

## The Center for Space Policy and Strategy Hosts Briefing on Orbital Debris

by **Dianna Ramirez**  
September 22, 2017

The Center for Space Policy and Strategy (CSPS) hosted a briefing and panel discussion with embassy representatives from Australia, Japan, and the United Kingdom at the Rayburn House Office Building on Capitol Hill on Thursday, Sept. 21.

"This was our first CSPS event in a congressional office building and it was a success," said Dr. Jamie Morin, Aerospace vice president and executive director, Center for Space Policy and Strategy. "Nearly 50 attendees from congressional offices, federal agencies, and reporters from *SpaceNews*, *POLITICO*, and *Communications Daily* heard about critical issues and our recommendations for mitigating orbital debris."

Aerospace highlighted its technical expertise in monitoring orbital debris. Ted Muelhaupt, associate principal director for

Aerospace's Systems Analysis and Simulation Subdivision, provided an overview about the state of orbital debris, risks, and the company's efforts to identify and monitor debris, collision avoidance, and reentry break up for the past 20 years.

Muelhaupt explained that one of the major risks from orbital debris is not being able to track what is dangerous. "Currently, we track objects down to about 10 centimeters. However, debris that is one centimeter could end a mission."

Muelhaupt added that the number of possible new satellites that will be launched into low earth orbit could increase over the next 10 years. "We anticipate that the number could grow from 10,000 to 20,000 if all proposals are carried out. To date, only 7,800 payloads have been launched by all of mankind in 60 years of space travel."

Given the risks of space debris and possible collisions, Marlon Sorge, senior project engineer for Aerospace's Space Innovation Directorate, briefed about the importance of guidelines for debris mitigation and urged effective low-cost policies. Sorge suggested that the solution needs to come from all countries building a stronger collaboration to eliminate debris and minimize collisions.

One strategy that Sorge recommends is to plan for the disposal of the spacecraft before the end of its mission. "Don't leave your satellite to be a ticking time bomb."

The next session was moderated by Frank Rose, Aerospace's chief of government relations, and focused on international perspectives and the importance of global cooperation.

"Forming and enforcing international rules is of high importance for Japan," said Michiru Nishida, special advisor for disarmament and non-proliferation policy for the Ministry of Foreign Affairs of Japan. "The code of conduct needs to be reinstated and the international community needs to interact."

Rose added, "It's notable that the cooperation with Japan has increased dramatically since 2008 when Japan changed its domestic law to allow for the use of space to support national security missions."



*Frank Rose, chief of government relations, moderates panel. (Photo: Aaron Clamage)*



Vice President and Executive Director Dr. Jamie Morin opens the briefing. (Photo: Aaron Clamage)

Jan Drobik, minister-counsellor, Defense Science and Technology for the Embassy of Australia, shared that the space industry in Australia is weaker than the U.S. and Japan and discussed next steps.

"We're looking to create our own space agency," said Drobik. "We will invest in space and provide a safe piece of geography in the southern hemisphere."

The panel discussion ended with another key perspective from Neville Clayton (RAF), British defence staff of the U.K. embassy. "We have a joint framework for international collaboration and without it we can't operate in space," he said.

To learn more about Morin's view about space debris, click on his [op-ed piece](#) published on Sept. 21 in *The Hill* publication.

## Successful Launch of National Security Payload

by **Gabriel A Spera**

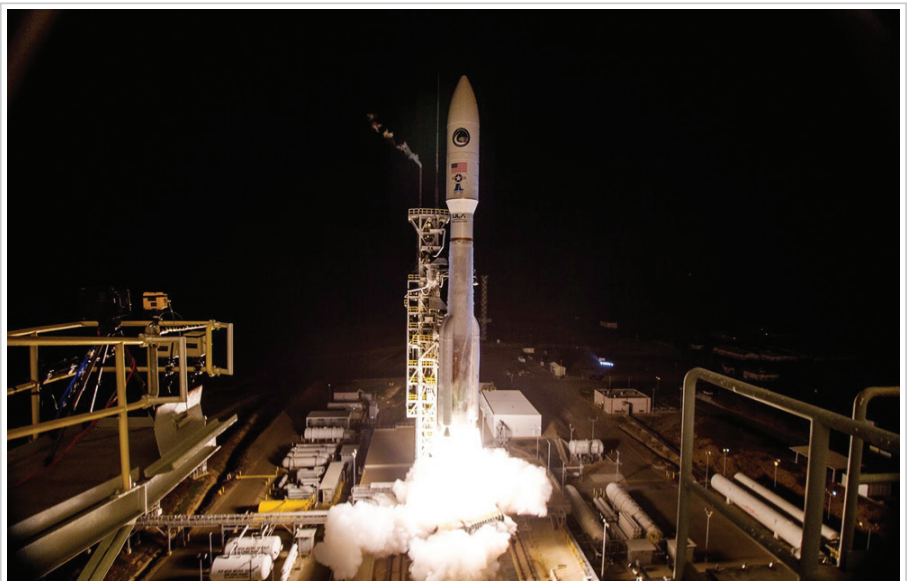
September 25, 2017

An Atlas V rocket carrying a national security payload lifted off from Space Launch Complex 3 at Vandenberg Air Force Base on Saturday, Sept. 23. United Launch Alliance (ULA) was the launch provider.

The launch, designated NROL-42, was originally scheduled for Thursday, but was delayed by the need to replace a faulty first-stage battery on the Atlas V.

Mark Brosmer, general manager of the Launch Operations Division, commended the Aerospace staff supporting the launch. "This was an extremely challenging launch campaign, with multiple launch system issues requiring resolution coupled with multiple weather-related delays," he said. "The launch team maintained focus throughout, diligently addressing each challenge to ensure mission success. I couldn't be more proud of them!"

NROL-42 marks the sixth ULA launch in 2017 and the 25th ULA launch of a national security payload. The vehicle flew in the "541" configuration, which includes a five-meter payload fairing with four solid rocket boosters and a Centaur upper stage. Since its introduction 15 years ago, the Atlas V has maintained a perfect launch record, without a single failure. ULA is scheduled to launch another national security payload from Cape Canaveral in early October.



The Sept. 23 Atlas V launch of NROL-42. (Photo: United Launch Alliance, LLC.)

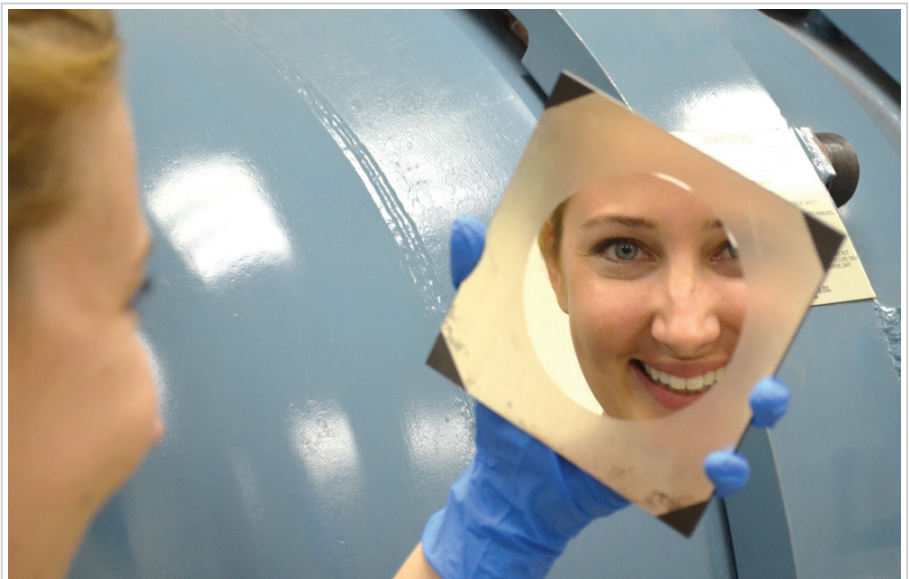
# Aerospace Scientists Develop Fabrication Method for High-Precision Mirrors

by Nancy Profera  
September 11, 2017

Large, lightweight, high-precision mirrors are a critical enabling technology for space-based imagery satellite systems.

Observations from space require increasingly larger optical collecting areas (i.e., bigger mirrors) for high-resolution imagery from long distances. However, large glass mirrors are time-consuming to manufacture, taking from many months to years to finish, and are very heavy. Larger mirrors that are lightweight and have high-stiffness would enable higher resolution space telescopes that can be easily sent into space. Aerospace's Air Force and intelligence community customers are interested in lightweight mirror technology.

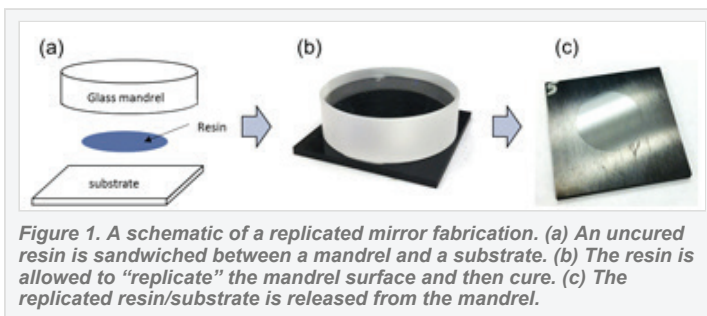
In recent years, composite replicated mirrors have gained increasing attention over traditional polished glass mirrors because of their potential for significant improvements in manufacturing lead-time, aerial density, and lower cost, and for their tailorable mechanical and thermal properties.



*Geena Ferrelli, member of the technical staff, Materials Science Department, holds up a laboratory coupon-sized replicated mirror. (Photo: Joseph Severino)*

Working to advance the technology, scientists and engineers in Aerospace's Materials Science Department, led by Dr. Rafael Zaldivar, have been experimenting with a series of unique in-house processing protocols, overcoming many critical issues with composite mirrors. "The process of utilizing a defect-free, molecularly thin, organic, monolayer release agent has been developed in the Aerospace labs to produce near-net replicated surfaces without the need for post polishing," said Hyun Kim, a research scientist in the Surface Science and Engineering Department.

Composite replicated mirrors are manufactured by sandwiching an uncured resin between a high-quality mandrel and a preassembled composite substrate. The resin then cures and replicates the surface of the mandrel while bonding to the composite surface.



A mandrel, used here in the figure, is a high-quality glass mirror that serves as the master copy. One analogy is the way LP (long-playing) records or CD's (compact discs) are fashioned. One master copy or negative is created, and multiple replica are made from the master. However, nanometer-scale precision is the key to success of replicated optics.

The resulting replica resin surface is then removed from the mandrel and coated with a reflective metal to make a high-quality mirror. This process can be repeated many times using the same mandrel, allowing for finished manufacturing within weeks, rather than months or years. Conventional glass mirrors require an extensive secondary polishing process to achieve

acceptable flat surfaces, hence they take much longer to manufacture.

Numerous processing challenges remain before composite replicated mirrors will require little to no secondary polishing — this has limited the quality and stability of the mirrors thus far. The effects of humidity and temperature on these mirrors also remain of significant concern.

Additionally, dimensional stability remains one of the most critical issues for these resin-based, high-precision optics, and the Aerospace team has developed a series of processing protocols for high-optical quality polymer mirrors that can be manufactured



with durability and environmental dimensional stability using an ultraviolet curable replication resin system. The mirrors have been tested under a wide range of humidity, thermal, and radiation exposures.

"We are exploring how the materials and optical processing correlate. We are focused on stability in many different environments," said Geena Ferrelli, a member of the technical staff in the Materials Science Department. The team is exploring how the composite mirrors perform under, and are affected by, an array of environments, leading to characterization, checks for crosslinking, and effects of the absorption of water, as well as exposures to thermal and radiation conditions, and discovery of where these effects may lead to breakdowns in functionality. In other words, the team is testing in the relevant environments these mirrors will undergo during their life cycles, from manufacturing to testing, storage, and in-space operation.

The team has applied for two patents with the United States Patent and Trademark Office and is in the process of filing for a third. Patents applied for include "Deposition Assembly and Methods for Depositing Model Release Layers on Substrate" and "Fabrication Assembly and Methods for Fabricating Composite Mirror Objects." The third patent being prepped by Aerospace Legal to file with the USPTO is "A Process to Improve Dimensional Stability of Replicated Composite Mirrors."

The team's work on replicated composite mirrors has also been recognized as a finalist in the CAMX 2017 Awards for Composites Excellence (ACE) competition for the most creative application. According to the CAMX website, the award "recognizes cutting-edge innovations and innovators that are shaping the future of composites and advanced materials in the marketplace."

## Isakowitz Reviews His First Year, Looks Ahead

by **Eric Cheevers**  
September 20, 2017

At the final Corporate All-Hands meeting of FY2017, Aerospace President and CEO Steve Isakowitz recapped the past year's highlights while looking ahead to FY2018, and discussed the role that the four corporate imperatives (Shaping the Future, Innovation, Growth and Velocity) will play in taking the company to the "next level."

Speaking from Chantilly, Isakowitz also announced that the board of trustees has approved a merit pay raise pool for FY2018, although the merit budget for nonsupervisory members of the technical staff must be negotiated with the union and will not go into effect until negotiations are completed.

In the area of launch activity, FY2017 saw four successful accountable launches, with one more scheduled, 17 monitored launches, and continuing new launch entrant certification activity, including participation in the Falcon 9 failure investigation.

Isakowitz noted that Aerospace's customer approval scorecard was 99.4 percent, the highest rating in 11 years, indicating that the company is "keeping the recipe" and prompting this comment from one of the customers:

"Aerospace has been and continues to be an integral part to the success of DOD space programs. The support provided is unparalleled in terms of technical skills and leadership. The success of national security space is due to Aerospace's ability to meet and exceed daily challenges and needs."

With regard to the future, however, Isakowitz said customers have expressed concern about new challenges. Discussions by trustees with customers yielded the following comments:

- Aerospace needs to be a more visionary organization — pushing out bold, innovative solutions to the big problems.
- Aerospace needs to help reduce the cycle times and cost of satellites by helping to adjust the risk equation.
- Aerospace needs to innovate.
- Aerospace needs to bring aspects of California's startup culture to the space business.
- Aerospace can be very expensive, which favors other providers where expertise is available and appropriate.



*President and CEO Steve Isakowitz recaps his first year.*

Isakowitz said the four imperatives will enable Aerospace to address these issues and lead to the next level.



Wayne Goodman and Ed Bolton explain the Space Warfighting Construct.

## **SHAPING THE FUTURE**

FY2017 saw an increasing list of invitations to participate in space forums, and Aerospace enhanced its position on the national stage as a thought leader through a reinvigorated Center for Space Policy and Strategy (CSPS). The Center has produced well-received publications on topics ranging from orbital debris to the 50<sup>th</sup> anniversary of the Outer Space Treaty. In addition, the company co-hosted two successful conferences with more planned in the near future. On July 14, CSPS hosted a conference to discuss American leadership in space in an event featuring Rep. Brian Babin, chairman of the House Space Subcommittee, and Scott Pace, the new head of the National Space Council. Conferences and other events will continue in the future, further educating our elected officials and the public about state of space today, while raising awareness of Aerospace's role and capabilities.

Aerospace will also encourage collaboration from across the company with CSPS. This fall, the center will solicit papers from Aerospace staff on key strategic themes aligned with aerospace companies and customer needs. This CSPS Partners Program will leverage expertise of the staff to bolster the Center while showcasing the diverse impactful work of Aerospace.

These efforts are also being furthered by the addition of the Honorable Frank Rose to Aerospace as new chief of government relations. Previously having served as assistant secretary of and deputy assistant secretary for space and defense policy in the State Department, Rose will lead efforts to inform Congress, the executive branch, and state and local governments of our efforts, and will serve as a liaison with key committees on the Hill.

## **INNOVATION**

FY2017 was marked by an increased demand for innovation, presenting an opportunity to build upon an exceptional legacy of forging new technologies and processes. To further this cause, FY2017 also saw the establishment of iLab, which was not only crucial to encouraging development of new technologies and processes, but also to fostering a general culture of innovation at Aerospace. iLab served as the site of innovation open houses in El Segundo and Chantilly, showcasing several novel technologies including Sextant (a position, navigation, and timing system that can supplement GPS), counter-drone advances, and virtual reality simulations.

In FY2017, the Exploration, Prototype, and Innovation Center (EPIC) was launched to encourage interdisciplinary solutions to the complex challenges faced daily at Aerospace. Eighteen sabbatical programs were also established to allow 47 employees to pursue approved projects.

Lastly, FY2017 was a successful year for Agile Mission Assurance (AMA) efforts. During this time, 15 demo projects led to the creation of new methodologies for assessing MA risk at a constellation level, as well as the application of cloud computing to run launch simulations at greater speeds and reduced costs.

FY2018 is expected to set the record for the highest investment in technology, which will include the creation of Engineering, Science, and Technology Hubs, as well as the expansion of AMA by way of investment, workshops, and working with industry partners.

## **GROWTH**

FY2017 has seen growth in several areas, most notably Civil Systems Group, which saw an increase of roughly 7.7 percent, with an expected 10.5 percent growth in FY2018. This growth was generated by new work on extra vehicular activity (NASA), as well as Department of Homeland Security counter-UAV work, and a NASA enterprise-wide capability assessment.

FY2018 may see an increase of the STE cap, Isakowitz reported, with additional work for Aerospace likely. To meet these demands, in FY17 Aerospace hired the largest number of employees in the last 20 years, and the hiring rate is expected to increase by another 25 percent in the coming year.

## **VELOCITY**

In FY2017, Aerospace began process improvements designed to speed key corporate activities and decision-making. In procurement, purchase requisitions over 30 days old decreased from 42 to 19 percent, and processes were automated via

elimination of paper forms under the Digital Aerospace initiative. People Operations implemented Strategic People Partners who work with senior leadership in each organization to implement key needs and strategies. FY2017 also saw the implementation of a streamlined hiring process with an average position-filling time decreasing from 76 to 56 days, resulting in reduced recruitment costs, as well as a higher capture rate for high-demand talent.

FY2018 will usher in new initiatives to create a uniform “One Aerospace” experience across the company through improved, consistent support for core Aerospace activities. In addition, FY2018 will also see the implementation of a new “Digital Aerospace” era, characterized by data reuse and the analysis of metrics on all key processes, in addition to the elimination of paper from daily work activities.

Lastly, the ‘Optimal Aerospace’ initiative will ensure the company’s cost structure will remain competitive for years to come, with a more strategic focus on investments made to better enable the workforce.

Following Isakowitz’s main presentation, Executive Vice President Dr. Wayne Goodman and Senior Vice President of Defense Systems Group Ed Bolton discussed the role of Aerospace in the Space Warfighting Construct (SWC) in the coming year. The SWC is an Air Force initiative that aims to evolve the space enterprise to a more robust and resilient architecture with the tools and response options needed to prevail against adversaries if a conflict extends into space.

## **AWARDS AND RECOGNITIONS**

The following individuals have been promoted to new general manager positions:

Todd Nygren  
Jim Fishenden  
Mark Jelonek  
Akhil Gujral

Isakowitz called out the following winners of the Strategic Imperative Hero Pins:

**Shaping the Future**—Linda Wolters, for her team leadership that reshaped the Air Force Space Command FY19 performance goals, which will impact the future for SWC and related efforts.

**Innovation**—Siegfried Janson, for his continued work on his novel Brane Craft concept and pursuit of external funding; and Chris Ranieri, for his innovation leadership on his maneuvering analysis.

**Growth**—Todd Nuteson, Mark Jelonek, Joel Moss, Tim Grabowski, and Cedric Mann, for generating remarkable growth and increasing Aerospace’s value to the Intelligence Community.

**Velocity**—Lianne McGinley, for developing and implementing the single corporate awards ceremony.

**CEO 007** (For extraordinary work and commitment to Aerospace)

- Cheryl DeMatteis, for her dedication to safety and going beyond the call of duty during a nearby shooting incident earlier this summer.
- Kasemsan Siri and Mike Willhoff, for their dedication to mission success by helping predict, understand, and help mitigate a potential spacecraft power system issue which could have affected multiple SMC satellite programs.

## **Art Show and Music Round Out Hispanic Heritage Month**

by **Kimberly Locke**  
September 28, 2017

An art show, accompanied by Latin music, capped off Hispanic Heritage Month observances at Aerospace on Thursday, Sept. 28 in El Segundo.

Francisco Reyes of the FJ Reyes Latin Jazz Band played a mix of Latin jazz tunes on the conga drums as employees viewed a variety of paintings and other items made by artist and author Carlotta Giangulano. Her work is based on the personal relationship she had with her Mayan shaman grandmother and the stories she was told about multiple facets of the Mayan culture including agriculture, astronomy, medicine, and architecture.

These stories and artistic renditions of the stories have been captured in a book by Giangulano titled, *Legends and Myths of the Mayan Culture*.



Leah Harris, who works in Vaeros Contracts in the Office of the Chief Financial Officer, was the lucky winner of a drawing for one of Giangulano's colorful paintings.

"We really wanted to showcase the diversity among Latino cultures," said Delilah Nuñez, ALMA president. "This is the first event of its type for ALMA and it's a great way to help broaden employees' understanding of the different Latino communities and histories of the world."

ALMA, Nuñez added, may be offering similar events in the future where members will be able to showcase their artistic talents at Aerospace. Judging by the event's turnout, interest will be strong.

Earlier in the month ALMA sponsored a guest speaker event featuring Chris Hernandez, sector vice president of research, technology and engineering at Northrop Grumman. Hernandez is also a member of the Mexican American Opportunity Foundation board of directors, the largest non-profit social services organization in the U.S. primarily serving the Hispanic community of California. His topic was the "Hispanic Role in the Future of STEM."



*Artist and author Carlotta Giangulano with ALMA President Delilah Nunez (Photo: Walt Sturrock)*

## Awards and Recognitions, September 2017

by Gail Kellner  
September 25, 2017

**Aerospace employees frequently earn recognition for their professional accomplishments. This Orbiter feature acknowledges those honors and awards, including the publication of books. To nominate someone for consideration in this section, send details of the award in a timely fashion to [orbiter@aero.org](mailto:orbiter@aero.org), or contact Gail Kellner at [gail.d.kellner@aero.org](mailto:gail.d.kellner@aero.org).**

### John Fiorello

John Fiorello, senior project engineer, GOES-R onsite office at NASA Goddard, was the recipient of the third quarter (April-June 2017) Esprit de Corps Award for his excellent support to the GOES-R Program.

The Esprit de Corps Award recognizes the individual among the entire program, government, contractor, SETA, and FFRDC community that always has a positive attitude, takes on difficult challenges with a positive outlook, infuses a positive "can-do" attitude into the rest of the organization, and inspires teams to solve problems collaboratively.

Fiorello was a key member of the various teams that performed the GOES-16 post-launch testing and checkout campaign. He was instrumental in bringing together a diverse group of stakeholders, from instrument vendors to satellite operators to science data users in order to develop the test procedures and command scripts needed for satellite, instrument, and product testing. As a direct



result of his contributions, GOES-16 post-launch testing and checkout was completed on time, and GOES-16 is providing positively astounding images of current weather phenomena to the weather community and the nation.

### **Kathryn Fricks**

Kathryn Fricks, senior project engineer in the GOES-R onsite office at NASA Goddard, was the recipient of the third quarter (April-June 2017) Team Member of the Quarter. The Team Member of the Quarter recognizes the individual among the entire program that had the most impact on the success of the GOES-R Program that quarter.

Fricks was recognized for her leadership during the GOES-R transition from the GOES-R Program Office to NOAA's operational organization, the Office of Satellite and Product Operations. Fricks led the activity to prepare for this transition, which included developing detailed plans, documents, and numerous checklists in coordination with various stakeholder organizations.

These detailed plans were critical for the GOES-R program to stay on track for the Handover Readiness Review in June 2017, which culminated in the transition of the GOES-16 spacecraft and the GOES-R ground system from the NASA Mission Operations Support Team to NOAA operators. As a direct result of her contributions, GOES-16 achieved this operational transition successfully and on schedule.

### **Marc Hayhurst, Brian Wood, Dr. Shirin Eftekharzadeh, and Vishnu Jyothindran**

The Aerospace Mission Operations Cost Estimation Tool (MOCET) team, including Marc Hayhurst, Brian Wood, Dr. Shirin Eftekharzadeh, and Vishnu Jyothindran was honored with the NASA Cost and Schedule Team Award. The award was presented at the NASA Cost and Schedule Symposium held at NASA headquarters at the end of August.

This NASA award recognizes the Aerospace team's work that has spanned multiple years beginning with the formulation of MOCET in 2013 through its initial release in 2015, public release in April 2017, and continuous enhancement up to the present day.

The MOCET team worked vigorously to further improve the model by actively demonstrating the tool to NASA program offices and general users, addressing concerns from all points of view. In 2017 the team had several significant achievements including the release of Version 1.2 and the approval of the tool for public release on the NASA Software Catalog at [software.nasa.gov](http://software.nasa.gov). Public release of MOCET is a significant milestone as it further establishes MOCET as one of the essential cost estimation tools at NASA.

## **EIS Brings Velocity to the Digital Aerospace Project**

by **Wendy O'Dea**  
September 05, 2017

With a goal of increasing the velocity of business processes, Enterprise Information Services (EIS) has been making steady progress toward digitizing a number of Aerospace's most-used forms. The project is known as Digital Aerospace. It kicked off in March and is expected to continue through FY18.

"Ultimately, we're trying to improve business process consistency, modernize the user experience, and encourage more innovation," said Jennifer Halford, director of the EIS Applications Development Department (App-Dev) and lead for the project. "The goal is to reduce the pain points for both our employees and customers through automation, streamlining, and eliminating the corporations 300-plus paper forms."

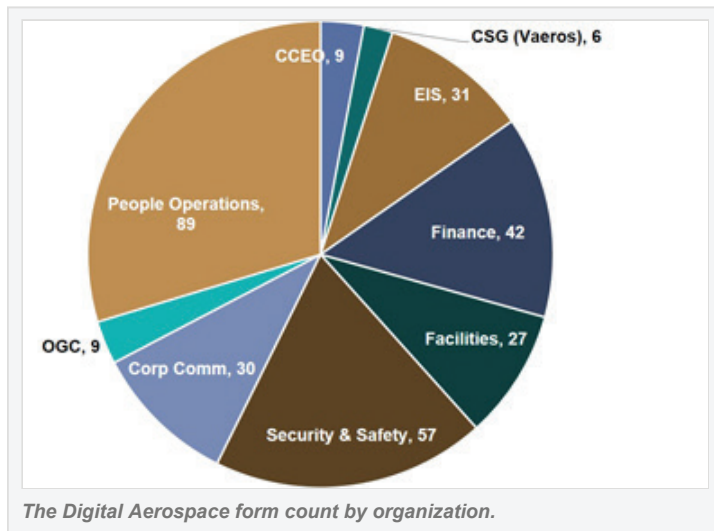
Because digital processes can access data sources from around the company, they can eliminate time-consuming and error-prone duplicate data entry. How many times have you had to fill out your mail stop or cost



*Some members of EIS's Team Fierce: (Front Row) Ella Johnson, Jennifer Halford, Stephanie Charoensub, and Ginni Machamer. (Back Row) Kelly Lynch, Aditi Crosby, and Satish More. (Photo: Eric Hamburg)*



In June, EIS rolled out the first version of the Electronic Procurement Information Center. This tool eliminates the need to maintain unwieldy procurement binders of information about each contract, and enables improved information sharing among buyers. In the first two weeks of operation, more than 136 electronic binders were created, with 33 now complete.



The velocity of these efforts has been increased by the teams' adoption of agile methods. In particular, development and analysis teams have adopted the Scrum framework, which is a specific agile approach for improving team effectiveness. This has helped improve EIS's ability to prioritize and visualize the extensive backlog of work for this broadly-scoped project. Due to strong interest from around the company, Halford will present an EIS forum in the fall on agile methods that will be open to the entire company.

Business analysts are a key part of the Digital Aerospace team. These individuals meet with the customer, determine what is needed and translate those needs back to the developers working on that specific team. One part of the strategy is to assign business analysts to specific business units, so those analysts can build long-term relationships and domain understanding within those units.

Prioritizing the forms and business processes has been a challenge. In general, the highest-priority processes are the ones that have the greatest impact on the most people. Available development resources, complexity of the process, and other factors also impact the decisions. Processes currently in work include foreign travel and contact reporting, food and beverage service orders, different types of cost transfers, vanpool/mass transit forms, and the telecommuting memorandum of understanding.

A heatmap, generated via EPIC, provides data used for process improvements

# September 2017 Obituaries

by Michelle Love  
September 06, 2017

*Sincere sympathy is extended to the families of:*

**Glen Brewer**, member of administrative staff, hired May 7, 1979, retired Sept. 1, 2011, died Aug. 7, 2017

**Albert Coltin**, member of technical staff, hired Feb. 28, 1961, retired April 1, 1979, died June 9, 2017

**Geza Csanky**, member of technical staff, hired June 22, 1981, retired April 1, 2012, died July 29, 2017

**Richard Dolbee**, member of technical staff, hired Oct. 10, 1961, retired Oct. 1, 1996, died Aug. 25, 2017

**Felicisimo Dy**, member of administrative staff, Aug. 2, 1982, retired Feb. 1, 2005, died Sep. 2, 2017

**Robert Hankin**, member of technical staff, hired June 8, 1980, retired Dec. 1, 1994, died July 26, 2017

**Merrill Hinton**, member of technical staff, hired Nov. 24, 1961, retired Jan. 1, 1990, died Aug. 6, 2017

**Daniel Holmes**, member of technical staff, hired July 18, 1966, retired Jan. 1, 1994, died Aug. 15, 2017

**Yvonne Hull**, office of technical staff, hired Jan. 2, 1961, retired Dec. 1, 1985, died June 30, 2017

**Donald Katsuda**, member of technical staff, hired July 13, 1970, retired Dec. 1, 1994, died Aug. 15, 2017

**David Martin**, member of technical staff, hired Jan. 12, 1980, retired Nov. 1, 1991, died Aug. 20, 2017

**Daniel McDermed**, member of technical staff, hired Feb. 12, 1979, retired Feb. 1, 2013, died Aug. 22, 2017

**Antonio Pena**, member of technical staff, hired Aug. 29, 1977, retired March 1, 1982, died Aug. 29, 2017

**Ronald Rector**, member of technical staff, hired July 13, 1964, retired Oct. 1, 1993, died June 14, 2017

**Robert Sempek**, member of technical staff, hired Feb. 16, 1961, retired Nov. 1, 1991, died July 4, 2017

**William Spindler**, member of technical staff, hired Nov. 9, 1965, retired July 1, 1994, died Aug. 8, 2017

**Johnson Wang**, member of technical staff, hired March 5, 1984, died Aug 30, 2017

**Richard Whitanis**, member of technical staff, hired July 22, 1969, retired Oct. 1, 2001, died May 13, 2017

**Robert Williamson**, member of technical staff, hired Sept. 11, 1967, retired Sept. 1, 2002, died Aug. 13, 2017

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

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