



SHAPING THE
FUTURE 2017

THE AEROSPACE CORPORATION



CORPORATE

PROFILE

The Aerospace Corporation is a nonprofit corporation that operates a federally funded research and development center (FFRDC) for the United States Air Force. In this capacity, the corporation is able to respond with agility to the unique challenges posed by national security space requirements, delivering well-defined, innovative solutions that assure mission success. Relying on its cutting-edge tools and facilities, a vast repository of space-system knowledge and experience, and, most importantly, the technical expertise of its people, Aerospace provides unsurpassed levels of support to both immediate and long-term military and intelligence space programs and other programs of national significance.

FFRDCs fill a unique role in service to the government and the nation. Along with commercial industry and academia, FFRDCs support government science, engineering, and technology development. FFRDCs do not compete with industry and do not manufacture products, eliminating conflict of interest, which enables them to work with industry on important problems. FFRDCs operate as strategic partners with their sponsoring government agencies to ensure the highest levels of objectivity and technical excellence.

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THE LETTER:

CHAIRMAN OF THE BOARD AND PRESIDENT-CEO

*Aerospace is
well positioned
to address a
new generation
of challenges*



In an era of dynamic changes in space, The Aerospace Corporation experienced a year of tremendous achievement and progress. As the only FFRDC committed exclusively to the **space enterprise**, Aerospace brought its wide-ranging technical expertise to bear on expanding the nation's capabilities at an unprecedented speed. In doing so, the company has opened an exciting new chapter across the domains of national security, civil, and commercial space.

Guiding these efforts and many others was the adoption of our four new strategic imperatives. These imperatives will allow the company to build on 50-plus years of success while taking our efforts to the next level required to meet national imperatives:

1. **Shaping the Future** — partnering for success
2. **Innovation** — meeting new challenges
3. **Growth in our Value** — increasing value to the enterprise
4. **Velocity** — responsive, effective execution

Some noteworthy successes enabled by these strategic imperatives include:

- Support to five successful national security space launches while bolstering efforts to usher in new launch vehicles, including a readiness review of the Falcon 9 GPSIII-2, design validation of the SpaceX Falcon 9 launch system, and certification for the Falcon Heavy launch system, ULA Vulcan vehicle, and Orbital ATK's Next Generation launch system.
- Expansion of the Center for Space Policy and Strategy to ensure the development of well-informed and sound space and technology policy.
- Continued development of novel innovations, such as the AeroCube, Sextant, REACH, counter-drone capabilities, and cost-effective GPS anti-jamming techniques.
- Delivery of new innovations in classified programs to meet our country's urgent needs, while expanding collaboration with new and innovative space companies to bring those capabilities to our government customers.
- Winning a 2017 NASA Innovative Advanced Concepts (NIAC) Phase II award for Aerospace's Brane Craft proposal for a revolutionary space vehicle that removes orbital debris.
- Innovations achieved through Agile Mission Assurance, such as cloud-supported launch simulations that reduce schedule and costs.
- Forging a new partnership with NASA to broaden our support of extravehicular activity on the International Space Station and advance the design of next-generation spacesuits.
- Hosting an accelerator event to highlight promising new start-ups in commercial space.
- Incorporation of new initiatives, such as Digital Aerospace, which automate and optimize various internal company processes.

We began to lay the groundwork to become the primary resource for advancing the Space Warfighting Construct. The company will provide engineering leadership to this endeavor and is organizing to defend, protect, and preserve U.S. assets in space and the interests of our allies. In addition, we augmented our work with the National Nuclear Security Administration to modernize our country's nuclear arsenal.

Aerospace also developed design changes, mitigations, and CONOPS changes to further ensure mission success, and added resilience to capability designs for new space and ground systems like AEHF-6. Among our many satellite achievements, we helped launch and bring into operation WGS-8 and WGS-9.

Closer to home, we continued to champion our community where our employees work and live. In honor of the U.S. Air Force's 70th anniversary, Aerospace proudly hosted its first exhibit at our local annual Torrance Armed Forces Day, where we showcased our singular capabilities and support of the USAF throughout the years. We also enhanced our summer intern program with over 200 college students, hired at record numbers, and improved diversity through partnerships with the Brooke Owens Fellowship and GEM scholars.

As the needs of the space enterprise evolve and accelerate, The Aerospace Corporation is well positioned to address a new generation of challenges. Our corporate values—Dedication to Mission Success, Technical Excellence, Commitment to Our People, Objectivity and Integrity, and Innovation—remain the enduring bedrock of our aspirations. We look forward to fulfilling our nation's boldest ambitions for space and reimagining new frontiers for the space enterprise.



Barbara M. Barrett
Chairman



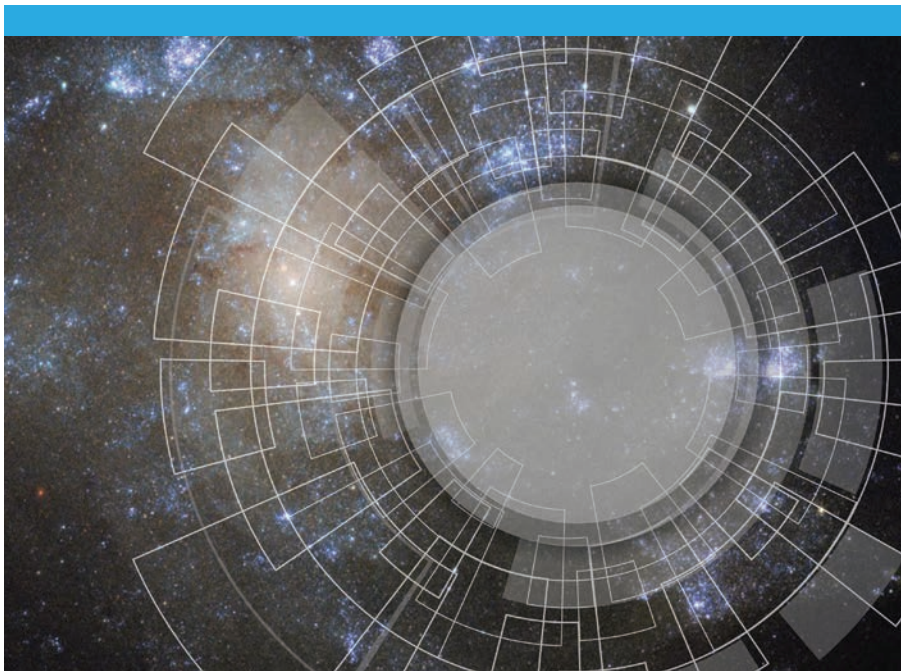
Steven J. Isakowitz
President and CEO

FEATURED STORIES

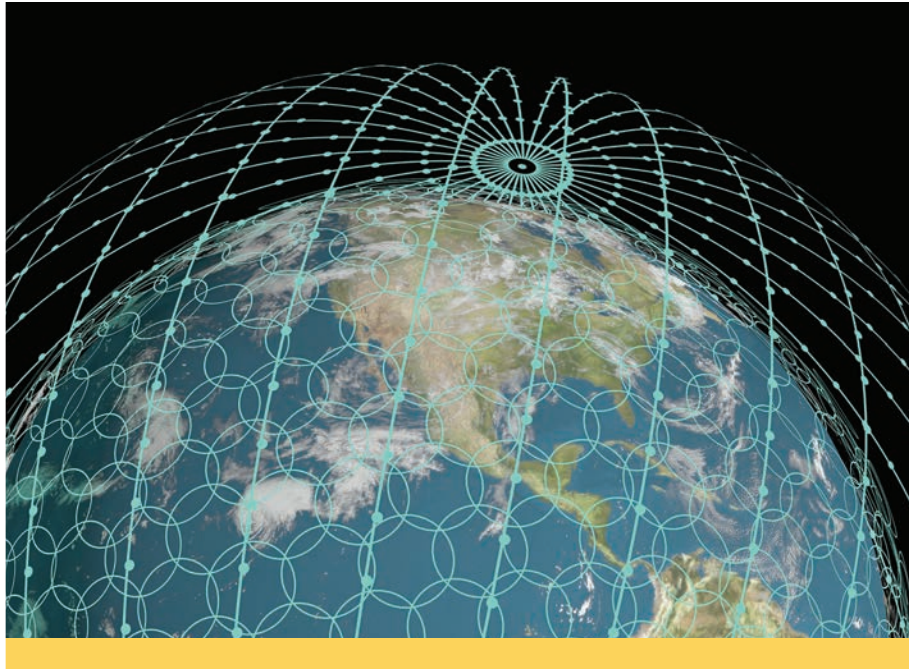


SHAPING THE FUTURE *Partnering for Success*

INNOVATION *Meeting New Challenges*



OUR



GROWTH IN OUR VALUE
Increasing Value to the Enterprise

VELOCITY
Responsive, Effective Execution



STRATEGIC IMPERATIVES

The U.S. can't allow its warfighters to go into a "fair fight" — its duty is to ensure they hold every advantage over all adversaries, including in the realm of national security space missions. With an increasing number of private companies entering their new generations of giant rockets into competition for these crucial national security missions, this duty cannot be overstated.

Before a new entrant's rocket is entrusted to lift a military satellite into space, it must undergo rigorous launch certification. Aerospace is helping these private companies reduce their launch risks by turning to the mission assurance and launch verification processes for which the corporation is known and trusted. Aerospace is also working with the Air Force to ensure that new entrants gain fair access to these missions.

Aerospace is committed to building and nurturing valuable relationships with these new entrants, while keeping the recipe for mission success. This reinvigoration of the launch industry ushers in exciting new opportunities for the government as well as the new entrants. The new entrants have hit the launch scene with innovation and cost savings for all, and the government must continue to nurture these efforts while maintaining high standards for mission success. Amid this exhilarating climate of change, Aerospace is helping to bridge both compelling cultures by imparting the corporation's counsel and more than 50 years of experience.

Since January 2016, Aerospace has been a key member of the certification team for Orbital ATK's Next Generation Launcher. Aerospace held several detailed technical

discussions between the government and Orbital ATK, and is closely monitoring Orbital ATK's design, development, and test activities. Aerospace also holds biweekly working groups with Orbital ATK across all relevant technical disciplines.

Aerospace recently completed a Falcon 9 GPS III-2 12-month review, to assess all Aerospace launch verification work remaining for a planned 2018 launch. Aerospace continues its rigorous technical and programmatic support of SpaceX's Falcon 9 upgrade and the work to certify the Falcon Heavy launch vehicle.

In parallel with the debut of Blue Origin's methane (natural gas)-fueled BE-4 engine, Aerospace revamped an engine performance analysis tool for this and other contemporary engines. The corporation also developed unique laboratory capabilities to test these engines and a rocket engine test standard for new entrant certification.

Meanwhile, Aerospace remains committed to assisting United Launch Alliance in flying out its manifest of Atlas V and Delta IV launches, while the industry undergoes workforce reductions to control costs.

Aerospace's 100-percent launch success rate on national security space payloads since 1999, objective technical analysis, and proven expertise make the corporation uniquely qualified to bridge the cultures of private companies and the government. It's Aerospace's top priority to support the Air Force's quest to safely and successfully launch national security payloads on new entrant launch vehicles — to ensure protection of life and mission.

NEW PATHWAYS TO ORBIT





Rendering of United Launch Alliance's Vulcan launch system. Aerospace continues to work closely with ULA as the latter develops its Vulcan rocket. (Image courtesy of United Launch Alliance, LLC)

Previous page: Aerospace analysts in the STARS Mission Operations Center in El Segundo acquire and process telemetry during a launch.

Above left: The SpaceX Falcon 9 rocket carrying NOAA's Deep Space Climate Observatory spacecraft, or DSCOVR, lifts off at Cape Canaveral Air Force Station in Florida. (Photo courtesy of NASA/Tony Gray and Tim Powers)

Top right: A Falcon 9 launch. Aerospace's agile approach to mission assurance preserves new entrant ingenuity without compromising performance and reliability. (Photo courtesy of SpaceX)

Bottom right: Lt. Gen. John Thompson, commander of the Space and Missile Systems Center, and Aerospace's Randy Kendall (left) are among those in STARS closely monitoring a Falcon 9 launch.

SPACE WARFIGHTING:

DEFENDING THE HIGH GROUND

Not so long ago, space was less crowded and more friendly.

The U.S. and its allies designed their space systems in an era before many of the emerging kinetic, electronic, and cyber threats of today.

Our national security space systems were developed for an uncontested environment; now, however, the space environment in which they operate has changed, evolving into an increasingly crowded and hostile warfighting domain. In short, the United States no longer dominates in space as it once did, nor is it assured of protected space assets.

“Our joint warfighting partners need to have access to space all the time. That’s not a given anymore; we’re hard at work to make sure that it is,” said Gen. John “Jay” Raymond, commander, Air Force Space Command.

The Department of Defense relies on space systems to provide critical capabilities that support military and other government operations, including communications; missile warning; position, navigation, and timing; and intelligence gathering. However, early national security space systems were built as stovepipes, operating independently as they delivered their mission effects to users.

To end up on the winning side of a space conflict today, the United States needs new space systems and must change how it acquires and operates space systems. The Aerospace Corporation is helping the Air Force, government, and intelligence community plan a way forward—one in which space systems are operated as an enterprise that can deliver integrated, multidomain (space, air, ground, and cyber) combat effects.

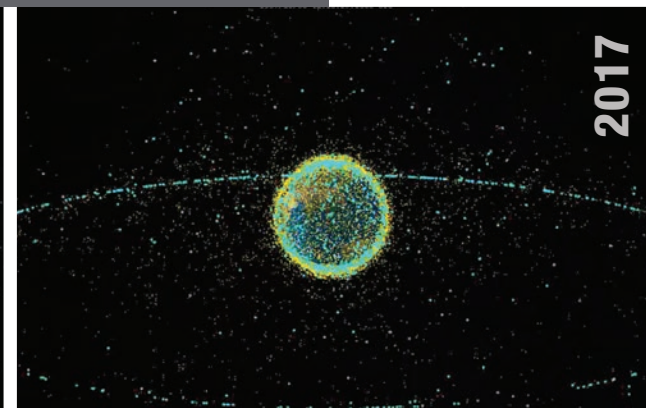
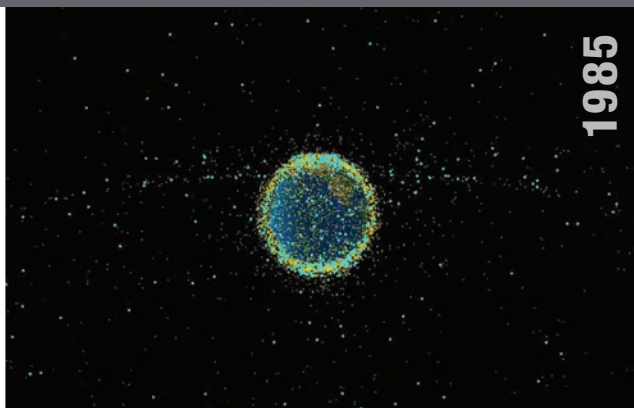
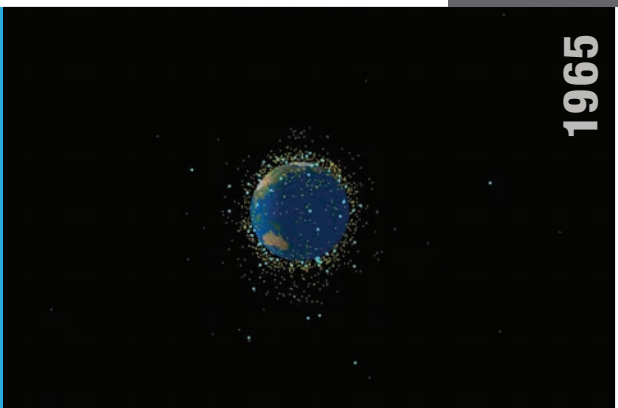
***the United States
...must change
how it acquires
and operates
space systems***

Toward this effort, in 2017 Aerospace initiated the Aerospace Resiliency Coalition and the Space Analysis and Collaboration Center. These efforts directly support Aerospace’s work to create a framework for modeling enterprise-level resiliency for national security space systems using heritage, high-fidelity Aerospace mission models. Resilience is the ability to deliver the mission in the face of human or natural interference, and a high degree of resilience is essential to ensure mission success of space systems. Aerospace assesses many levels of resilience, depending on the mission.

Overarching strategies may include avoidance, robustness, and adaptation. Another consideration is reconstitution and recovery, in the case of reestablishing capabilities after an adverse event.

Other topics for consideration under the Space Warfighting Construct include disaggregation and distribution of space systems. Disaggregation is the separation of capabilities into separate platforms or payloads, while distribution is the use of numerous nodes, working together to perform the same mission or functioning as a single node. Both are intended to provide greater resilience and faster acquisitions due to simpler systems.

Just as Aerospace supported Air Force Space Command in the development of the space enterprise vision in 2015, Aerospace is now enabling the Air Force to create the new Space Warfighting Construct to shift the dialogue to operational risk. Aerospace is supporting all of its customers and industry as we move forward together to address the threats.



Above: Space is becoming more congested as the amount of debris and number of satellites have grown enormously over the past 50 years, shown in this illustrated timeline.

Left: In addition to an increasingly congested space domain, space debris poses a threat to critical U.S. space systems.

Below: Employees work in the new Space Analysis Collaboration Center (SACC) in Colorado Springs. The SACC features unique data sources and processing capabilities for Aerospace customers to collaborate, innovate, and experiment with new space situational awareness tools in a realistic setting.



FROM VISION

TO REALITY:

NEW DIRECTIONS IN SPACE POLICY



The rules of space are changing; the role of space is changing.

In recent years, access to space has grown cheaper and easier. As a result, many new players with new objectives are joining the space game, including governments, businesses, and academic institutions. The question is, will America's future in space be dictated by external events, or will it be shaped by a cohesive space policy that leverages the changing technical and economic landscape while responding to emerging threats?

In 2017, Aerospace expanded the Center for Space Policy and Strategy to help policymakers manage the opportunities and challenges inherent in a time of rapid change. The goal is to provide timely, independent, well-informed thought leadership, policy, and strategy information to key decisionmakers. The center consciously takes a nonadvocate role, not arguing for particular solutions, but rather identifying and comparing options for policymakers. The center aims to provide objective analysis and data to support policy development, built on Aerospace's exceptional foundation of technical insight.

As part of that effort, the center provides a forum for thought leaders to share ideas, discuss emerging trends, and stay ahead of future developments. Venues include conferences, seminars, and panel discussions. In its first year, the center hosted a number of invitational events, both alone and in conjunction with other independent policy groups.

An inaugural event in March in Washington, D.C. brought together Aerospace policy analysts with senior staff from numerous government agencies as well as launch providers, prime contractors, and legislative staff. Topics ranged from expansion of public-private partnerships

to the prospects for creating a Space Corps. A second conference on ensuring U.S. space leadership, which examined emerging trends in space security, was held in July. Speakers and panelists included the chairman of a key congressional committee as well as leaders from industry, the National Security Council, the Office of Science and Technology Policy, and the newly formed National Space Council.

The center also publishes topical papers that explain complex issues and delineate the full range of possible solutions, examining the implications of each. Recent subjects have included the Outer Space Treaty, commercial remote sensing, spaceflight regulation, orbital debris, the National Space Council, and many others. These papers help foster a constructive dialogue and provide a valuable reference for policy researchers and analysts. They allow experts from across the corporation to highlight critical issues and present them in terms relevant to policymakers. This has already resulted in multiple executive branch customers reaching out to the center for help in finding solutions to issues where technology, economics, and policy intersect.

Sound policy is essential to safeguarding the nation's interests in the increasingly contested space domain. Through the Center for Space Policy and Strategy, Aerospace is leveraging nearly six decades of experience to provide a trusted, nonpartisan perspective to guide the creation of effective and sustainable space policy and strategy.



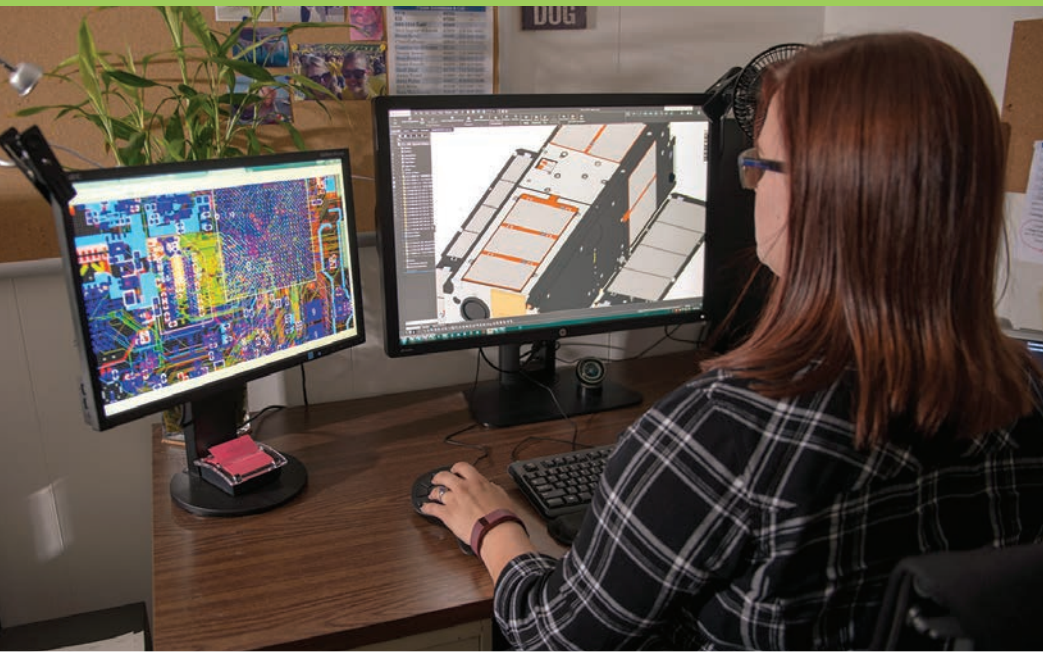
➤ Dr. Scott Pace, executive secretary of the National Space Council, addresses the audience at a Center for Space Policy and Strategy conference on ensuring US space leadership.



➤ U.S. Representative Jim Bridenstine of Oklahoma addresses the 2nd Annual Schriever Space Futures Forum, of which Aerospace is a proud sponsor.



➤ Dr. Jamie Morin, executive director of the Center for Space Policy and Strategy, discusses The New American Space Age at a Politico event, alongside Secretary of the Air Force Heather Wilson.



➤ Aerospace's Jackie Tardif works on the design of AeroCube 11.



➤ Aerospace's Geoff Maul assembles the avionics components for AeroCube 7.

BIG VISION...

SMALL PACKAGE

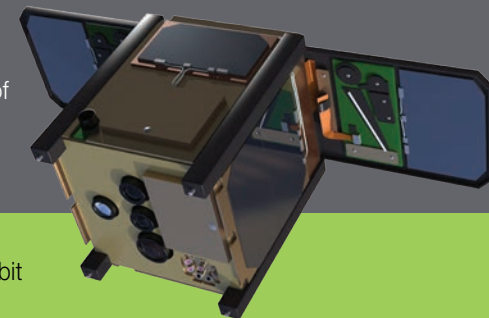
Good things often come in small packages.

Technology is getting smaller and smaller, and most people today carry more computing power in their pocket than could be gotten from an entire mainframe in the past.

Satellites are no exception to this trend, and the explosion of small satellites has revolutionized the space industry. Smallsats have increased our understanding of the near-Earth environment; helped in the search for planets in other star systems; demonstrated various telecommunications systems; served as testbeds for the development of new space technologies; and helped educate countless students, scientists, and engineers.

From early on, Aerospace has been on the front lines of this minimalist movement, leaning on the remarkable work of our picosat lab to produce breakthroughs in the design and construction of small satellites.

Aerospace has its own crop of CubeSats, known as AeroCubes, and we have 12 operational satellites in orbit at the moment, on a variety of missions.

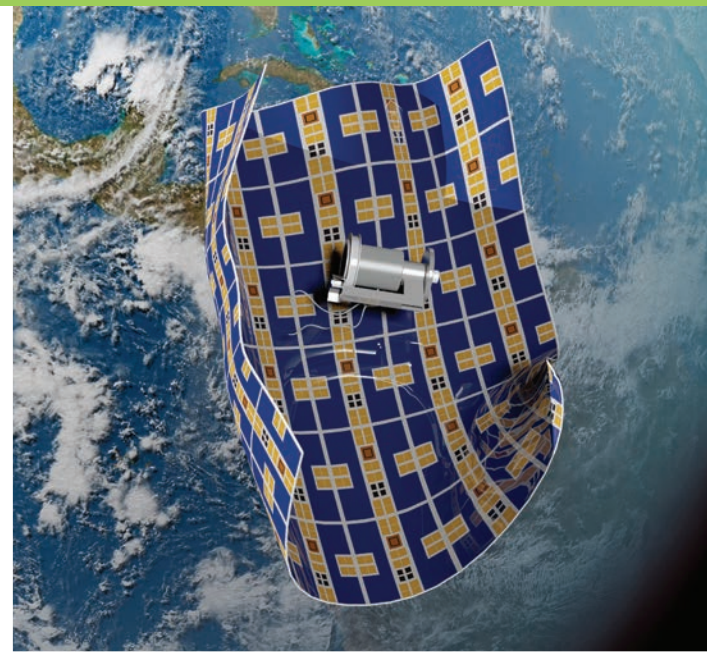




⤴ The Small Satellite Orbital Deployer, in the grasp of the Kibo Laboratory robotic arm on the International Space Station. (Photo courtesy of NASA)



⤴ Artist's illustration of one of the CubeSats Aerospace is designing for a NASA-funded mission to study the upper atmosphere.



⤴ Artist's illustration of Brane Craft, an extremely thin spacecraft that would wrap around debris and remove it from Earth's orbit.



Recent work by our specialists includes laser communications to increase data downlink rates by one to two orders of magnitude, and proximity operations for formation flying. Other Aerospace missions include studying the atmosphere and looking at ways to improve remote sensing and Earth imaging at night. Our staff of experts has been nationally recognized for setting the standard for reliability and technology development within the CubeSat community.

But Aerospace has a vision to go smaller still.

In FY17, Aerospace won a NASA Innovative Advanced Concepts Phase II award to investigate the possibility of developing an extremely thin spacecraft that would wrap around debris and remove it from Earth's orbit. The innovative concept, called Brane Craft, is a 1-meter-square membrane-like spacecraft that is a little more than half the thickness of a human hair, and therefore exceptionally light, maneuverable, and fuel-efficient.

The Brane Craft would weigh only about 80 grams, compared to a standard CubeSat at about 1,330 grams. The 50-micron-thick Brane Craft would have a very high thrust-to-weight ratio, and would be capable of traveling long distances, which opens up other possibilities beyond just the removal of space debris.

Aerospace's Brane Craft concept is at once cutting-edge and anticipatory. In keeping with Aerospace tradition, Brane Craft presents a visionary concept that stands to dramatically transform space missions by way of ingenuity, economy, and heretofore unexplored ideas.

***Aerospace has
been on the
front line of
this minimalist
movement***

Right: Astronauts can test spacesuits and related equipment in a subsea research habitat called Aquarius. (Photo courtesy of NASA) >>

Far right: Aerospace EVA hardware managers, Anne Tripathi (far right) and Tamra George (middle), review data from a EVA hardware test in support of an upcoming mission to repair the Alpha Magnetic Spectrometer on the ISS. (Photo courtesy of NASA)



Maneuvering in space, outside of a space vehicle, has captured the imagination of millions over the years. The first American spacewalk was conducted on the Gemini 4 mission in 1965 by astronaut Ed White. Extravehicular activity, or EVA, has since played a major role in every crewed U.S. space program.

Now, Aerospace is working with NASA to assist astronauts with their spacewalks on the International Space Station (ISS) and to plan the future of EVA.

Earlier this year, the Civil Systems Group's Human Exploration and Spaceflight Directorate began directly supporting the mission of Johnson Space Center's EVA Office via Aerospace's agency-wide NASA contract.

The emphasis of this work is to provide unified support at the project office level that streamlines management of operations, provides improved control of proprietary data, and reduces the potential for conflict-of-interest issues, all in support of current ISS and future exploration-related activities.

WALKING IN SPACE



Above: Astronaut David Wolf installs an exterior television camera during a spacewalk at the International Space Station in 2002. (Photo courtesy of NASA)

Right: Aerospace played an integral role in developing the tools that astronaut Dan Burbank uses as he trains for extravehicular repair of the Alpha Magnetic Spectrometer. Tools used during EVA must be specifically designed to operate in the zero gravity environment. (Photo courtesy of NASA)

Aerospace manages and controls existing EVA tools and equipment used during crucial EVA sorties that keep the ISS running. Aerospace is also involved with developing future EVA equipment by evaluating new concepts in relevant space environments such as the subsea research habitat called Aquarius or the world's largest pool, the Neutral Buoyancy Lab.

In addition, our employees are researching and constructing the most accurate requirements to help direct future exploration equipment development that will eventually include newer spacesuit technology. Aerospace employees are managing the development of new tools to support critical and unique missions such as the repair of the Alpha Magnetic Spectrometer on the ISS. Aerospace is responding to the needs of our NASA customers by providing specialized technical specialists, such as our battery and power experts, to support important fact-finding tasks.

This new EVA work provides challenging and compelling opportunities that enhance the overall technical expertise of Aerospace engineers and scientists. As we explore new ideas in space technology, and even in more terrestrial fields, we expand our overall company knowledge base and hone our creative abilities, while expanding our service in the public interest. This affords Aerospace an edge in attracting a top-notch workforce that can participate in some of the most challenging and exciting arenas of human space exploration.





SAVING

BILLION-DOLLAR

SATELLITES

When a catastrophic failure crippled a satellite system, a team of Aerospace engineers sprang into action.

The satellites involved were national technical means spacecraft, which use monitoring techniques such as satellite imaging to verify adherence to international treaties.

Solving this complex failure problem required a unique combination of skills and experience. The Aerospace team included material scientists, mechanical engineers, electrical engineers, physicists, thermal specialists, radio frequency experts, and a host of others.

They first reviewed on-orbit events to discover the root cause of the failure. To understand the physics behind the failure, the team developed unique electrical models to simulate the problem. They quickly conducted complex laboratory experiments to replicate what they had observed.

This initial testing laid the groundwork and set into motion more complex experiments. To evaluate their hypotheses, the team outfitted a new lab with state-of-the-art equipment, which included unique combinations of equipment such as probe diagnostics, vacuum chambers, infrared cameras, and waveform generators. The team mined extensive data sets to provide insight into the anomaly, developed new sensors to detect the phenomenon, and created innovative and integrated modeling techniques that were not previously thought possible.

The investigation led directly to the recovery of satellites valued at more than a billion dollars.

The team's efforts also enabled the redesign of future systems. Their recommendations ultimately resulted in a change to government operations that produced increased capabilities to ensure that future components function properly and there is no damage to hardware.

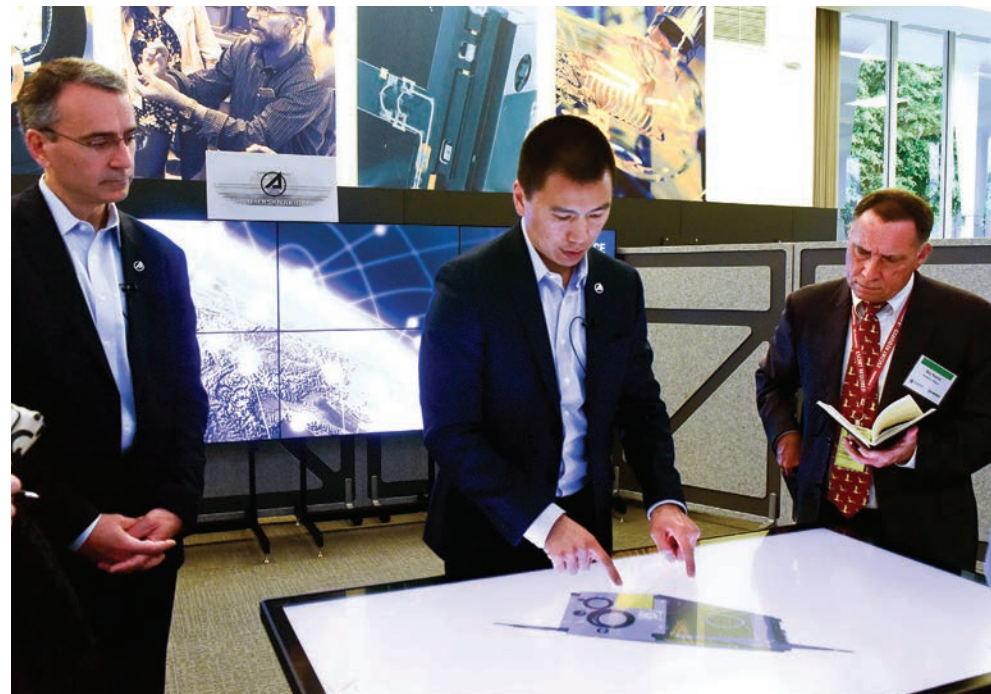
For their technical expertise, leadership, and relentless effort, Timothy Graves and Preston Partridge were awarded the corporation's highest honor, the Trustees' Distinguished Achievement Award. »



Right: Kyle Logue shows unmanned aerial system capabilities. >>

Far right, top: Dr. Randy Villahermosa demonstrates the interactive visualization table in EPIC, while Steve Isakowitz, left, looks on.

Far right, bottom: The EPIC area lends itself to cross-program analysis and testing.



A DIFFERENT *STATE* **OF MIND**

Aerospace is on a mission to find new ways to work smarter and with greater velocity. As we improve efficiency and streamline processes, we increase the opportunity for innovation and collaboration.

Velocity, by scientific definition, plots the speed and direction of an object. As used in our strategic imperative, it also provides a lens with which to view productivity, which results from deliberately embracing a more agile culture in order to streamline standard processes and become more efficient.

During the year, a number of procedures have been updated, and Aerospace facilities have been redesigned to encourage collaboration and creativity. A major step in this effort was the establishment of the Innovation Laboratory (iLab) initiative, which addresses the growing need for innovative solutions to tough problems. As part of this effort, the Lauritsen Library in El Segundo was renovated and is now home to the Exploration, Prototyping, and Innovation Center (EPIC), established to encourage cross-fertilization efforts between Aerospace employees and customers.

There has also been rapid progress in streamlining internal processes. Among the projects with the greatest potential impact, Enterprise Information Services has been moving quickly to digitize workflow tools as part of the Digital Aerospace project, which is expected to continue through FY18.

The People Operations Division, formerly known as Human Resources, was restructured in FY17 and hired the most new Aerospace employees during a single year in more than 20 years.

A major improvement came from the Procurement Department, which substantially shortened the processing time of purchase requests from an average of 38 days in recent years to 25 days. They are working toward paperless processes using an Electronic Procurement Information Center.

This mindset toward creating velocity without compromising quality is being reinforced throughout the corporation, and employees have been encouraged to present their ideas to management. One way they're doing so is through Aerospace's version of Shark Tank, based off the hit television show in which entrepreneurs present a business case for their product to a panel of judges, who decide whether to invest in their idea. Among the ideas selected by the Aerospace panel of judges for further development or implementation were an online database of properly licensed clipart and images; a paperless procurement system; and an augmented reality workplace proposal.

This additional focus on velocity and collaboration is quickly becoming part of the Aerospace corporate culture.

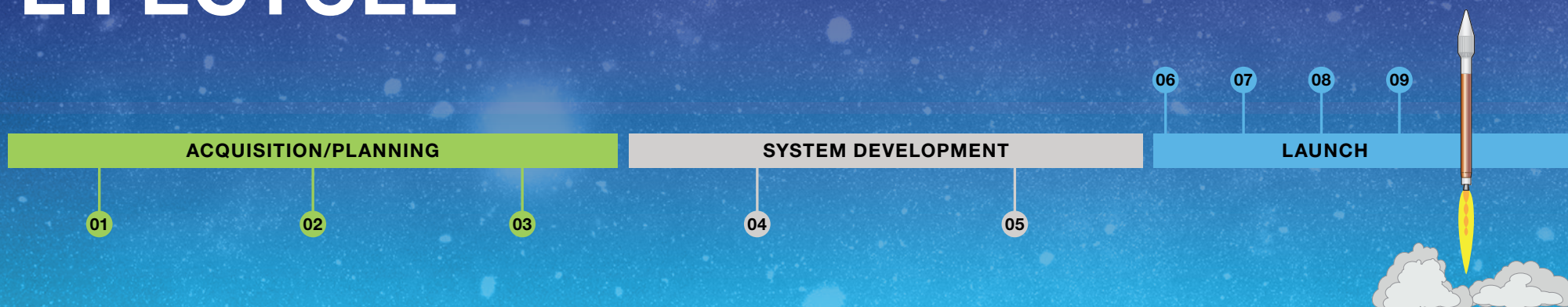


Technical demonstrations are commonly held in the EPIC collaboration spaces.

***Aerospace facilities
have been redesigned
to encourage
collaboration and
creativity***

DELIVERING TECHNICAL EXPERTISE:

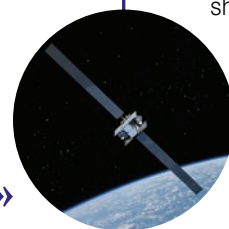
ACROSS THE MISSION LIFECYCLE



- 01.** Contributed to North Atlantic Treaty Organization satellite communications architecture.
- 02.** Assisted customers in frequency-allocation planning as competition among commercial users for spectrum continues to increase.
- 03.** Completed request-for-proposal development and source selection for Space Test Program missions.
- 04.** Supported the critical design review for Space-Based Infrared System (SBIRS) GEO-5 >> and GEO-6 satellites, which are key fleet additions for the SBIRS constellation.
- 05.** Discovered and helped mitigate a design flaw in a satellite power subsystem that affected multiple customers.
- 06.** Applied *Agile Mission Assurance* concepts to Falcon 9.
- 07.** Provided mission assurance launch support for five

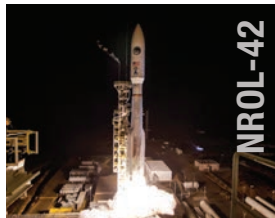
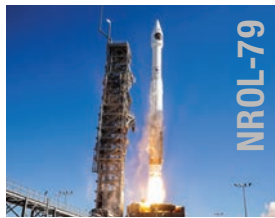
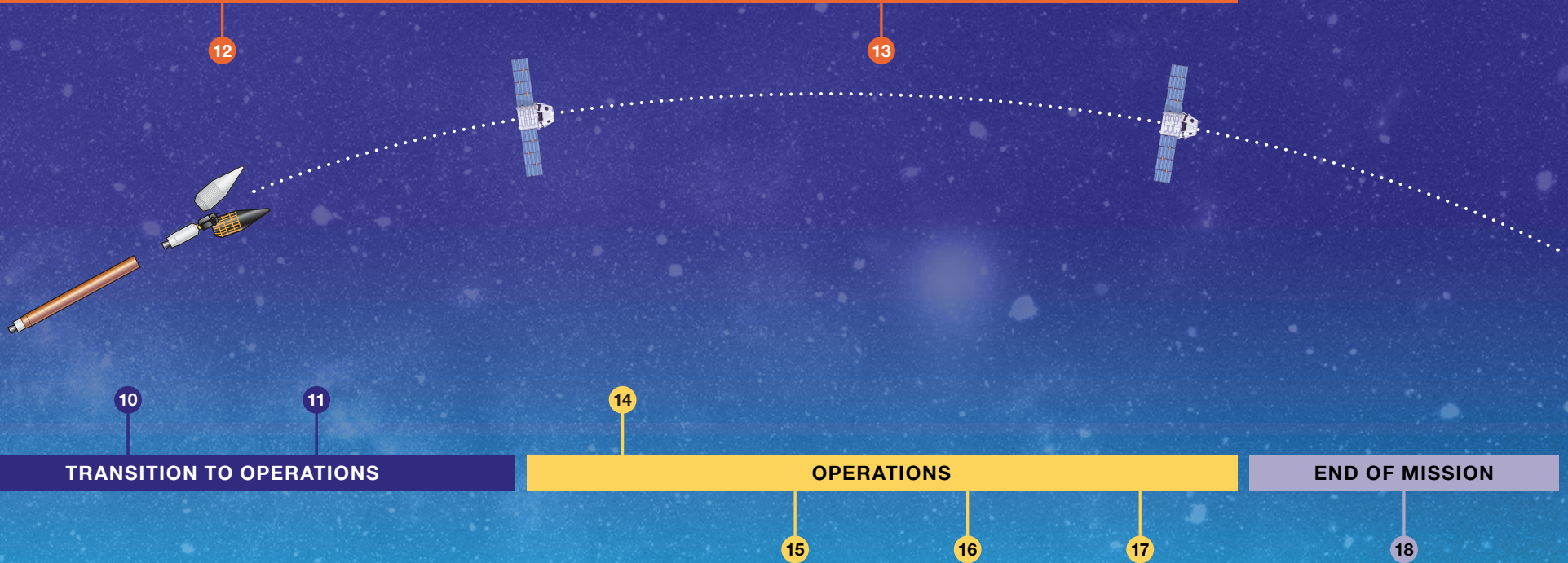


- national security missions during FY17: WGS-8 and WGS-9, SBIRS GEO-4, NROL-79, and NROL-42.
- 08.** Launched 11 Aerospace instruments into an auroral event to study the ionosphere and upper atmosphere interaction.
- 09.** Provided essential leadership and expertise for launch, activation, checkout, and transition activities for GOES-16.
- 10.** Conducted critical testing and on-orbit checkout for the WGS-8 and >> WGS-9 satellites.
- 11.** Provided plans and analysis to support Mobile User Objective System-5 satellite transition to operations.
- 12.** Supported an investigation into anomalies in a liquid-fueled apogee engine used on several national security programs.



- 13.** Resolved anomalies to maintain integrity of the Global Positioning System constellation.
- 14.** Analyzed the high-risk close approach between a Defense Meteorological Satellite Program spacecraft and a defunct Soviet-era satellite, projecting debris generation should a collision occur.
- 15.** Improved reliability for the Defense Meteorological Satellite Program by designing a flight software update.
- 16.** Assessed constellation mission assurance during operations.
- 17.** Evaluated options to ensure resiliency of the Air Force Satellite Control Network.
- 18.** Assessed the radiation hardness of electrical, electronic, and electromechanical parts for the Wide Field of Vision program to mitigate end-of-life disposal risks.

ANOMALY RESOLUTION RECOVERY



(All launch photos courtesy of United Launch Alliance, LLC)

(Image courtesy of Lockheed Martin)

AGILE MISSION ASSURANCE (MA)

Over the past half-century, Aerospace has been an industry leader in the establishment of processes and procedures to assure space mission success.

Agile mission assurance does not mean increased mission risk; rather, it is defined as looking for ways to do mission assurance more efficiently and effectively, in ways that meet the needs of both existing and new customers.

Our agile mission assurance strategy rests on four pillars:

- Exploit new technology and methods for current MA: We seek out and take advantage of advances in technology.
- Evolve MA for disruptive technology: Our mission assurance practices will change with the times.
- Evolve MA for new acquisition strategies and business models: New entrants to the space business have new ways of conducting business.
- Evolve MA for changing definitions of mission success: As national security space moves toward a vision in which multiple assets work together in an integrated fashion, we will provide mission assurance not just for single satellites, but at an enterprise level.



Above: Heydy Arias, left, inaugural recipient of the Dr. Wanda M. Austin STEM Scholarship, was an intern at Aerospace in the summer of 2017.

Top center: Aerospace volunteers collected nonperishable food items as part of the East Coast Holiday Food Drive, sponsored by the Aerospace Black Caucus.

Bottom center: A team from the Sherman Oaks Center for Enriched Studies won first place in the high school experiments category at the Herndon Memorial Science Competition with their project *The Future of Automation: Object Detection Algorithms*.

Below: Students from the Girls Academic Leadership Academy in Los Angeles visit the STARS Mission Operations Center in El Segundo.



➤ Aerospace volunteers with Lt. Gen. Samuel Greaves at the Aerospace booth for the Torrance Armed Forces Day celebration.



➤ Todd Nygren, left, checks out one of the exhibits at the Herndon Memorial Science Competition.

OUR COMMITMENT

TO THE COMMUNITY

Aerospace is an active part of its community.

Contributing to the communities where our employees work and live, and inspiring the next generation of scientists and engineers, are at the core of the corporation's outreach efforts.

Aerospace participated in the 58th annual Armed Forces Day celebration in Torrance, which honored the U.S. Air Force, by staffing an Aerospace booth featuring its decades-long commitment to the Space and Missile Systems Center. Many employees also participated in the 5K run/walk held as part of the weekend festivities, which drew hundreds of attendees from around the South Bay.

For the second consecutive year, the Dr. Wanda M. Austin STEM Endowment scholarship was awarded. Carlos Rivas of Verbum Dei High School, Los Angeles, was the FY17 awardee.

« Rivas received a \$10,000 scholarship, potentially renewable over the next three years, and is attending St. John's University in Collegeville, Minnesota, to begin his undergraduate studies in physics. Employees are able to contribute to the endowment fund and other charities through payroll deductions.

Throughout FY17, employee volunteers teamed on multiple student and teacher tours and competitions focused mainly on STEM, both on and off campus. In May, the 40th annual Robert H. Herndon Memorial Science Competition was held in El Segundo and Chantilly. These events provided students the opportunity to compete in either an essay contest or science experiment competition. The Aerospace Women's Committee (AWC) also hosted its annual Take Our Kids to Work Day on both the East and West Coasts, where dozens of students enjoyed a fun-filled and educational day filled with hands-on activities and tours of our labs and facilities.

Our STEM activities in FY17 included a first-ever visit by students from Sherman Indian High School, an all-Native American boarding school located in Riverside, California. Their visit, hosted by the Aerospace American-Indian and Alaskan-Native Council employee resource group, featured sessions with some of our leading technical experts and visits to the Aerospace space debris garden and nearby Flight Path Museum, home to Aerospace's Space Gallery Exhibit.

Other related STEM outreach events included the CyberPatriot IX competition, in which Team Togo from North Hollywood High School earned the title of 2017 CyberPatriot IX Open Division National Champions under the guidance of East Coast employee volunteers. Additional STEM-focused events included Discover STEM Day at the National Museum of Nuclear Science and History, and the Washington Teacher Training Seminar cohosted by the corporation with the MIT Club of Washington.

The Holiday Food and Gift Drive marked its 26th year. Organizations and individuals benefiting from the El Segundo food and gift collection of more than 3,000 gifts and 2,000 pounds of nonperishable food items included 1736 Family Crisis Center, which assists victims of domestic violence as well as homeless youth, and Los Angeles Children's Hospital.

This generous spirit was also present throughout offices across the country where employees donated to assorted charities. The AWC sponsored the Albuquerque and Kirtland Air Force Base Holiday Drive, providing personal care items to seniors living at the South Valley Care Center nursing facility, and a toy, clothing, and gift drive benefiting foster children and the Court Appointed Special Advocates of the Pikes Peak Region in Colorado Springs. The East Coast Aerospace Black Caucus' Holiday Food Drive, which provided nonperishable food items to the James Mott Community Assistance Program, continued the giving tradition.



OUR LEADERSHIP:

BOARD OF TRUSTEES



Ambassador
Barbara M. Barrett
Chairman



The Honorable
Steven J. Isakowitz
President and
Chief Executive Officer



The Honorable
Michael B. Donley
Vice Chairman



The Honorable
Charles A. Blanchard



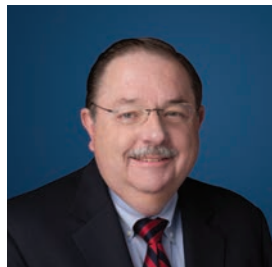
Dr. David M. DiCarlo



Dr. Bonnie J. Dunbar



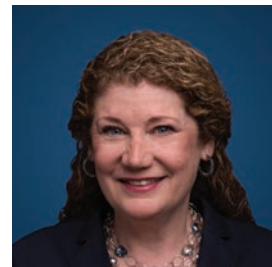
Dr. Charles Elachi



The Honorable
Keith R. Hall



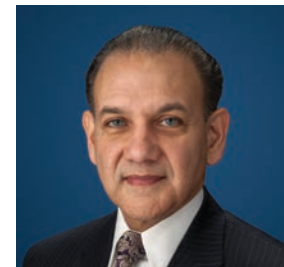
Dr. Daniel E. Hastings



Lt. Gen. Susan J. Helms
USAF (Ret.)



The Honorable
Tina W. Jonas



The Honorable
Michael Montelongo



The Honorable
Stephanie O'Sullivan



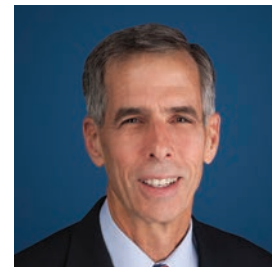
Gen. William L. Shelton
USAF (Ret.)



The Honorable
Heidi Shyu



Ms. K. Anne Street



Dr. John J. Tracy



Mr. Alan C. Wade

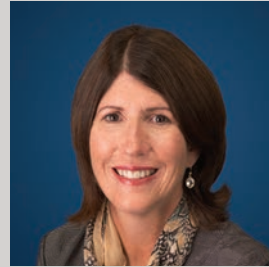
CORPORATE OFFICERS



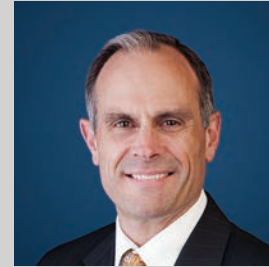
Steven J. Isakowitz
President and
Chief Executive Officer



Dr. Wayne H. Goodman
Executive Vice President



Ellen M. Beatty
Vice President,
Chief Financial Officer,
and Treasurer



Kevin D. Bell
Vice President,
Space Program Operations



Edward L. Bolton Jr.
Senior Vice President,
Defense Systems Group



Malissia R. Clinton
Senior Vice President,
General Counsel,
and Secretary



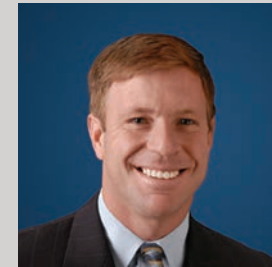
Glenn A. Davis
Vice President,
Strategic Space Operations



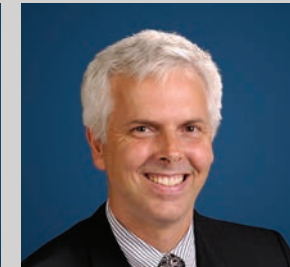
Dr. Charles L. Gustafson
Senior Vice President,
Engineering and Technology
Group



Dr. Malina M. Hills
Senior Vice President,
Space Systems Group



**Randolph L. "Randy"
Kendall**
Vice President,
Launch Program Operations



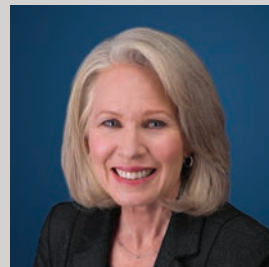
**Dr. William C. "Willie"
Krenz**
Senior Vice President,
Chief Velocity Officer, and CIO



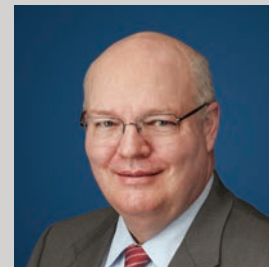
Heather R. Laychak
Vice President,
Chief People Officer



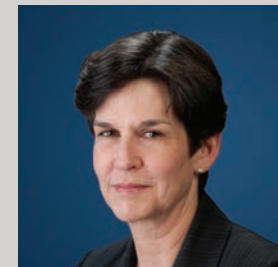
Dr. Jamie Morin
Vice President,
Defense Systems Operations



Catherine J. Steele
Senior Vice President,
National Systems Group



Edward M. Swallow
Senior Vice President,
Civil Systems Group



Dr. Sherrie L. Zacharius
Vice President,
Technology and Laboratory
Operations

OUR FACTS:

AEROSPACE BY THE NUMBERS

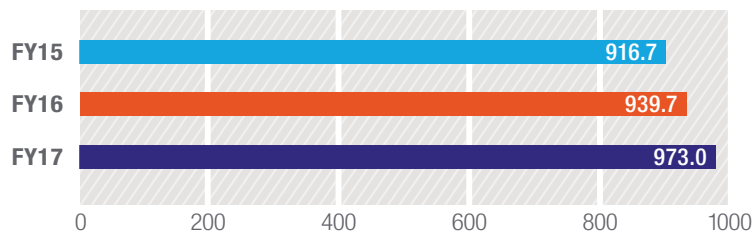
3,900
Employees

73% TECH STAFF

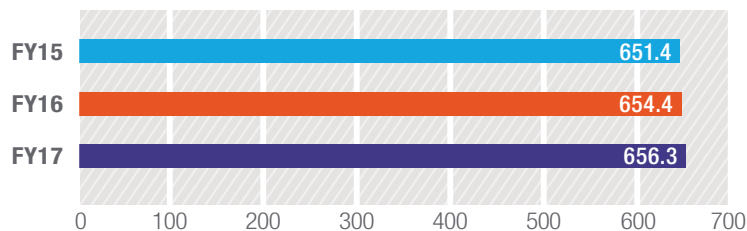
More than 750 Ph.D.s

FINANCIAL DETAILS*

TOTAL REVENUE (\$ IN MILLIONS)

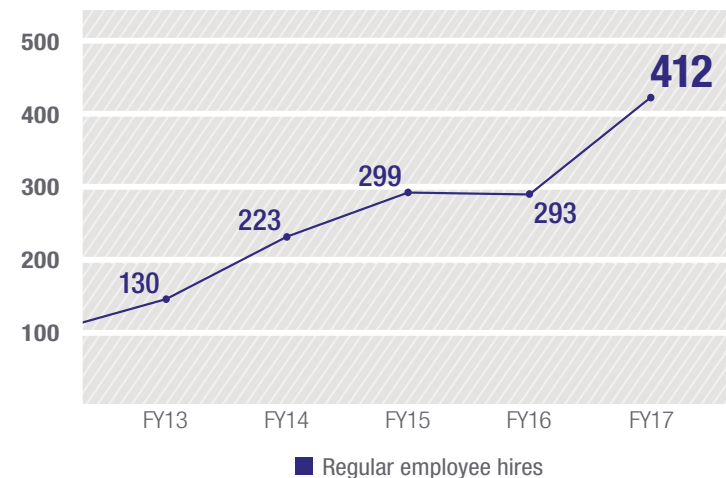


TOTAL ASSETS (\$ IN MILLIONS)



EMPLOYMENT DETAILS

EMPLOYEE HIRING TREND



*2017 unaudited. The corporation's independent auditor is Deloitte.
For a copy of The Aerospace Corporation's audited financial statements, please request via email at CFO@aero.org.

OUR AWARDS & RECOGNITION

The Aerospace Corporation Corporate Awards

- *Trustees' Distinguished Achievement Award* – NTM Satellite Team, Timothy Graves and Preston Partridge
- *President's Distinguished Achievement Award* – Steve Dunham; and the Geosynchronous Space Situational Awareness Program/Mobile User Objective System Team of Dave Albert, William Bjorndahl, Lori Crosse, Michael Mirowski, Laura Needels, Andrew Schickling, Mark Simon, and Mark Shockey
- *Program Recognition Award* – Electronic Program Division's Directorate H Team
- *Innovation Award* – Genetic Resources for Innovation and Problem Solving Team of Ronald Clifton, Dr. Matthew Ferringner, and Timothy Thompson
- *Aerospace Team of the Year Award* – Mt. Wilson Aerospace Facility for Integrated Optical Testing Team
- *Excellence in Diversity Award* – Delilah Nuñez and Daniel Winton
- *Office Professional Recognition Award* – Candace Puls

NASA

- *Group Achievement Award* – Dr. Selma Goldstein and Dr. James Womack
- *Space Flight Awareness Award* – Leslie Padilla
- *NASA/NOAA Geostationary Operational Environmental Satellite-R (GOES-R) Series Program, Outstanding Team of the Quarter Award* – Dr. Frank De Luccia, Dr. Gabriel Moy, Patrick Johnson, Dr. Peter Isaacson, Scott Houchin, Thomas Grycewicz, Justin Graybill, Dr. Christopher Folley, Charles Fink, Pradeep Thiyanaratnam, Dr. Philip Slingerland, Dr. Donald Rudy, and Dr. Brian Porter
- *NASA/NOAA GOES-R Series Program, Esprit de Corps Award* – John Fiorello
- *NASA/NOAA GOES-R Series Program, Team Member of the Quarter Award* – Kathryn Fricks
- *Cost and Schedule Team Award* – Aerospace Mission Operations Cost Estimation Tool (MOCET) team of Marc Hayhurst, Brian Wood, Dr. Shirin Eftekhazadeh, and Vishnu Jyothindran
- *Silver Snoopy Award* – Mark Bender
- *Johnson Exploration Integration and Science Directorate Director's Commendation Award* – Christine Kovich
- *NASA Engineering and Safety Center (NESC), Engineering Excellence Award* – Dr. Shant Kenderian, Dr. Toby Case, and Dr. Yong Kim
- *NASA Engineering and Safety Center (NESC), Engineering Excellence Award* – Dr. Vinay Goyal

NRO

- *National Security Customer Team of the Year* – Dr. Matthew Ferringner, Karl Doty, Ryan McKennon-Kelly, William Whittecar, Dick Dickinson, Dr. Grant Karamyan, Krista Katayama, Dave Barnard, Dr. Zoltan Somogyi, Dr. Richard Casten, and Matt Gypson

NOAA

- *Certificate of Appreciation* – Ramesh Rangachar

OFFICE OF THE SECRETARY OF DEFENSE

- *Certificate of Appreciation* – Bruce Arnheim, Dr. Yontha Ath, Donald Gardner, Bonnie Keillor-Slaten, and Dr. James Womack

INTERNATIONAL COST ESTIMATING AND ANALYSIS ASSOCIATION (ICEAA)

- *Service Award* – Timothy Anderson

INTERNATIONAL ACADEMY OF ASTRONAUTICS (IAA)

- *Engineering Sciences* – Dr. David Bearden was elected a corresponding member for Section 2

AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS (AIAA)

- *Intelligent Systems Technical Committee, Distinguished Service Award* – Dr. Christopher Tschan
- *2017 Associate Fellows*: Ted Muelhaupt and Mark Mueller

AMERICAN ASTRONAUTICAL SOCIETY/AIAA

- *Space Flight Mechanics Meeting, "Best Paper" Award* – Marc DiPrinzio and Dr. Lake Singh ("Reducing Wall-Clock Time of Metaheuristic-Driven Constellation Design with Coarse Parametric Mapping")

INTERNATIONAL COUNCIL ON SYSTEMS ENGINEERING (INCOSSE)

- *Outstanding Service Award* – Terry Rector

CALIFORNIA STATE UNIVERSITY, NORTHRIDGE (CSUN)

- *CSUN Distinguished Alumni Award* – Patricia Maloney
- *Oviatt Library Volunteer Service Award* – Marilee Wheaton

BLACK ENGINEER OF THE YEAR AWARD (BEYA)

- Blake Kimbrough

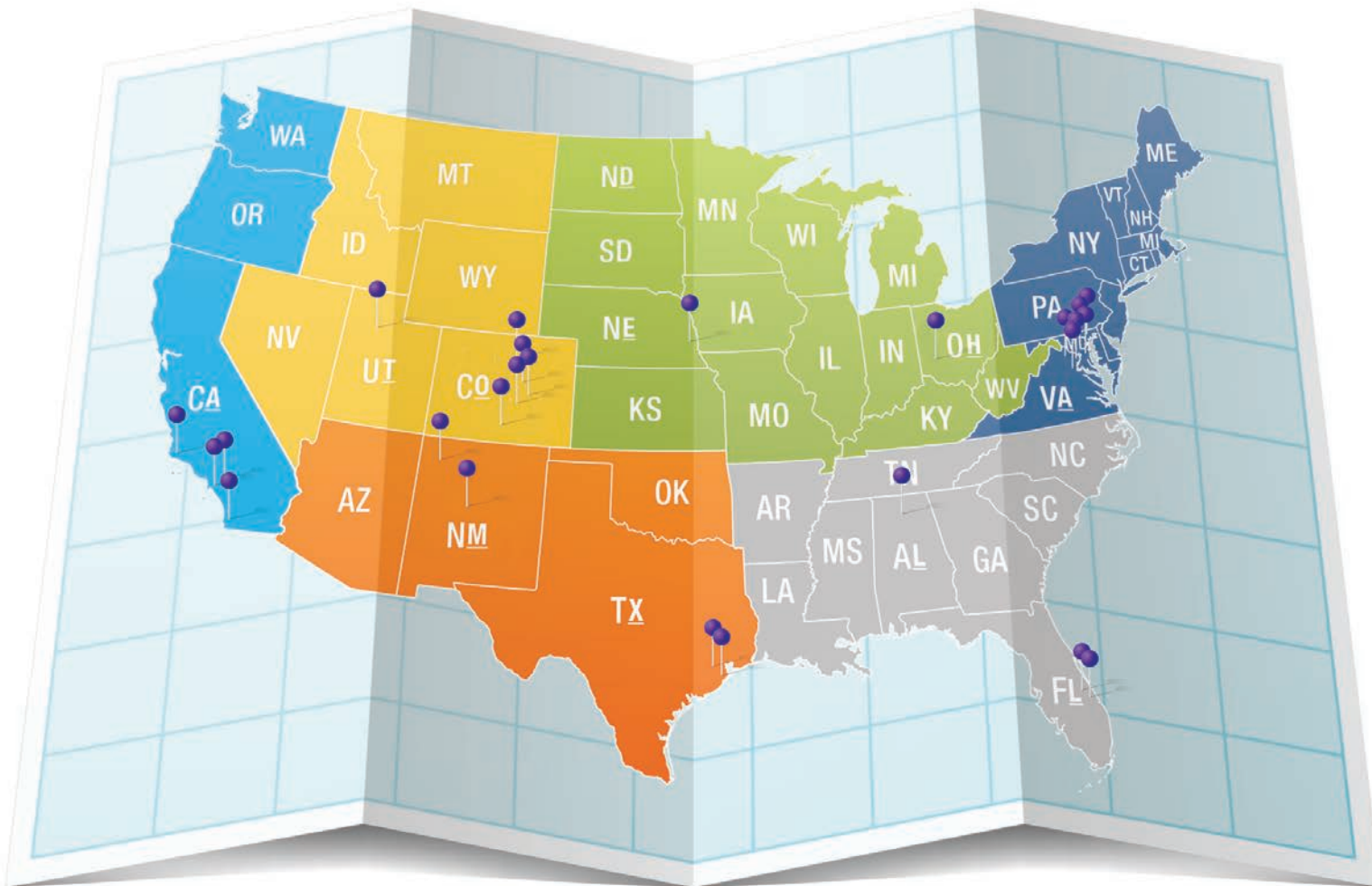
THE OPTICAL SOCIETY (OSA)

- *Board of Directors*: Dr. Walter Buell was elected to OSA's class of '96 OSA Fellows

ASSOCIATION FOR TALENT AND DEVELOPMENT (ATD)

- *BEST Award* – The Aerospace Corporation

OUR NATIONWIDE LOCATIONS



Corporate Headquarters —
El Segundo, CA
Pasadena, CA
San Diego, CA
Vandenberg Air Force Base, CA

Chantilly, VA
Arlington, VA

Buckley Air Force Base, CO
Colorado Springs, CO
Denver, CO
Peterson Air Force Base, CO
Schriever Air Force Base, CO

Hill Air Force Base, UT

Albuquerque, NM
Kirtland Air Force Base, NM

Houston, TX
Johnson Space Center, TX

Offutt Air Force Base, NE

Wright-Patterson
Air Force Base, OH

Columbia, MD
Goddard Space Flight Center, MD
Silver Spring, MD
Suitland, MD

Cape Canaveral
Air Force Station, FL
Kennedy Space Center, FL

Huntsville, AL

