operations.

Beyond looking into the overall accuracy of these markers, the team dedicated time to truly understand the technology's intricacies—such as the installation process, calibration routine, and the possible failure modes that exist.

"If you have a shadow cutting across certain types of fiducial markers, it'll corrupt the pose estimate and provide an inaccurate prediction of an object's location," said Lopez. "If you get a bad estimate that says your satellite is further away from its target and starts to maneuver, but in reality it's two inches away, what happens then?"

The empirical study is a starting point in exploring how different fiducial markers work, what the failure modes are, and the recommended types of markers customers should utilize. On a broader scale, the experiment is indicative of the type of analyses Ironsight can perform and demonstrates the intended model for the testbed: responding to RPODtechnology problems by collecting information that can help customers make informed decisions.



Aerospace engineers have already conducted experiments to explore and exercise the testbed's capabilities, including examining the functioning of QR code-like fiducial markers.

A Model for the Future



The recent addition of omnidirectional rovers is just one example of how Ironsight's capabilities are being expanded.

Ironsight is up and running, and additional features are being considered to expand the capabilities of the testbed. Recent additions to the lab's environment include omnidirectional rovers. By mounting the arms on the rovers, the testbed will be able to stimulate maneuvers that span the volume of the lab. The gradual improvements made to Ironsight will continue to support the testbed's original intention of answering customers' questions about new RPOD technologies. Successfully performing RPOD actions—such as satellite servicing, on-orbit inspection, or refueling—will become increasingly important as the number of spacecraft grow in tandem with the need for sustainability. By conducting empirical studies and collecting data with Ironsight, Aerospace will help build confidence in the developing RPOD field.

"Among customers, the question still remains: can these emerging RPOD technologies be trusted?" said Lopez. "With Ironsight, we can take in these new technologies, test them

to ensure they meet the specifications required for those types of missions, and then advise our customers what technology to acquire—making sure they're smart buyers."

Ironsight's work contributes to Aerospace's larger goal of supporting multivehicle missions as best as possible.

This article has been published on Aerospace.org.

Aerospace Facility Raises the Bar for Electric Propulsion Testing

March 09, 2023



Aerospace's EP3 chamber recreates the frigid and airless vacuum of space to conduct electric propulsion testing for spacecraft.

The desire for increased agility in the space environment has prompted research into forms of propulsion that are capable of meeting the objectives of increasingly ambitious missions. While electric propulsion has mostly been used for station-keeping of satellites, its high efficiency has made it a viable and practical option for sending probes to far-off targets.

The Aerospace Corporation is continuing to expand researchers' understanding of electric propulsion with its <u>EP3 vacuum chamber</u>, a new testing facility for spacecraft thrusters that greatly improves upon the capabilities of its contemporaries, offering testing options on an unrivaled scale.

Spacecraft Propulsion Requires Earth-bound Testing

Electric propulsion involves the application of electricity to ionize gas, which is accelerated out of a thruster to a very high velocity through a combination of electric and magnetic forces.

Unlike chemical propulsion, which provides a high amount of short-lived thrust at the expense of fuel efficiency, electric propulsion offers a low amount of long-lived thrust and high fuel efficiency, making it ideal for long-distance space exploration missions.

To make these long journeys, researchers must be certain that spacecraft thrusters can perform consistently and reliably over the duration of a mission. To do so, thrusters must be tested in an environment that replicates space as closely as possible, requiring cryopumps to remove all background gas from the 14-ft diameter by-30-ft long EP3 chamber to recreate the cold vacuum of space.



"As on-board satellite power is increasing, people are developing bigger, more powerful thrusters that have more gas flowing through them, so we needed a chamber that could test the next generation of highpower electric propulsion devices. That is why we built EP3, and it's unique in a number of ways," said Aimee Hubble, Department Director of the Propulsion Science Department. "The pumping system, which is so critical to maintaining that space-like background pressure, is the fastest in the country. That lets us test bigger thrusters. We also have some unique diagnostics that help us stand apart and attract customers from the commercial and civil sectors."

To learn more about Aerospace's EP3 chamber, read the full article on Aerospace.org.

Slingshot 1 Poster Signing Party March 01, 2023

Aerospace employees celebrated the success of <u>the Slingshot 1 mission</u> recently with a poster signing party and some pizza in xLab. The Slingshot program leverages the potential of open standards and non-proprietary interfaces to simplify and expedite payload



development and integration on next-generation satellite systems. The Slingshot 1 satellite is a 12U CubeSat hosting 19 payloads, 16 of which were funded by Aerospace. In spite of its diminutive size, Slingshot 1 is brimming with a myriad of autonomy, robotics, propulsion, onboard processing and communication systems whose evolution and maturation require on-orbit testing. Launched in July 2022, a number of Slingshot payloads have hit significant milestones.

March 2023 Obituaries

March 01, 2023

Sincere sympathy is extended to the families of:

- **Dorothea Benison**, office of technical support, hired Nov. 28, 1962, retired Oct. 1, 1994, died Dec. 9, 2022
- Bryant Burgess, office of technical support, hired May 19, 2014, died Feb. 22, 2023
- Charles Daniel, member of technical staff, hired Feb. 16, 1978, retired May 1, 2003, died Jan. 12, 2023
- John Duffy, member of technical staff, hired July 22, 1985, retired June 1, 2017, died Jan. 5, 2023
- **Reinaldo Gutierrez**, member of technical staff, hired March 20, 1978, retired May 1, 1986, died Jan. 26, 2023
- **Kenneth Paschen**, member of technical staff, hired Aug. 21, 1972, retired Nov. 1, 1991, died Jan. 30, 2023
- Robert Perram, member of technical staff, hired April 9, 1973, retired May 1, 1986, died Feb. 6, 2023
- Dawn Pfeifer, member of administrative staff, hired Jan. 9, 2012, died Jan. 9, 2023
- Eduardo Rodriguez, member of technical staff, hired Oct. 8, 1973, retired Jan. 1, 2004, died Dec. 3, 2023
- Christine Spira, office of technical support, hired Sept. 14, 1976, retired July 1, 1988, died Dec. 2, 2023
- James Tetirick Jr, member of technical staff, hired April 29, 1985, retired May 1, 2003, died Jan. 28, 2023
- **Donald Wong**, member of technical staff, hired Jan. 31, 1977, retired March 1, 2009, died Feb. 16, 2023

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 Visit: Aerospace.org Contact Orbiter staff: <u>Orbiter@aero.org</u>

