

September 2020

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American Institute of Aeronautics and Astronautics,
 Los Angeles-Las Vegas Section

Gerstenmaier warns against ending space station program prematurely

by Jeff Foust — 8 September, 2020

<https://spacenews.com/gerstenmaier-warns-against-ending-space-station-program-prematurely/> (with Permission [Spacenews.com](https://spacenews.com))



Bill Gerstenmaier, a longtime NASA official now working as a consultant for SpaceX, said NASA should not rush to retire the International Space Station while commercial markets for low Earth orbit are still being established. (Credit: NASA/Aubrey Gemignani)

WASHINGTON — The former head of NASA's human spaceflight program, now working as a consultant to SpaceX, said he welcomes greater commercial activity in low Earth orbit but cautioned against ending the International Space Station prematurely.

Bill Gerstenmaier discussed the importance of the ISS, from a technical and policy standpoint, during a **virtual town hall meeting** Sept. 5 by the Los Angeles-Las Vegas Section of the American Institute of Aeronautics and Astronautics (AIAA). His appearance was one of his first public comments on space topics since retiring from NASA in late 2019, **several months after being reassigned from the position of associate administrator for human exploration and operations** and more than four decades after joining the agency.

At the AIAA town hall meeting, he outlined the benefits of the ISS program, from science and technology development to the setting of standards for future exploration efforts. The station, he added, has also been a catalyst for commercial activity, creating demand for launch services for cargo and crew and hosting a growing number of private activities and facilities.

(Continued on Page 14)

"Clear and Visibility Unlimited"... Lt. Col. Mark Hasara's 9/11 story

by Mark R. Hasara, Lt Col, USAF, (ret), Author of *Tanker Pilot: Lessons from the Cockpit*

(The 2nd Speaker in the AIAA LA-LV e-Town Hall Meeting on 10 October, 2020, <https://conta.cc/3ep6vqa>)



Noble Eagle mission

0550 Tuesday 11 September 2001
Fairchild Air Force Base
Spokane, Washington

“Opportunity often comes disguised in the form of misfortune, or temporary defeat.”

--Author of personal success literature Napoleon Hill

“America has stood down enemies before and we will do so this time. None of us shall never forget this day.”

--President George W. Bush speech at the World Trade Center rubble

"Are you guys ready? Let's roll!"

--Todd Beamer's signal to take United Flight 93 back from the Al Qaeda hijackers.

Sunlight crept through our bedroom windows when the phone rang next to Val at 0550 Tuesday morning 11 September. Travis slept between us, barely a month old. Val picked up the phone, and in a groggy state I heard Staci screaming,

“WHERE IS MARK!?! WHERE IS MARK!?! WHERE IS MARK!?!”

Val told her I'm asleep right next to her since it's 0550 in the morning and we have a new baby in the house... hint, hint. I overheard Staci telling Val to wake me up and turn on Fox News. I rolled over grabbing the remote off the nightstand and pointed it at the tv. Remember, I'm a news junkie, so Fox News is already dialed in. Staci tells Val a plane hit a building in New York City. Fox News commentators confirm an airliner hit Tower One of the World Trade Center Complex at 0846 eastern time, four minutes ago. Remember, the CNN Effect is less than five minutes. I see the building, but too many things don't add up in my head. A large fire is consuming several floors near the top. It's a CAVU day in pilot language, clear and visibility unlimited.

How could an airline pilot with thousands of flight hours hit a building in broad daylight?

There are no flight routes near the Towers. Fox News commentators just kept saying a plane hit the World Trade Center. My subconscious brain screams attack, but I cannot believe it. Who would be so bold?

(Continued on Page 16)

Recent military tensions near Alaska (Russia), India-China border, and South China Sea, Taiwan Strait (Pratas Islands) (China PLA)

arranged / summarized by Ken Lui

The tension around the Pacific, especially the Indo-Pacific area has been rising. Russia conducted major military exercises very close to US west coast. The India-China border tension also raises. The French Defense Minister visited India on 10 Sept, and several Rafale fighters were acquired by the Indian Air Force to join the defense at the border. China's People's Liberation Army have been conducting multiple military drills, including launching 2 DF-21D "Carrier Killer" missiles and 2 DF-26B "Guam Express" or "Guam Killer" IRBM, into the South China Sea, and drills to block/deter reinforcement to the Pratas Islands, and the double-carrier drills etc. China/PLA complained the suspected U-2 surveillance in the East China/Yellow Sea during their military firing drills there. And, should India get the Mirage 2000 from Taiwan, or get Rafale from France? (Links below)

Russia conducts military exercises very close to US shores

translated from (helped by Philippe Mairet, Associate Fellow of AIAA, Member of 3AF) and based on (Sep. 2, 2020):

<https://www.capital.fr/economie-politique/la-russie-mene-des-exercices-militaires-tres-pres-des-cotes-americaines-1379303>

French defence minister Florence Parly to visit India on 10 Sep to attend Rafale induction ceremony

The first batch of five Rafale jets arrived in India on 29 July, nearly four years after India signed an inter-governmental agreement with France (FP Staff September 08, 2020 17:18:44 IST)

<https://www.firstpost.com/india/french-defence-minister-florence-parly-to-visit-india-on-10-sep-to-attend-rafale-induction-ceremony-8797041.html>

India inducts Rafale jets amid rising tensions with China

New Delhi says move sends 'stern message' to those eyeing its sovereignty

KIRAN SHARMA, Nikkei staff writer, September 10, 2020 20:47 JST

<https://asia.nikkei.com/Politics/India-inducts-Rafale-jets-amid-rising-tensions-with-China>

Report: China fires 'carrier killer' missile in disputed sea

A newspaper reports China's military has launched two missiles into the South China Sea, including a "carrier killer" military analysts suggest might have been developed to attack U.S. forces

By The Associated Press, August 27, 2020, 1:47 AM

<https://abcnews.go.com/International/wireStory/report-china-fires-carrier-killer-missile-disputed-sea-72642922>

South China Sea: Taiwan holds emergency meeting on China's 'provocative' military drill

CHINA has conducted large-scale military exercises in an air defence zone controlled by Taiwan, leading ministers there to hold an emergency press conference.

By EDWARD BROWNE, PUBLISHED: 02:48, Fri, Sep 11, 2020 | UPDATED: 11:42, Fri, Sep 11, 2020

<https://www.express.co.uk/news/world/1334152/South-China-Sea-news-Taiwan-US-military-drills-peace-region-threat-world-war-3>

WW3 latest: China launches secret double aircraft mission as US condemns military action

CHINA has launched unprecedented double aircraft carrier missions in the Yellow and Bohai Seas, in an apparent military exercise.

By DYLAN DONNELLY, PUBLISHED: 00:55, Tue, Sep 8, 2020 | UPDATED: 03:00, Tue, Sep 8, 2020

<https://www.express.co.uk/news/world/1332183/world-war-3-china-news-us-navy-South-China-Sea-aircraft-carriers>

Beijing protests alleged U.S. spy plane incursion during Chinese military drills

By ASSOCIATED PRESS on LA Times, AUG. 26, 2020, 1:46 AM

<https://www.latimes.com/world-nation/story/2020-08-26/china-protests-us-spy-plane-incursion>

Taiwan plans to retire its Mirage -2000 fleet ! should India buy?

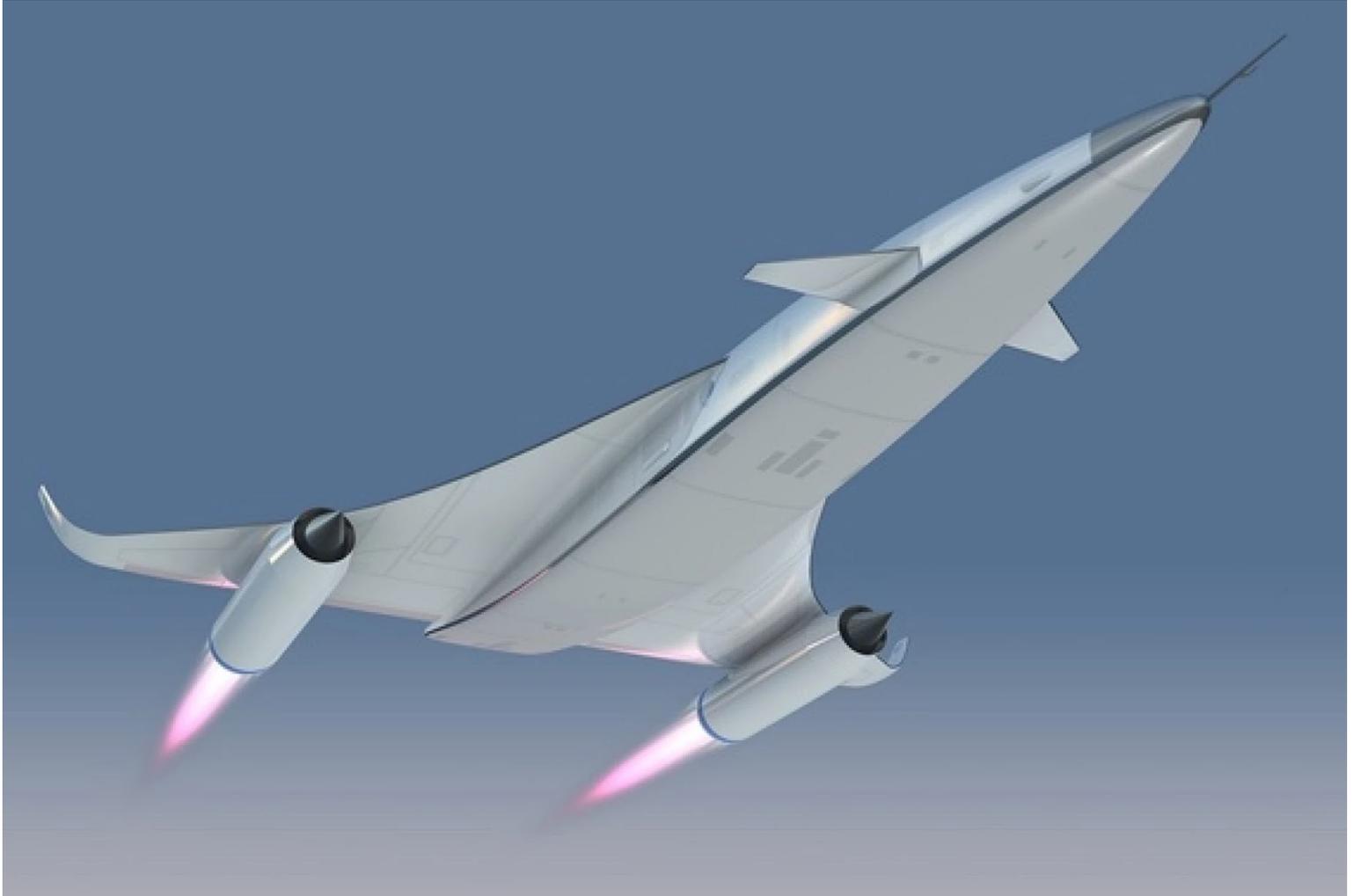
September 4, 2020 | SOURCE: TUSHKAR SHIRODKAR / FOR MY TAKE / IDR.W.ORG.

<https://idrw.org/taiwan-plans-to-retire-its-mirage-2000-fleet-should-india-buy/>

Reaction Engines testing ammonia as carbon-free aviation fuel

by David Szondy (23 August, 2020) (with Permission)

<https://newatlas.com/aircraft/reaction-engines-ammonia-carbon-free-aviation-fuel>



The new ammonia propulsion system uses heat exchanger technology originally developed for Reaction Engines' Skylon spaceplane. (Credit: Reaction Engines)

Reaction Engines and Britain's Science and Technology Facilities Council (STFC) have completed a concept study into the practicality of using ammonia as a jet aviation fuel. By teaming Reaction Engines's heat exchanger technology with STFC's advanced catalysts, they hope to produce a sustainable, low-emission propulsion system for tomorrow's aircraft.

Modern jet engines use a variety of fuels based on kerosene that have a very high energy density that can propel aircraft well beyond the speed of sound and carry passengers and cargoes across the globe. Unfortunately, such fuels are also derived from fossil fuels and produce significant carbon dioxide emissions, which the airline

industry and many governments have pledged to reduce radically by 2050.

One way of achieving these cuts is to look at alternatives to conventional jet fuels to power airliners. The problem is that most of these alternatives have much lower energy densities than standard aviation fuels and suffer from other drawbacks. For example, present-day battery technology would require future aircraft to be very small, short-range, and with little payload capacity. Meanwhile, liquid hydrogen could be a viable alternative, but so much of it would need to be carried that planes would have to be completely redesigned and new infrastructure built.

(Continued on Page 17)

The growing importance of the digital thread across the A&D product lifecycle and associated systems

by Siemens Digital Industries Software (with Permission) (Release July, 2020)

<https://www.plm.automation.siemens.com/global/en/resource/digital-thread/83133?stc=usdi101354>



Executive summary

Today's aerospace and defense companies are at the forefront of two historic trends: unprecedented innovation and increased complexity. To take advantage of these trends and compete successfully, aerospace and defense companies must embrace the digital enterprise (digital twin and digital thread) in order to be more productive, innovate faster, and achieve program execution excellence to ensure programs deliver on technical requirements, cost and schedule.

Introduction

Digitalization is permanently changing the way industries across the globe conduct business. The aerospace and defense (A&D) industry is no exception. In fact A&D is innovating and combining technical innovations in ways never seen before to transform commercial aircraft, space travel and defense. And it's this digital revolution that has spurred the emergence of companies involved in electric aircraft, electric vertical take-off and landing (eVTOL) aircraft, supersonic aircraft, next generation fighter jets and new space applications for tourism, satellites and space exploration.

The advantages of digitalization are quickly becoming the difference between companies that advance in a competitive marketplace and companies that fall behind. Digitalization is not just about creating or sharing data, it's about seamless data integration and analyzing the data in a virtual context for better and more predictive decision making. Digitalization in the A&D industry helps companies improve program performance – whether it's faster time to market, cutting costs, or adding the latest capabilities. It's about unlocking

innovation so teams can move faster. It's adding productivity enhancements in every phase of the product development lifecycle. And today more than ever, it's providing the tools for increased collaboration among remote teams and empowering individuals working off site.

Enabling the digital enterprise is the Siemens Xcelerator, a portfolio of software, services and an application development platform that empowers customers to rapidly meet changing business models with flexible and adaptable applications. Xcelerator not only encompasses the industry's most comprehensive digital twin, but brings together a series of connected digital threads for the interoperability of task automation and other activities throughout all phases of systems development



Trends driving the need for more digitalization

The A&D industry finds itself at the forefront of one of the most transformative periods in history. This movement to a more digitalized enterprise is without precedent. It's important to understand the trends and challenges facilitating the need for more digitalization.

Demand for digitalization is driven by:

- **Pressure to reduce program costs and schedule**
OEMs and their suppliers are challenged to bring new products to market faster while meeting technical, cost and schedule objectives. To compound this scenario, a growing number of competitors are bidding on fewer programs which makes winning the next program even more important. Methods and practices used just a short time ago as means to share and collect information are no longer applicable today.

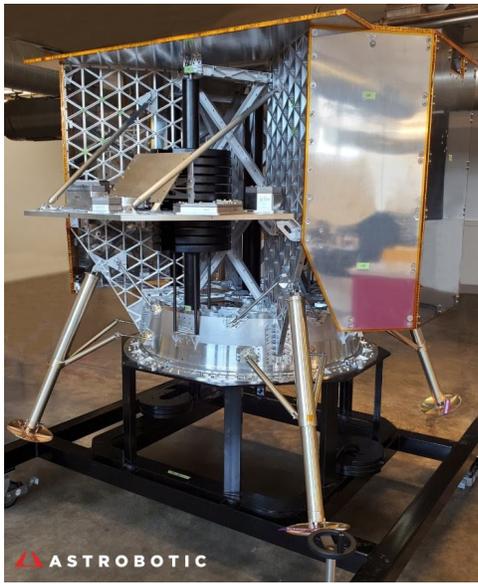
(Continued on Page

18)

Astrobotic Successfully Completes Peregrine Lunar Lander Structural Model Testing

Completion of Structures Testing is a Major Milestone for Upcoming Mission to the Moon

by Astrobotic Technology, Inc., on 3 September, 2020 (with Permission)



meet aggressive schedules while operating under the strict safety protocols required during the pandemic,” Sharad Bhaskaran, Mission Director for Peregrine Mission One.

Moving forward, the STM will be used for Peregrine Mission One landing stability testing and future mission configuration studies. Flight structure manufacturing for the mission will begin this fall.



Pittsburgh, PA – Astrobotic’s Peregrine Mission One program has successfully passed structural qualification testing, marking a major development milestone toward its maiden voyage and lunar landing in 2021. These tests qualify the integrity of the Peregrine lander’s structure and its ability to survive launch while carrying payloads from 16 customers.

The test campaign was completed using the Peregrine Structural Test Model (STM), a one-to-one scale representation of Peregrine that was assembled at Astrobotic’s new lunar logistics headquarters in Pittsburgh. The majority of the STM hardware elements were manufactured by vendors in the local Pittsburgh area. The STM, in launch configuration, underwent structural testing necessary for mission success.

Testing was conducted over two months at the Dayton T. Brown, Inc. commercial test facility in Bohemia, NY. The campaign proved that Peregrine can withstand the flight environment of United Launch Alliance’s Vulcan Centaur, the launch vehicle for the mission. The qualification campaign included static, sine vibration, shock, and vibro-acoustics testing, and was carried out in accordance with NASA standards and process qualifications. Detailed post-test inspections verified the STM met all success criteria, verifying the structural design is ready for the mission to the Moon.

“This is a major step towards verifying the Peregrine design, and I’m really proud that our team was able to



With payloads from 6 countries on board for the first mission, and a recent \$199.5 million new contract win from NASA, Astrobotic is expanding operations and growing its team. Career opportunities are available now at the Astrobotic website. The nation’s best technical talent is invited to come make history with their team.

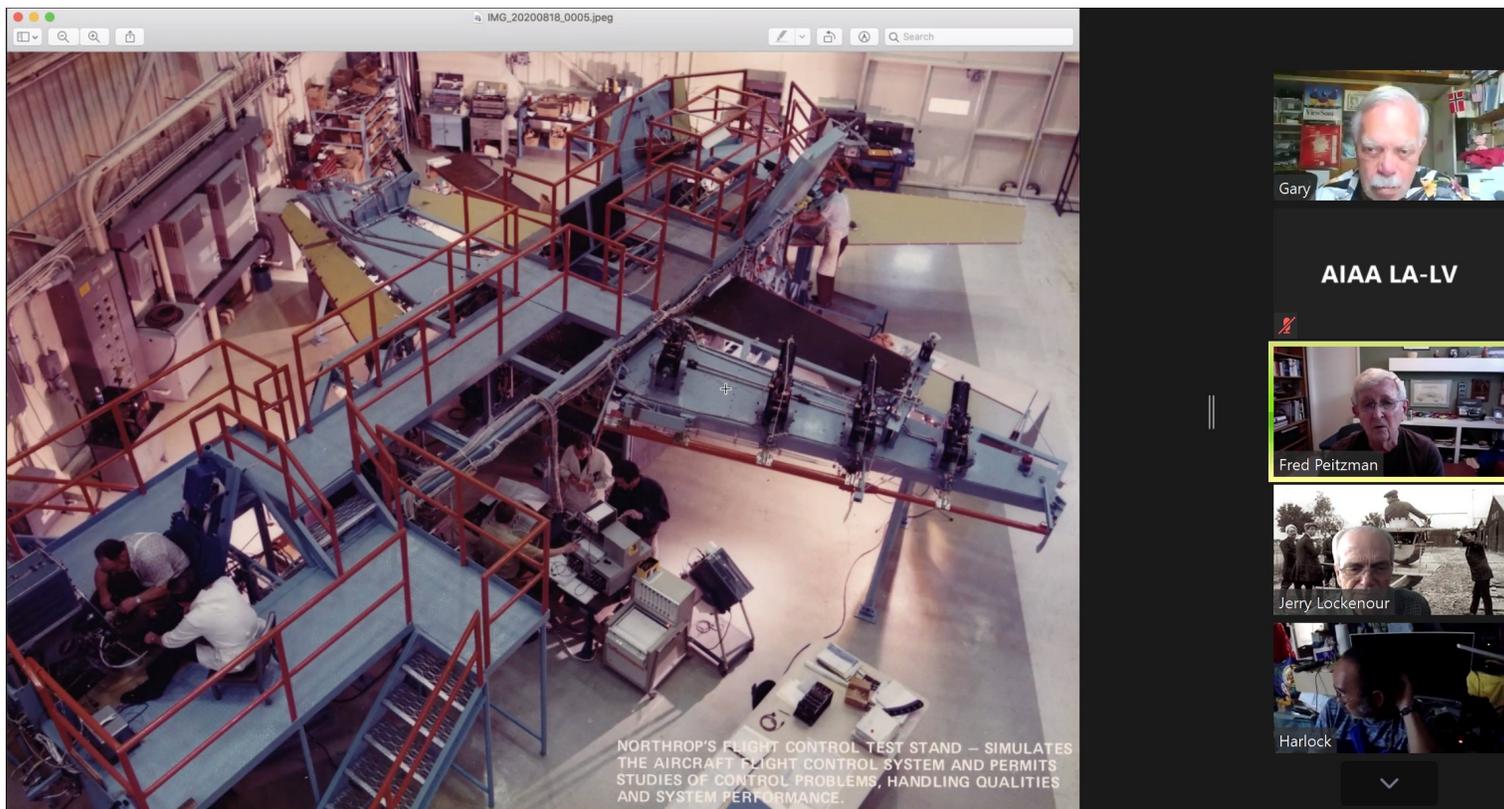
About Astrobotic

Astrobotic Technology, Inc. is a space robotics company making space accessible to the world. They develop advanced navigation, operation, and computing systems for spacecraft, and their fleet of lunar landers and rovers deliver payloads to the Moon for companies, governments, universities, non-profits, and individuals. The company has more than 50 prior and ongoing NASA and commercial technology contracts and a corporate sponsorship with DHL. Astrobotic was founded in 2007 and is headquartered in Pittsburgh, PA.

AIAA LA-LV Aero Alumni August Meeting (19 August, 2020, 11 AM) (Screenshots Only)



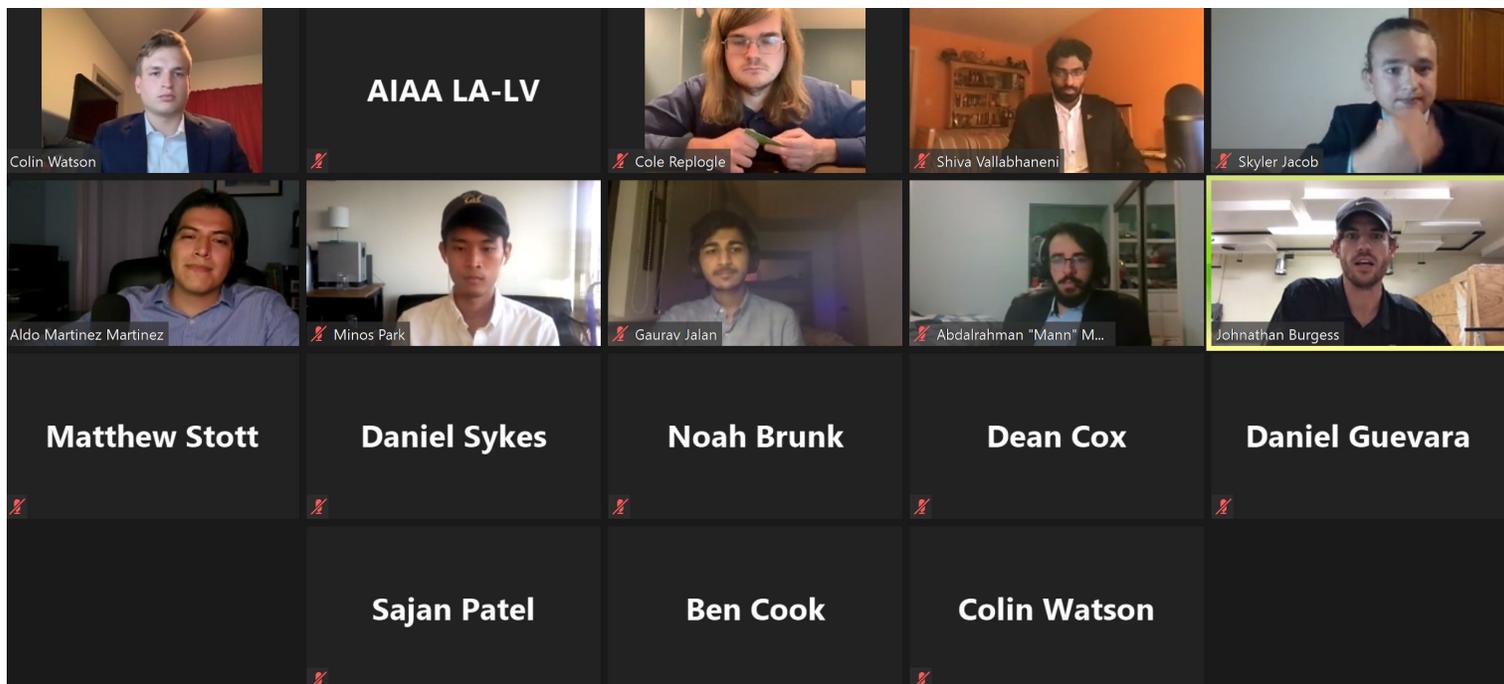
Mr. Jerry Lockenour sharing his story with a virtual backgrounds of the first flight simulator. Mr. Gary Moir led this meeting for a review of the WmoF Tour by Roy Martin on YF-23 Flying Qualities. Attendees also shared their own views and stories.



Mr. Fred Peitzman sharing a photo from his previous work experience on the Northrop's Flight Control Test Stand for YF-23.

AIAA LA-LV Project Boom Review Event (19 August, 2020, 4 PM) (Screenshots Only)

<https://engage.aiaa.org/losangeles-lasvegas/viewdocument/august-19-2020-aiaa-la-lv-proj>



The Project Boom Team members, under the mentorship of Mr. Aldo Martinez Martinez, taking turns presenting their parts of responsibilities, and answering questions from the judges.

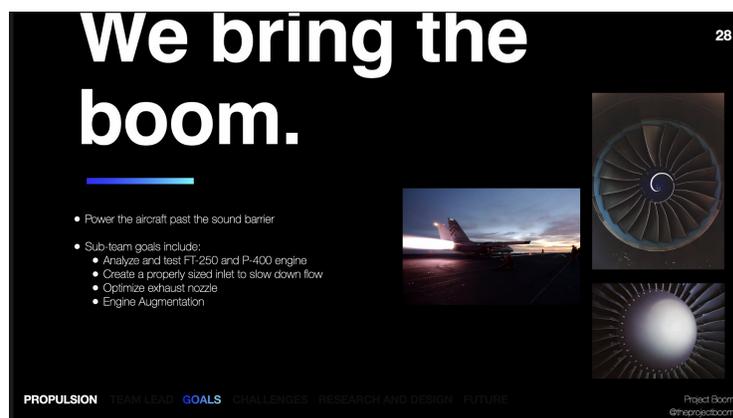


Aldo Martinez Martinez (AIAA LA-LV Membership Chair), opening the event and introducing the team members of Project Boom.



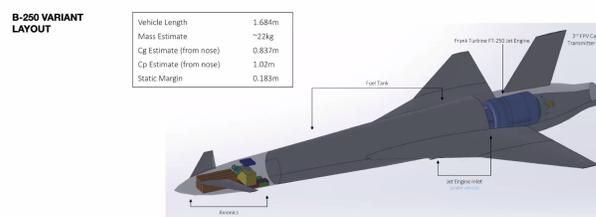
Agenda

- 4:00 PM PST – AIAA LA-LV Section Introductions
- 4:10 PM PST – Project Boom Team Introduction
 - Team Introduction
 - Judges Introduction
- 4:15 PM PST – Project Boom Presentation
- 5:00 PM PST – Judges Comments/Q&A
- 5:20 PM PST – All Participant Q&A
- 5:55 PM PST – Closing Remarks



Abdalrahman ("Mann") talking about the goal of powering the aircraft past the sound barrier, and the 4 sub-Team goals.

Component Layout



INTEGRATION TEAM LEAD GOALS CHALLENGES RESEARCH AND DESIGN FUTURE

Cole Replogle explaining the B-250 Variant Layout.



AIAA LA-LV e-Town Hall K-12 STEAM Meeting with Alan Chan and Maj. Cornelius Neil Cosentino (29 August, 2020) (Screenshots Only)

Part I: Red Rover Planetary Driving Simulator (Alan Chan)

Part II: Letters from the Cockpit (Maj. Cornelius Neil Cosentino)

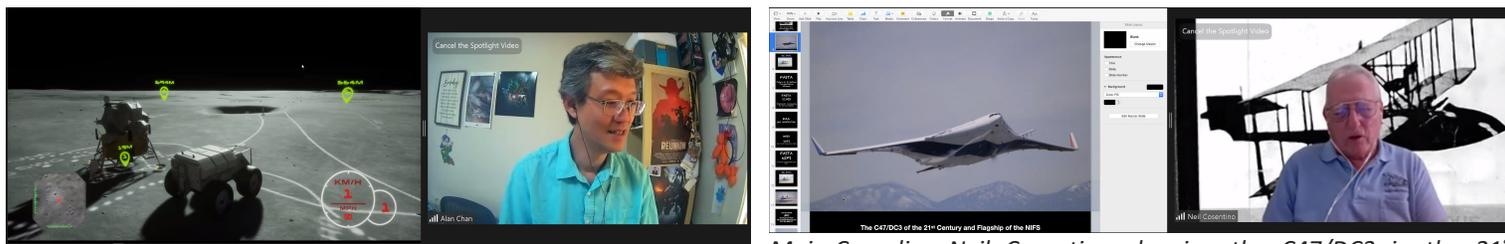
<https://aiaa-lalv.org/august-29-2020-aiaa-la-lv-k-12-stem-meeting-with-alan-chan-and-maj-cornelius-neil-cosentino/>



Mr. Alan Chan showing the fun demo of the Mars Rover Driving Simulator on Zoom, and sharing the stories of the development.



Maj. Cornelius Neil Cosentino sharing the stories of his pilot/aviator career, and also explaining what he has been doing for the future of aviation: the Small Aircraft Transportation System (SATS).

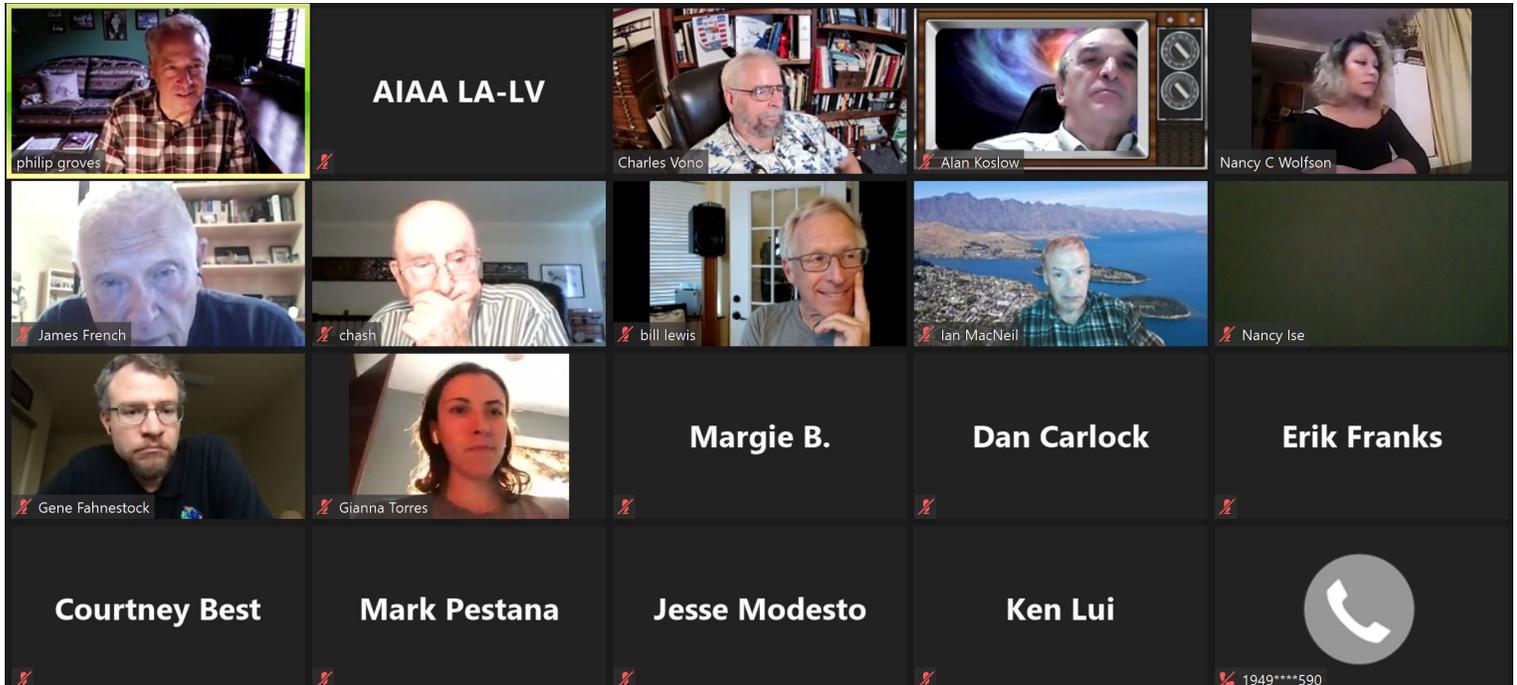


As a bonus, Mr. Alan Chan showing the new feature of the Apollo 11 Moon Landing Site recently added into his Mars Rover Driving Simulator, allowing the players to revisit the landing sites of the Apollo 11 Mission.

Maj. Cornelius Neil Cosentino showing the C47/DC3 in the 21st Century as the flagship of NIFS, and the Wright Flyer in his virtual backgrounds on Zoom.

AIAA LA-LV e-Happy Hour ! - "Asteroid Hunters" IMAX Production (2 Sept., 2020)

by Philip Groves, Writer/Producer "Asteroid Hunters"



Attendees taking turns sharing their stories and asking questions related to NEOs, Planetary Defense, Asteroids Explorations, movies, and IMAX etc, while enjoying a cheerful evening!

At the invitation of the AIAA LA-LV folks, I had the pleasure of hosting an e-Happy Hour event on September 2. It was a fun chance to share the experiences and insights I had gained in the making of my IMAX documentary, "Asteroid Hunters." (October '20 Release) I was very pleasantly surprised to find it was less a one-way presentation on my part, and more a free-flowing discourse had with other fans and experts of the scientific community. The overall experience far exceeded my expectations, especially in the way I received from others much more than I gave. The event was further enhanced by the expert organizational skills of the event organizer, who made sure it all happened perfectly. I thank the AIAA and look forward to the next e-Happy Hour, whether as a host or a participant!

Asteroid Hunters | An IMAX® Original Film | Official Trailer | Narrated by Daisy Ridley



Mr. Philip Groves showing the official trailer to the attendees, and explaining some of the fun stories in the productions, as well as what he saw in the current status of the Planetary Defense efforts in NASA, the aerospace industries, and in the society/film industries.



aiaa-lalv.org | aiaa-lasvegas.org
engage.aiaa.org/losangeles-lasvegas

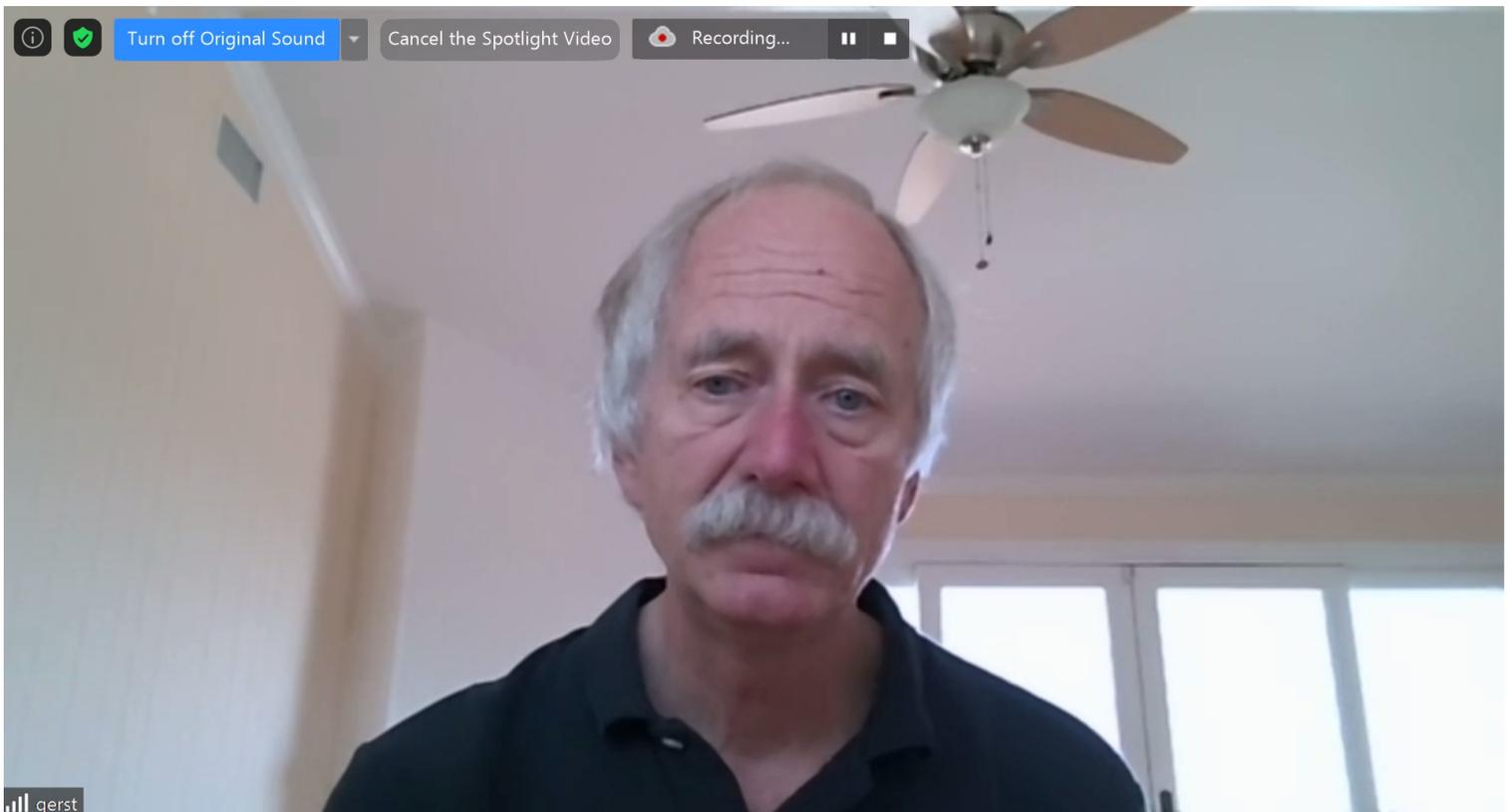
AIAA LA-LV Special Event with Dr. Bill Gerstenmaier & Dr. Dan Dumbacher (plus Dr. Bruce Banderdt and Mr. Frank Czopek) (5 September, 2020)

Part I: Dr. Dan Dumbacher (AIAA Executive Director Introduction & Introducing Dr. William H. Gerstenmaier)
Part II: Dr. William H. Gerstenmaier (International Space Station's critical role in enabling human exploration beyond low Earth orbit)

Part III: Dr. Bruce Banerdt (The InSight Mission to Mars)

Part IV: Frank Czopek (Introduction to GPS & Pre-History of GPS)
 (Screenshots Only)

<https://aiaa-lalv.org/september-5-2020-bill-gerstenmaier-spacexiss-critical-role-in-enabling-human-exploration-beyond-low-earth-orbit-dr-bruce-banerdt-jplmars-insight-frank-czopek-introduction-to/>



Dr. Bill Gerstenmaier delivering his speech and thoughts about ISS and Human Spaceflight with AIAA LA-LV on Zoom on September 5, 2020.



AIAA e-membership (Free, 1-year trial)
aiaa.org/emember

Dr. Bill Gerstenmaier (ISS) / Dr. Dan Dumbacher (AIAA)
Dr. Bruce Banerdt (Mars InSight), Frank Czopek (GPS)

Agenda/Schedule (September 5, 2020)

All Time PDT (Pacific Daylight Time, US and Canada)

10:05 AM Dr. Chandrashekar Sonwane (AIAA LA LV Section Chair) (Welcome)

10:10 AM Dr. Dan Dumbacher (AIAA Executive Director)

10:30 AM Dr. Bill Gerstenmaier (SpaceX)

12:00 PM Dr. Bruce Banerdt (Mars InSight)

01:30 PM Frank Czopek (Introduction to GPS and Pre-History of GPS)

04:00 PM Adjourn

Agenda for September 5, 2020



Dr. Chandrashekar Sonwane opening the event & welcoming people



Dr. Dan Dumbacher introducing AIAA and Bill Gerstenmaier.

(Continued on Page 19)

AIAA LA LV e-Town Hall Meeting (12 September, 2020) (Screenshots Only)

Part I: Mr. Steve Lee (AIAA) (Aerospace Cybersecurity as a main focus for AIAA)

Part II: Dr. Harold "Sonny" White (LSI) (GO INCREDIBLY FAST)

<https://aiaa-lalv.org/september-12-2020-aerospace-cybersecurity-as-a-priority-area-of-focus-for-aiaa-with-steve-lee-and-go-incredibly-fast-by-dr-harold-sonny-white/>



AIAA e-membership (Free, 1-year trial)
aiaa.org/emember

Steve Lee (AIAA) | Dr. Harold "Sonny" White (LSI)

Agenda/Schedule (September 12, 2020)

All Time PDT (Pacific Daylight Time, US and Canada)

Tentative Agenda (All Time PDT (US and Canada))

- 10:05 AM: Welcome (Dr. Chandrashekhar Sonwane)
- 10:10 AM: Steve Lee (AIAA Aerospace Cybersecurity)
- 11:40 AM: Dr. Harold "Sonny" White (GO INCREDIBLY FAST)
- 01:10 PM: Adjourn (Tentative)

Agenda for September 12, 2020 e-Town Hall Meeting

AIAA Aerospace Cybersecurity Program Overview

Steve Lee
Aerospace Cybersecurity Program Manager
12 September 2020

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Title page of Mr. Steve Lee's presentation on September 12, 2020.

Aerospace Cybersecurity Programming at AIAA

Forum Programming

- AVIATION: Steve Luczynski/Aerospace Village HUB presentation
- ASCEND: Cubesat Capture-the-Flag (CTF), Commercial Space Cyber Tabletop Exercise (TTX), Space Cyber Meta discussion; Cybersecurity Tutorial
- SCITECH: CTF, TTX, Plenary/F360/special session w/ISACs
- Online: Quarterly Aerospace Cybersecurity podcast or webinar for corporate members in development

Publications

- Daily Launch: 1-2 aerospace cybersecurity articles per day
- Aerospace America:
- Books

Learning

- Developing initial training offering (101-level)

3
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AIAA Aerospace Cybersecurity efforts led by Mr. Steve Lee.



(e-Town Hall) Sep. 12: Steve Lee (AIAA) & Dr. Harold "Sonny" White (LSI)



Aerospace Cybersecurity
as the priority area of focus of AIAA
by
Steve Lee

Aerospace Cybersecurity Program Manager
American Institute of Aeronautics and Astronautics (AIAA)



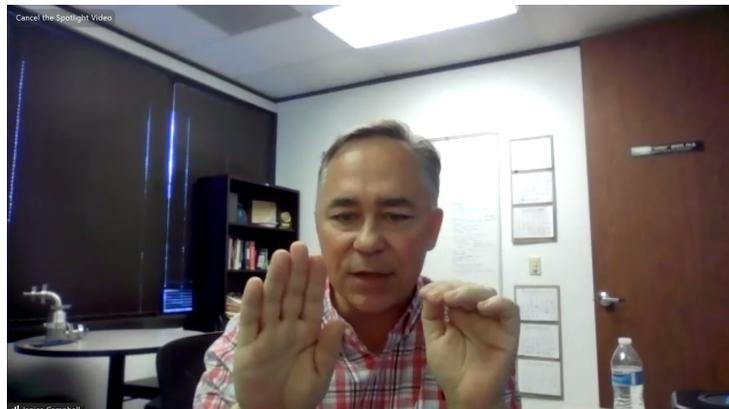
GO INCREDIBLY FAST

by
Dr. Harold "Sonny" White
Director, Advanced Research & Development
Limitless Space Institute (LSI)

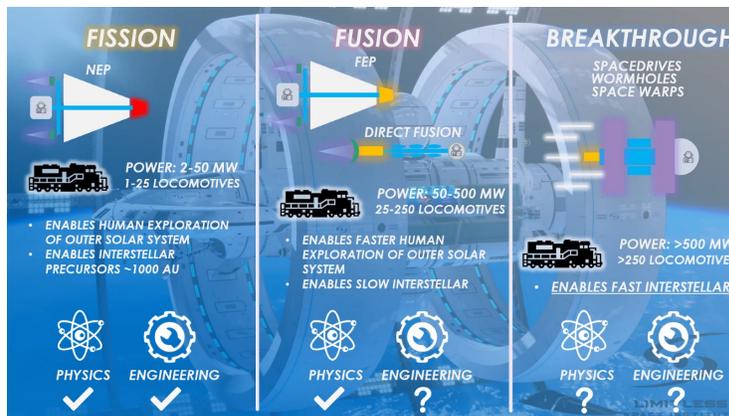
Advanced Propulsion Theme Lead, Engineering
JSC Rep to Nuclear Systems Working Group
NASA Lyndon B. Johnson Space Center



Program for the AIAA LA-LV e-Town Hall on September 12, 2020.



Dr. Harold "Sonny" White explaining the Venn Diagram between Quantum Mechanics and General Relativity.



Dr. Harold "Sonny" White projecting the possible mechanism for advanced propulsion to go incredibly fast, possibly by the end of the century.

Gerstenmaier warns against ending space station program prematurely [\(Continued from Page 1\)](#)

While NASA has discussed plans to eventually transition from the ISS to private space stations in LEO, he warned against doing so too quickly. “The push will be strong to end ISS and free up resources, predominantly dollars, for exploration. I think that’s a false trade,” he said. “ISS is still playing a very strong role in U.S. leadership.”

He argued it would take time for companies to develop the markets that can sustain private activities to the point where commercial stations are viable. “ISS is enabling the U.S. private sector companies to explore and develop commercial markets in low Earth orbit. This is going to take time,” he said. “This effort is actually critical, I believe, to establishing and making exploration sustainable into the future.”

“We don’t want to do an Apollo: a rush to a single objective and then have nothing left,” he continued. “We need to build infrastructure, leave pieces behind that the private sector can use, as well as the government, to move forward.”

Gerstenmaier said he didn’t know how long such a transition from the ISS to private facilities would take, but didn’t think there was a firm deadline for ending the station. “I don’t know that there’s a hard date where the station needs to be retired,” he said. “I think there will be probably a push to retire the station with the idea that you’re going to free up funds for exploration. That’s what I described to you as a false choice.”

NASA’s fiscal year 2019 budget request, released in early 2018, proposed ending federal funding of the ISS in 2025 as part of a LEO commercialization initiative. That proposal faced strong opposition in Congress, and NASA has not proposed a similar deadline for the station in subsequent budget requests. Past engineering studies have found that the ISS should be able to operate through at least 2028.

Gerstenmaier said it would take time for companies to explore markets for LEO activities, noting that both tourism and pharmaceutical research appeared promising. It was important, he added, to give more industry sectors access to the ISS to see how they can make use of the space environment in their fields.

“That’s the heart of the innovation that has to occur,” he said. “I don’t think I can predict where those areas are, but I think our job is to expose the world, get more people to space, let them understand what we’re seeing and understand how we’re seeing it, and turn them free to figure out how to creatively use it.”

That innovation, he said, is needed to help stimulate the commercial spaceflight industry despite the success of SpaceX’s Demo-2 commercial crew mission to the station this summer. “I think the transportation sector for crew still isn’t quite established yet,” he said. “I think we need to give that a little bit of time to mature and get ready.”

He did not discuss in his comments his reassignment from associate administrator for human exploration and operations to a special adviser in July 2019. He quietly retired from the agency late last year and, in February, became a consultant to SpaceX.

He declined to go into specifics about his work at SpaceX, but said there’s less difference between work at the company versus that at NASA than one might expect, at least from a technical standpoint.

“It’s interesting being on both sides,” he said. “The demands of human spaceflight are the same. The precision that we have to do every day to make sure our crews are safe, make sure the hardware works, are absolutely the same. There’s no forgiveness for mistakes or being lazy or not sharing. You have to be 100% focused. That’s what we’re working on at SpaceX: how do we transition and get ready to really establish a transportation system that normal people would be willing to use.”

About the Author:

Jeff Foust, Senior Staff Writer, Spacenews.com

Jeff Foust writes about space policy, commercial space, and related topics for SpaceNews.

He earned a Ph.D. in planetary sciences from the Massachusetts Institute of Technology and a bachelor’s degree with honors in geophysics and planetary science from the California Institute of Technology.

Executing Sustainment Risk Mitigations *(Continued from Page 2)*

Only, of course, it is not. Everything is as “good as old” not as “good as new”. Nothing remains quite the same. This is the reason to institute a FRACAS-like system at your repair facilities. Not just to detect early failure modes as an earlier article said, but also to increase the control you have over how your system is being subtly changed.

I have participated in far too many soul-searching meetings with our people in charge of repair, or our people in charge of finding parts, that had the exact same conversation: “But there wasn’t any change to the specification, I mean, not really.” Only to find there, of course, was.

If there is a need to institute a FRACAS-like system at the repair facilities to capture emerging failure mode data and maintain your baseline, it would be very foolish to not institute the same in production during your mods, and for the same reasons.

Being a program management function, you will also be presented with the perennial choice of paying for data now, or leaving your successors with massive headaches. Hopefully, your experiences with being on the receiving end of this as a sustainment manager will help inform your decisions.

In summary, consider empowering a deployment schedule integration team, ensure FRACAS occurs on your production lines, and buy as much data as you can justify.

Next month, we will dive into more details of CLFA. The final article the following month will conclude this series by exploring a few of the aspects of your three Complex System Sustainment Management Model enablers: people, process, and data.

About the Author:

Col. Charlie Vono
AIAA Distinguished Lecturer
AIAA Associate Fellow
USAF & TRW – Retired

Charlie Vono, an AIAA Associate Fellow, is a retired USAF colonel and retired defense contractor senior manager. In his 45 year career, he has been an operator, e.g., KC-135 aircraft commander. He has been an engineer, e.g., F16 structures. And he has been a sustainer, e.g., ICBMs. Charlie was born and raised in Wasco, California. He has a Bachelor of Science from the USAF Academy in Astronautical Engineering, a Master of Science in Systems Management from the University of Southern California, and a Master of Science in Mechanical Engineering from Utah State University. He is a graduate of Air War College. Charlie has 13 years full time active duty in Air Force and Joint assignments and 12 years part time duty in Air Force Reserve assignments. Since retiring from a major defense contractor in 2014, Charlie has been writing and presenting extensively on the sustainment of complex systems. But his most popular presentation harks back to his first USAF assignment in 1977 as a tanker pilot supporting the world-wide SR-71 mission during the Cold War. Charlie’s Dad, Mike, was a WWII B-24 ball turret gunner in Europe and his Uncle Chuck was a Navy gunner engaged in every major combat operation in the Pacific. For more information on Charlie, his other roles, his blogs about his stories (and his Dad and Uncle’s stories), his presentations and technical papers, visit charlesvono.com.

"Clear and Visibility Unlimited"... Lt. Col. Mark Hasara's 9/11 story

(Continued from Page 3)

Sitting in bed, I'm thin-slicing through the images on tv. Airliners are precision-guided weapons in the right hands, a delivery vehicle for explosive content. Is this an attack? Were Middle East terror groups like Hamas or Hezbollah involved? What's that group and their leader's name again... something Laden? Thoughts bounce in my head like a Three Wood driver in a tiled bathroom. Gut feelings scream attack in the six inches between my ears. But I cannot wrap my head around that. America does not get attacked.

A second airliner appeared in the upper right-hand corner of the tv screen, nose pointing toward Tower Two. My brain cognitive functions stopped as I focused on the jetliner's flight path. It's like I'm at a stoplight with the gearshift in neutral. The plane disappeared behind Tower One and a massive fireball exited Tower Two's north side. Val gasped, left hand over her mouth.

The military portion of my brain shifted into gear immediately, pedal through floorboards. I bolted from bed waking Travis headed for the shower.

We are under attack!

I am watching my generation's Pearl Harbor on cable news...

THE US IS NOW A NO-FLY ZONE LIKE OVER IRAQ!

All of this went through my head in the twenty feet from the bed to shower, shedding clothes running for the shower. I just wanted to shave and wash my hair because I may not be home for a couple of days. Val walked in three minutes later saying the Wing Command Post just called. I have been recalled, come in immediately. I stepped out of the shower dripping wet and looked at the clock.

0613

Val had laid a clean flight suit on the bed, boots on the floor. She then asked, "Silly question... when do you think you'll be home?"

Standing to zip up my flight suit, Fox News showed PANTA Flight, two F-15Cs from Otis National Guard Base Massachusetts zip across New York City's skyline. Eagles are on patrol over New York City... HUNTRESS controlled all east coast airspace. Good. Nothing will get by the Eagles so New York City is safe now. What's happening on the West Coast? Light Grey F-15Cs burn 8000 pounds an hour in their patrol stations, 2000 pounds a minute fighting in afterburner. Will Eagles go to

Combat Two configuration chasing airliners, dropping the centerline external fuel tank? Four ships of Eagles need eighteen tanker sorties over twenty-four hours, twenty-two if shooting missiles because external fuel tanks are punched off. Eagles will have five to six CAP stations down the west coast. Worst case, 132 tanker sorties every twenty-four hours. Call Western Air Defense Sector, callsign BIGFOOT... get Soup, a Western Air Defense Sector controller and Weapons School graduate on a secure line... how will BIGFOOT manage tankers? Is Tinker sending an E-3 AWACS to McChord or Mountain Home? AWACS needed gas every five hours... five more tankers... 137 sorties. I rounded up to 140 missions a day. Most important... what are the rules of engagement for killing a US airliner over the states? Who approved that engagement! I cannot wrap my brain around killing a US airliner over the States. Wayno, one of our CES Grads was on the road. I'm a one-man show. I'll need to talk to Wybo, the Wing Scheduler, and see what we can do.

"Hun... I have no idea. Tonight, tomorrow, maybe Friday... Gotta go. I love you!"

In the twenty-five minutes from our driveway on the North Hill to Fairchild's front gate, I'm still crunching tanker math in my head. Another thought came to me. Many of my Air Force friends are now airline pilots. Where is Pee Wee, Slider, and Flounder with Delta? Where in the US are Shredder and Zoid with American? I hope Shredder is on air defense alert in his Fresno California Guard Viper. My thirst for information is almost unbearable, and I wanted my assumptions to become fact right now. Driving along I-90 and Route 2 through Airway Heights, Spokane's law enforcement roamed the highways kitted out. Arriving at the Front Gate, a mile-long line of cars waited to pass through one lane. After waiting for forty minutes to get on base, the second situation briefing projected on the screen walking into Fairchild's Command Post. CNN and Fox News were silent on flat-screen TVs. A briefer said US airspace is closed, all air traffic is grounded and airliners are landing everywhere outside the continental US. Military aircraft are the only thing flying. Good, clear field of fire for any fighters shooting missiles at airliners.

What am I saying?

Wybo was already in Wing Scheduling working a plan. He and I immediately started a mission analysis exercise. I told him my numbers.

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Reaction Engines testing ammonia as carbon-free aviation fuel

[\(Continued from Page 5\)](#)

The idea of using ammonia as aviation fuel isn't new. Though it only has a third of the energy density of diesel, it's relatively easy to liquefy and store, and was already used by the famous X-15 rocket-plane, propelling it into space on a series of suborbital missions in the 1950s and '60s. In addition, it's carbon-free.

The tricky bit is finding an economically viable way to use it in aviation. To solve this problem, Reaction Engines produced a new propulsion system based on the heat exchanger technology it developed for its SABRE hypersonic engine, which was then evaluated by STFC's Rutherford Appleton Laboratory near Didcot in Oxfordshire.

In this new system, the ammonia is stored as a chilled, pressurized liquid in the wings of the airplane just as kerosene-based fuel is today. Heat harvested from the engine by the heat exchanger would warm the ammonia as it is pumped out and fed into a chemical reactor where a catalyst breaks down some of the ammonia into hydrogen. The ammonia/hydrogen mixture is then fed into the jet engine where it burns like conventional fuel, though the emissions consist mainly of nitrogen and water vapor.

According to Reaction Engines, the energy density of ammonia is high enough that the aircraft wouldn't need significant modifications and the engine could be retrofitted in a relatively short time. A ground-based test is in the works with a first flight possible in a few years.

"The combination of Reaction Engines' transformative heat exchanger technology and the STFC's innovative catalysts will enable development of a game-changing class of green ammonia-based aviation propulsion systems," says Dr. James Barth, engineering lead at Reaction Engines. "Our study showed that an ammonia-fueled jet engine could be adapted from currently available engines, and ammonia as a fuel doesn't require a complete re-think of the design of civil aircraft as we know them today. This means a fast transition to a sustainable aviation future is possible at low cost; ammonia-powered aircraft could be serving the world's short-haul routes well in advance of 2050."

About the Author:

David Szondy

David Szondy is a freelance journalist, playwright, and general scribbler based in Seattle, Washington. A retired field archaeologist and university lecturer, he has a background in the history of science, technology, and medicine with a particular emphasis on aerospace, military, and cybernetic subjects. In addition, he is the author of a number of websites, four award-winning plays, a novel that has thankfully vanished from history, reviews, scholarly works ranging from industrial archaeology to law, and has worked as a feature writer for several international magazines. He has been a New Atlas contributor since 2011.

The growing importance of the digital thread across the A&D product lifecycle and associated systems *(Continued from Page 6)*

- **Increasing program complexity and integration**

Program complexity is one of the primary reasons most aerospace companies suffer delays and financial losses during the execution of major programs. Issues arise because aerospace systems are becoming more sophisticated and challenging. The end customer is demanding greater innovation and improved performance. As companies seek to improve the performance of their products, they rely on more integration, electrification and software to meet customer demands.

- **Increased electrification of products** Today there is a concentrated effort toward the de-carbonization of commercial aircraft, a shift to become more carbon neutral. The emergence of electric propulsion is a direct result of many new green energy programs. But even more important, electrification has replaced the traditional mechanical, pneumatic and hydraulic systems and structures that have been in aircraft for decades changing the skills, tools and approaches needed today. Electrification will only increase over the years as it improves aircraft system reliability and maintainability.

- **Globalization** The A&D industry stretches across all corners of the world. Global competition, global suppliers and a global workforce are now commonplace. The need to collaborate and communicate effectively within engineering teams and throughout the wider workforce is of the utmost importance. Globalization also means competition is more intense with the entry of smaller, more nimble start-ups who are able to bid and compete for major new programs.

It's not just commercial companies that are embracing digitalization. Equally important to the trends mentioned is how the United States Department of Defense (DoD) is addressing digitalization. The DoD refers to the digital transformation as digital engineering and in the document "[Digital Engineering Strategy](#)" released in June 2018, the DoD discusses the planning, development and transformation of an end-to-end digital enterprise across all departments. For the DoD, this is an opportunity to go faster and reduce the acquisition costs of new programs in order to stay competitive and dominant.

[Digitalization in aerospace and defense](#)

Siemens Digital Industries Software is helping customers across the aerospace and defense industries meet their rapidly changing needs through flexible and adaptable software and business solutions. We've been leveraging our expertise gained by applying our digital solutions, which includes our comprehensive digital twin, into some of the most innovative companies to assist in the design and manufacture of world-class products and processes.

The Siemens comprehensive digital twin

A digital twin is a virtual representation of a product or process in the correct context for users or teams to analyze, study and improve upon with very little risk or financial cost. In order to be useful, a digital twin must be tied to the latest authorized configuration. The Siemens comprehensive digital twin (figure 1) extends beyond the standard definition of a digital twin because it represents a digital twin of design, simulation and analysis and is part of an open ecosystem connecting tools from multiple vendors. The three configurations of the Siemens comprehensive twin include:

The **digital twin of product** predicts physical appearances and other attributes such as performance characteristics before the actual product is built. More than just 3D CAD, the Siemens digital twin of product virtualizes machine learning, generative design and product lifecycle management to name a few examples.

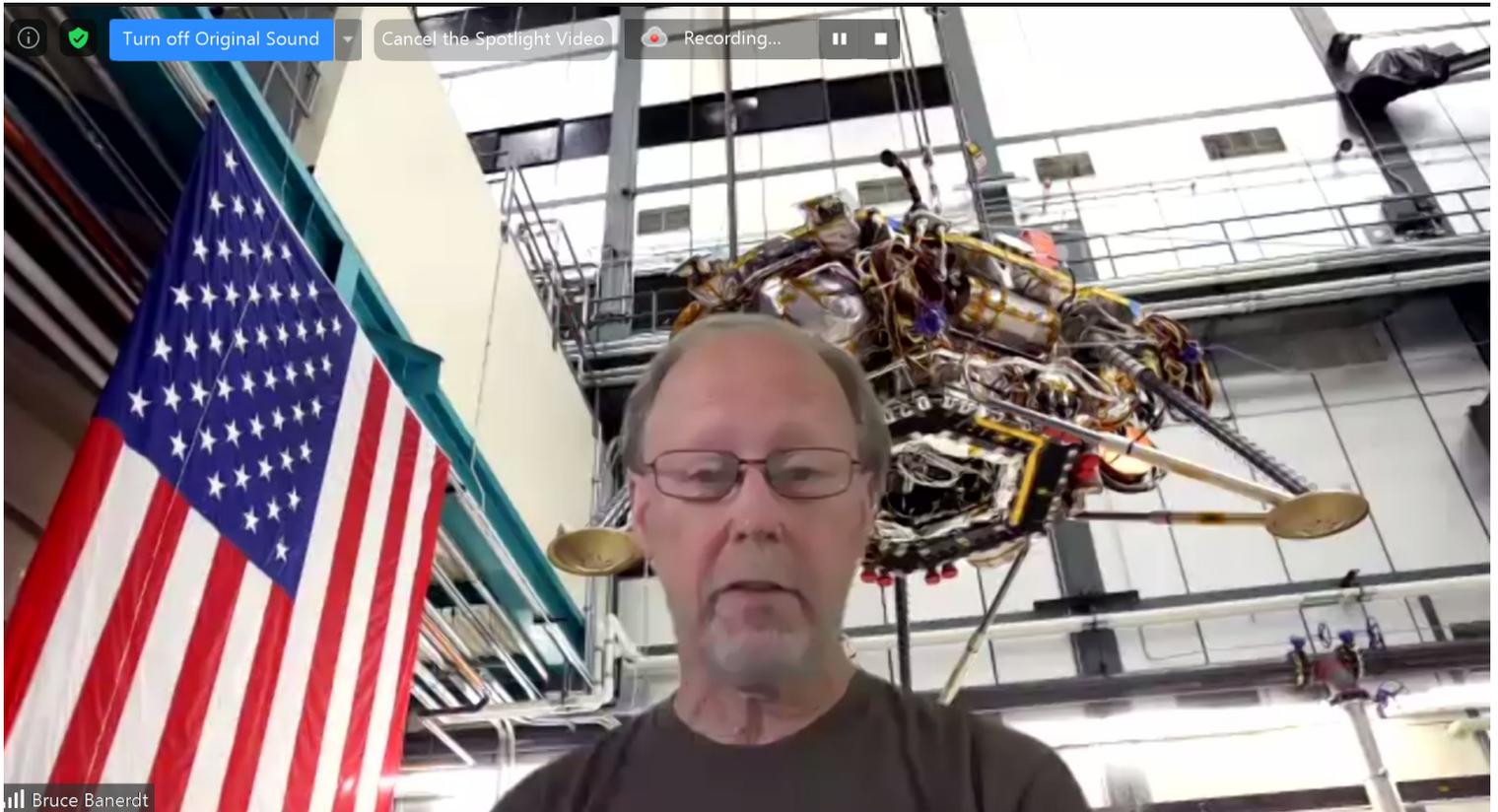
The **digital twin of production** allows for the optimization of the physical layout of production. This digital twin takes into account a variety of considerations for production capacity, virtual commissioning and utilization of resources for a more optimized throughput.

The **digital performance twin** provides insight and optimization of in-service operations to include abilities to predict maintenance aspects and validate what was produced versus what was initially designed.

The Siemens digital twin allows for the virtual testing or the "fly before you build" approach which enables users to confirm product performance and identify changes before the product is built. This approach reduces cost and schedule impacts, as well as limiting the risk to test programs. It also improves the effectiveness of a test program as users quickly understand where to focus testing to address areas of greatest concern.

[\(Continued on Page 21\)](#)

AIAA LA-LV Special Event with Dr. Bill Gerstenmaier & Dr. Dan Dumbacher (plus Dr. Bruce Banderdt and Mr. Frank Czopek) (5 September, 2020) (Continued from Page 12)



Dr. Bruce Banderdt sharing the stories, scientific discoveries, new progresses about the Mars InSight on the Martian Surface.



Mr. Frank Czopek listening and answering questions after his fun and informative talks on GPS basics and its pre-history.

"Clear and Visibility Unlimited"... Lt. Col. Mark Hasara's 9/11 story

(Continued from Page 16)

He says it's a good start, but nobody will move until they see requirements from AMC. Both of us agreed tankers and air refueling is critical. A No-Fly Zone of this scale cannot happen without a strong tanker plan. None of our Grads are at NORAD. Fairchild aircrews must be in crew rest now. If I were Commander in Chief of NORAD, what would I defend? The big west coast population centers are obvious targets. Wybo pointed to the Seattle/Tacoma area on our map. BIGFOOT is at McChord AFB south of SEATAC, a very busy airport. Well, not active anymore. Moving south to Portland, an F-15 Guard unit sits on the ramp. Passing Mount Shasta, San Francisco is the next big population center. Big targets downtown and a famous Bob Marley size bridge. Fresno Vipers probably cover San Francisco International. I hope Shredder is home and not flying an American Airlines trip. Six to eight thousand pounds every thirty to thirty-five minutes.

"Nuts, we need to add Hornets out of Lemoore to the mix."

Drogue sorties. Six to eight thousand pounds every twenty-five to thirty minutes for Hornets. Hornets are the critical fuel factor aircraft, just like they are in carrier airwing operations. I needed to know how many drogues Fairchild has available. Wybo was already working on the NO-FLY ZONE tanker plan. None of us have any direction and are doing a lot of this on the fly without authorization from Wing leadership or the TACC. Wybo coordinated two refueling areas with Canadian Air Traffic Control bringing CF-18 Hornets back to their home station of Canadian Forces Base Comox from an exercise at CFB Cold Lake Alberta. STAMPEDE just west of Calgary moved the CF-18s westward on their first hook up for gas. ORCA off Vancouver Island's west coast allowed RCF Comox Hornets to launch to the tanker in minutes. Wybo worked his planning magic on the phone through his network of people, solving complex and time-critical refueling problems because of folks he met and talked with around the water cooler. When it's crunch time in war, you always go to the guys and gals you talked with at the Water Cooler. Wybo's relationships saved us valuable resources and time on Tuesday, 9/11.

Tracing further down the California coast LA is next. Big population center and lots of traffic. Fresno Vipers sit alert at March Field in San Bernardino. The last major city is San Diego. I wrote down the mileage between each airport. The biggest problem is building and

coordinating refueling airspace with the FAA and BIGFOOT. I wanted a fluid refueling system, move anywhere whenever tankers are asked to do so but give the fighters a clear field of fire also. I looked for alternate airfields. Fortunately, there's a bunch. San Diego was the only issue, Navy North Island's 7500-foot runway is too short. KC-135s require 8000 feet but I'll tell everyone to use North Island only as a last resort.

KC-135s will be on alert like the old SAC days by this afternoon. What condition is the Fairchild Alert Facility in? Boom and drogue Spares must be part of every schedule. 9/11's tanker bill is huge, 140 sorties transferring 90,000 pounds equals 12.6 million pounds of jet fuel just for the west coast. I built a phantom list of implied and essential tasks to develop the west coast refueling system from my analysis. I still can't believe what I'm doing.

Defense of the west coast was getting off to a frustratingly slow start. Everyone waited for AMC to tell us what to do. I did not blame Wing leadership, it's an AMC cultural and institutional mindset causing us to ramp up so slowly. I'm not at Kadena... C-Liver and Bigs would have two tankers on Bravo Patio with 180,000 fuel loads, and Ammo folks hanging the "Load of Justice" on four F-15 Eagles fifteen minutes after the second airliner hit. Different Command... different employment philosophy. TACC only told us what to do after they received requirements. I knew TACC felt the same frustration as requirements slowly trickled in. Seattle and San Francisco must have air patrols overhead by now. Did anyone think to launch tankers? I realized tanking is a pickup game at this point while we waited. Wybo is leaning way forward building a flying and alert schedule but he and I can only lean so far without requirements. My frustration level was pretty high, some important basic things could be done now, but AMC will not turn a fan blade without requirements.

Wybo already had twelve crews staying in base billeting when requirements came in. 92nd Air Refueling Wing's first mission is... Montana. A critical FEMA Team needed a ride back to Washington DC from Billings. Two days later while I sat on alert the Aircraft Commander told me it was the creepiest mission he's ever flown. Lots of radio chatter with Air Traffic Control typically fills our ears as aircraft talk back and forth to ATC while flying across the US. He told me they heard not a word on the radio across the country.

(Continued on Page 22)

The growing importance of the digital thread across the A&D product lifecycle and associated systems *(Continued from Page 18)*

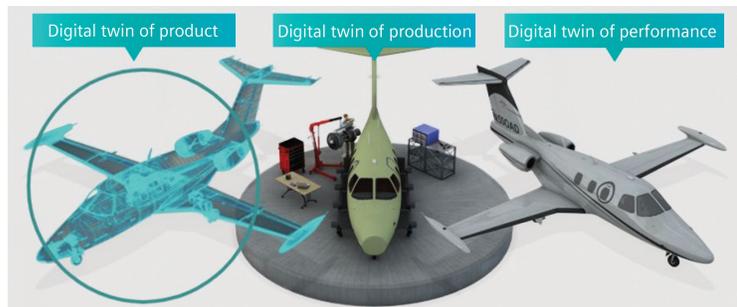


Figure 1: The value of the comprehensive digital twin is how closely the virtual world meets the physical world and how users can continuously optimize both product design and production activities.

To leverage the full potential of a digital twin, is to maximize its ability to think and understand the impact of changes from one connected twin to another, or from one connected system to the next within the product development ecosystem. This type of functionality requires a powerful, integrated and continuous exchange of digital information.

This is the role of the digital thread.

Digital thread

The Siemens digital thread brings a multiplying effect to our comprehensive digital twin by enabling numerous data processes across multiple systems. Merging the physical and digital worlds with a digital thread enables users to predict performance and optimize their product. Users are able to effectively deliver on their programs in a proven and secure manner.

One can think of the Siemens digital thread as a digital fabric that aligns with the most commonly used func-

tional programs; engineering, program management, supply chain, production, and product support. This arrangement is not a serial processes within a single function, nor are these functions intended to operate independently of one other. The exact opposite is true. With the digital thread task automation is achieved and functions are interconnected, integrated and linked so users can quickly access, share and manage program details across the entire product lifecycle – at any time, from any location.

Siemens Digital Industries Software provides the technical foundation to support our comprehensive digital twin and digital thread. The Siemens Xcelerator includes Teamcenter, for example, which weaves a digital thread and creates a fabric of information connecting people with data and applications for real-time, real-world decision making.

A&D digital thread solutions

Commercial aerospace and defense companies are embracing new technologies in ways the industry has never seen before. Siemens’ [program execution excellence](#), whether for a commercial or defense program, is based on the goal of improving technical performance, program cost, and program schedule – all while managing or mitigating risk.

To complement our digital twin and facilitate program excellence, Siemens offers seven A&D digital threads (figure 2) to serve as the digital foundation and solutions for the most commonly used processes in use today.

(Continued on Page 23)

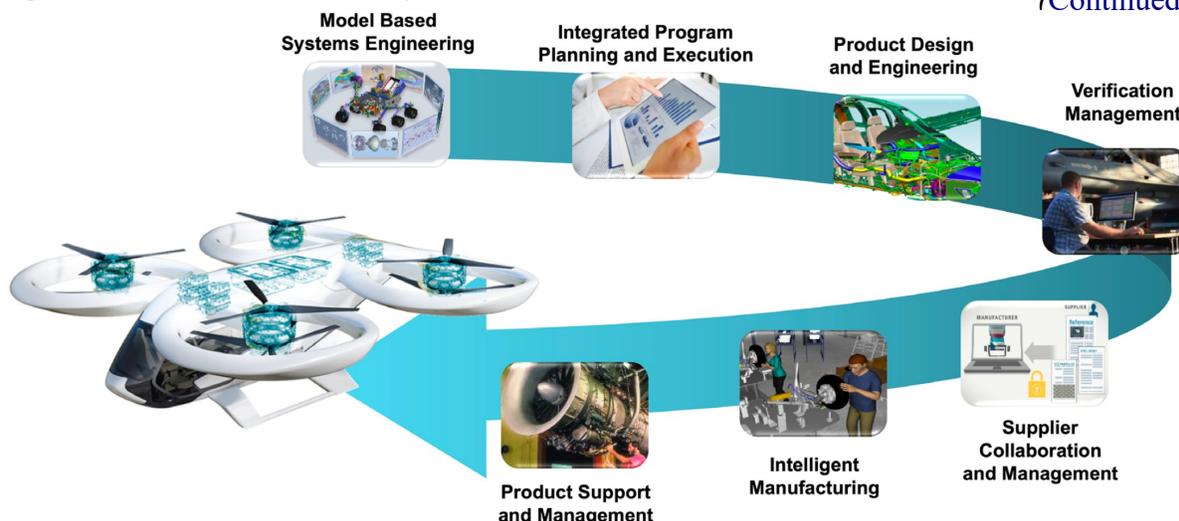


Figure 2: The seven A&D digital threads throughout the complete product lifecycle. Digital threads automate tasks and help users innovate faster and focus on areas where they can provide the most value.

"Clear and Visibility Unlimited"... Lt. Col. Mark Hasara's 9/11 story

(Continued from Page 20)

Chicago Center told them they were the only aircraft flying in their sector. Two F-16s from Selfridge Michigan joined on their wings south of Chicago for some gas. Landing at Andrews AFB, the crew waited for another assignment. They came home the next day after refueling fighters over Washington DC.

Additional missions finally started coming in. Refueling sorties for the Seattle CAP's came first. A sortie orbiting south of Portland came next. Strip Alert lines started coming in and Wybo used crews already on the day's flying schedule to fill the lines. Fairchild's old Cold War Alert Facility needed cleaning, but phones still worked. By end of the night, seven KC-135s sat in the old SAC Nuclear Alert Facility. Twelve tankers were on alert around the US when American Flight 11 hit Tower One. Over 100 tankers sat alert nationwide by Tuesday evening. Tuesday afternoon started feeling more like an air defense exercises at Kadena: air refueling made easy, launch fighters and tankers as packages. Keep fighters on the nipple until committed to attack. BIGFOOT or fighters will tell us where to relocate based on the tactical situation. My job got easier as the day grew longer. Additional fighter CAPs entered the system Wednesday morning. Hornets from Lemoore and Comox appeared on the schedule. Drogues now hung off the Booms of several tankers on Fairchild's Alert Facility Christmas Tree.

Some crews asked what's a good bingo, the name for a comfortable fuel reserve telling pilots when it's time to return to base. I told every crew to calculate three bingos: first bingo for returning to Fairchild and sleeping in your own bed. Second bingo gets an aircrew to McChord AFB south of Seattle or Travis AFB near San Francisco. Third bingo for any 8000-foot runway with a control tower and a Fixed Base Operator or FBO to fill the tanker back up with gas. Each tanker carries a fuel credit card in the Crew Entry Door or Maintenance Forms which fuel specialists charge the bill to. Call Command Post with a cell phone number after landing. I knew BIGFOOT or AWACS at some point will keep a tanker past a Fairchild bingo. Everything I did was being taught somewhere in the Employment School syllabus. Pulling up in my driveway tired, I walked through the front door late Wednesday morning, scheduled for Alert Thursday afternoon. The US-No Fly Zone and defense of our

airspace became Operation Noble Eagle on 14 September. None of us ever imagined a war defending US airspace from attack.

Between pulling alert and planning Noble Eagle missions, my crew prepared for our Incirlik Turkey deployment the following week. The evenings at home were very emotional in the aftermath of seeing thousands of lives lost in Manhattan, Washington DC, and Shanksville Pennsylvania. I held month old Travis one night in a rocking chair sitting next to our bedroom window. I'm going to miss a good portion of the first few years of his life. Rocking Travis asleep, I pondered being deployed over the next year or more looking down at him. Tears ran down my cheeks singing him asleep. Within the week three CES grads, Dewey, Rubber, and Staples received orders to deploy. Dewey hopped on the PSAB Rotator out of Baltimore for Prince Sultan Air Base Combined Air Operations Center in Saudi Arabia. Rubber and Staples headed to Florida assigned to AFNORTH and the 601st Air Operations Center at Tyndall AFB. Rubber and Staple's first task at Tyndall? Create Noble Eagle's air refueling system across the US, which they did with the utmost expertise and class.

About the Author:

Mark Hasara is a former Air Force KC-135 pilot, international businessman, and consultant in the defense industry. Directing the creation of the world's only graduate-level air refueling planning and operations course, he deployed five times after 9/11 leading a team of 30 international airmen responsible for all air refueling operations across three continents. Mark authored the book *Tanker Pilot: Lessons from the Cockpit* in November 2017 published by Simon and Schuster describing his experiences and relating them to core elements of success on the battlefield, in the boardroom, or everyday life. Delivering over 5000 presentations to military and international business leaders, he continues to write and speak about experiences and lessons learned from four wars and the business world. Mark and his wife Valerie are the parents of five wonderful kids and currently live in Utah.

(The author will speak in the AIAA LA-LV Webinar on October 10, 2020 on Air Refueling: conta.cc/3ep6vqa)

The growing importance of the digital thread across the A&D product lifecycle and associated systems *(Continued from Page 21)*

The seven A&D digital threads:

Model Based Systems Engineering (MBSE)

The MBSE digital thread brings together core elements of the Siemens collaboration platform with elements from systems engineering, mechanical, electrical/electronics (E/E), software design, multi-domain modeling and simulation. MBSE helps eliminate the unforeseen consequences that appear at system integration and establishes faster and more repeated successes in the future.

Integrated Program Planning and Execution

This A&D digital thread provides a systems-based approach to project program planning by integrating cost, schedule, risk and technical requirements into a fully planned and budgeted program management solution. This thread provides an integrated view across all domains.

Product Design and Engineering

Siemens is in the unique position to represent the entire product – digitally – in the mechanical, E/E and software disciplines. Additionally, these disciplines are served with an integrated set of Siemens tools for CAD/CAM/CAE development. By utilizing this A&D digital thread users obtain breakthrough results faster using an evolutionary process leveraging existing or prior investments.

Verification Management

The verification management A&D digital thread enables traceability for rapid certification through synchronizing requirements from design, analysis and test of virtual and physical assets. This digital industry solution instills a corporate wide standardization and the re-use of proven procedures. Not only does the thread address these concerns, but it also brings an unprecedented level of automation to a time-intensive process.

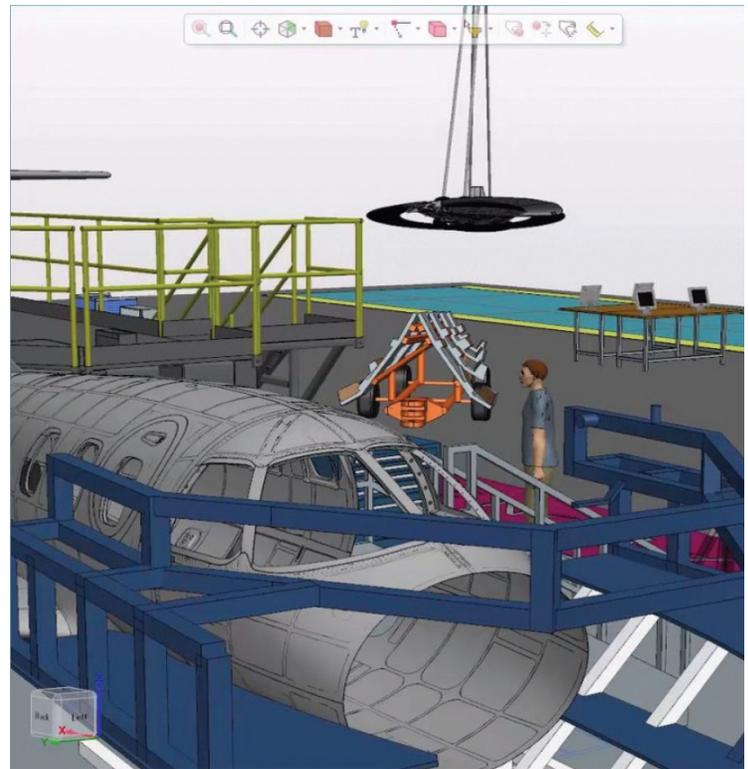
Supplier Collaboration and Management

This A&D digital thread manages data interactions, supplier source selection along with quality and deliverables for suppliers using a model-based process to help move away from document-based processes. Through this thread, along with various Siemens tools, users can coordinate processes and manage information, both internal and external, across all stages of the product lifecycle in a way that protects the data rights of all

parties involved.

Intelligent Manufacturing

The intelligent manufacturing digital thread achieves a fully integrated factory. Seamlessly moving from engineering designs to manufacturing planning, users can quickly optimize the factory layout and virtually evaluate flexible automation. Through virtual commissioning, this thread brings simulation and real-time feedback to large scale production lines and manufacturing plants. When connected to the other Siemens digital threads, users are able to create virtual aerospace and defense factories with unprecedented levels of automation, and utilize insights from the IIoT to optimize production processes.



Product Support and Management

A digital thread that enables manufacturers, owners and service organizations to support complex products within a model-based service management environment. Because this phase comprises the highest portion of an asset's total cost of ownership, it's critical for fielded products to be supported by a configuration-driven environment that provides physical, service-oriented product definitions and maintenance information.

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The growing importance of the digital thread across the A&D product lifecycle and associated systems *(Continued from Page 23)*

Conclusion

Digitalization today affects every A&D business or organization disrupting current leaders and creating new opportunities for the swift and innovative. While these opportunities are exciting, they present numerous challenges. The technology required to initiate new programs increases the level of complexity and integration along with the regulatory requirements necessary for success. We are also aware of the cultural or institutional challenges that accompany transformational change.

Siemens Digital Industries Software has carefully aligned itself to help customers meet the current and evolving conditions associated with the adoption of the digital enterprise. The Xcelerator portfolio is the mechanism and means to achieve this goal. It provides OEMs and their partners with the foundation to build and scale to a fully advanced digital enterprise that encompasses the comprehensive digital twin and corresponding digital thread solutions.

About Siemens Digital Industries Software

Siemens Digital Industries Software is driving transformation to enable a digital enterprise where engineering, manufacturing and electronics design meet tomorrow. Xcelerator, the comprehensive and integrated portfolio of software and services from Siemens Digital Industries Software, helps companies of all sizes create and leverage a comprehensive digital twin that provides organizations with new insights, opportunities and levels of automation to drive innovation. For more information on Siemens Digital Industries Software products and services, visit [siemens.com/software](https://www.siemens.com/software) or follow us on [LinkedIn](#), [Twitter](#), [Facebook](#) and [Instagram](#). Siemens Digital Industries Software – Where today meets tomorrow.

Comet Neowise Gallery 1/3



13" exposure, f2.8, iso 3200, Fujifilm x100s camera, 23mm lens. July 18, 2020, 9pm, Lockwood Valley, CA. (Courtesy of Andre Bormanis)



Photo from the backyard on JULY 19, in La Crescenta, CA (a little west of Pasadena, JPL, and the Rose Bowl), with Canon EOS Rebel at 18 mm focal length. Best time is around 9:15 to 9:45. Green color is real and is from diatomic carbon. (Courtesy of Dr. Henry B. Garrett, Fellow AIAA)

Comet Neowise Gallery 2/3



Photo from the backyard on JULY 19, in La Crescenta, CA (a little west of Pasadena, JPL, and the Rose Bowl), with Canon EOS Rebel at 300 mm focal length. Best time is around 9:15 to 9:45. Green color is real and is from diatomic carbon. (Courtesy of Dr. Henry B. Garrett, Fellow AIAA)

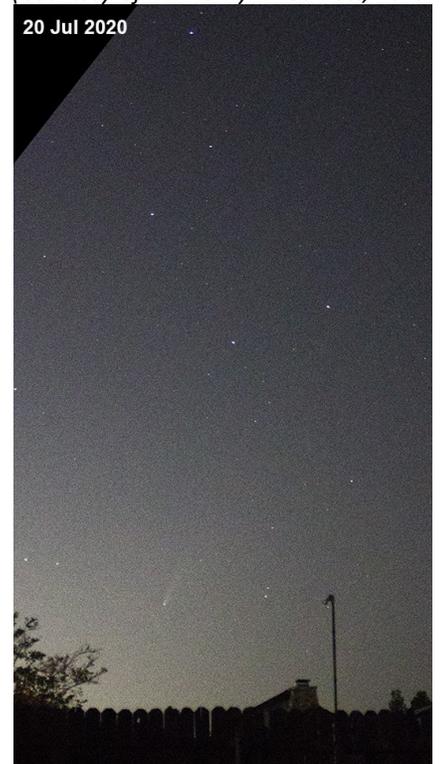
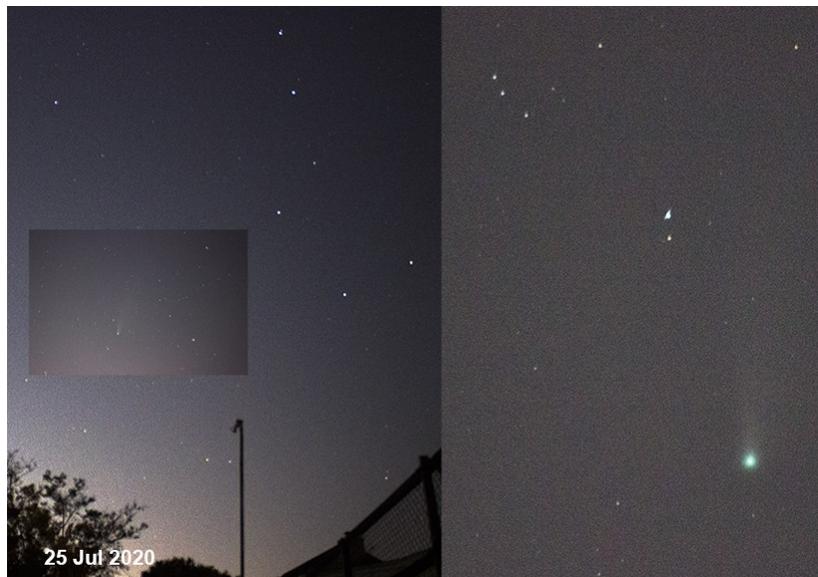


Photo from the backyard on July 19 – July 25, 2020
(also see next page)
(Courtesy of Dr. Henry B. Garrett, Fellow AIAA)

Comet Neowise Gallery 3/3



*Photo from the backyard on July 19 – July 25, 2020 (also see the previous page)
(Courtesy of Dr. Henry B. Garrett, Fellow AIAA)*

AIAA Member Spotlight Summary (25 August – 15 September)(31 August, 2020)



Left: Mark Pestana, NASA Research Pilot. Right: Pestana served as a NASA flight crew operations engineer at the cosmonaut training base in Star City, Russia, developing Soyuz spacecraft operations for the International Space Station Program. (Courtest of Col. Mark Pestana)

[Mark Pestana](#) *Pilot- Engineer-Artist* *AIAA Senior Member*

Mark Pestana, Colonel, USAF (ret), is a research pilot, aerospace human factors engineer, and consultant for NASA, DOD, and the FAA, and teaches aerospace safety as adjunct faculty at University of Southern California. He's flown over 5000 hours in over 30 aircraft types, from heavy transport to supersonic jet. As an Air Force pilot he logged 213 combat intelligence sorties. He served as an operations engineer in the NASA Astronaut Office, working in Russia developing the International Space Station and Soyuz spacecraft training. As a NASA pilot at Edwards AFB, CA, he flew aeronautics research and global Earth science mission. Besides missions collecting data on supersonic boom impact characterization, and hurricanes, atmospheric chemistry, global forestry, etc., he flew remotely piloted "drone" research on self-avoidance technology, and wildfire geo-location missions. Mark is an internationally award-winning artist, specializing in landscape, seascape, and aerospace art. His paintings are in corporate, government, and private collections. Fourteen of his paintings are in the Pentagon collection, and one of his paintings hangs in the Russian Space Mission Control Center, Moscow. Mark has the unique distinction of designing nine Space Shuttle mission patches for the astronauts. His art is in space!

"I am captivated and inspired from the great explorers of land, sea, air and space. My early influences in aviation and sciences were my father, a USAF air crew member, and my science teachers who promoted hands-on experiences, like dissecting a shark and collecting rocks in the Sierra Nevada range. The pioneering flights of the X-15 test pilots and the astronauts who ventured to the Moon gave me inspiration to pursue a science and engineering path in education and career. Similarly, my childhood pastime of drawing and coloring evolved into a serious avocation thanks to the inspiration of famed aerospace artists, like Chesley Bonestell's visions of planetary exploration, and the mentorship of Robert McCall and Keith Ferris. As a volunteer board member for a non-profit STEM outreach corporation, I promote the creative relationships between the art and engineering processes to inspire youth...the "STEAM" approach. I attempt to convey the inherent art and science behind the emotion, wonder, and excitement of these subjects, depicting themes in aviation, space, landscapes, and seascapes...on Earth and beyond." <https://pestanafineart.wordpress.com>

AIAA Member Spotlight Summary (25 Aug. – 15 Sep.)(31 August, 2020)



Mark Pestana painted "The Silent War", depicting his Cold War experience piloting RC-135 Signals Intelligence reconnaissance missions, which now hangs in the USAF Pentagon collection.

AIAA Member Spotlight Summary (25 Aug. – 15 Sep.)(8 September, 2020)**Michael Staab**

***AIAA Senior Member (Early Adopter),
Fault Management and System Autonomy Principal Engineer for
Lunar Missions at Northrop Grumman Corporation***

Michael Staab is a Fault Management and System Autonomy Principal Engineer for Lunar Missions at Northrop Grumman Corporation. In this role, he supports the Gateway and Human Lander System missions as part of NASA's Artemis Program, providing fault management and system autonomy design for the Habitation and Logistics Outpost (HALO) module and the Blue Origin, Lockheed Martin, Northrop Grumman, and Draper Laboratory National Team HLS entry. In his previous roles with NASA's Jet Propulsion Laboratory, he was a Fault Protection and Flight System Systems Engineer for the NASA-ISRO Synthetic Aperture Radar Mission, a Spacecraft Systems Engineer and Flight Director the Mars Exploration Rover Opportunity, and Flight Controller for the Cassini mission, and a Mission System Systems Engineer for the Mars Perseverance Rover. Michael is a PhD Student in the Department of Astronautical Engineering in the Viterbi School of Engineering at the University of Southern California, under the advisement of Prof Azad Madni and Prof Daniel Erwin. His research interests include system autonomy, system resiliency, machine learning, and fault protection. Additionally, Michael is an Aerospace Engineering Duty Officer in the United States Navy Reserves. Assigned to Naval Air Systems Command (NAVAIRSYSCOM), he supports the Naval Aviation Enterprise (NAE) with the acquisition, development, testing, and deployment of air and weapons systems to fleet operators conducting joint operations around the world. With a lifelong fascination in spaceflight, Michael was inspired from an early age with the successful landing of the Mars Pathfinder mission, John Glenn's flight aboard Space Shuttle Discovery, and frequent trips to the Kansas Cosmosphere and Space Center; he is an aspiring NASA Astronaut, having applied twice to NASA's Astronaut Candidate Program. Michael holds a Bachelor's of Science in Aerospace Engineering from Wichita State University and a Master's of Science in Aerospace Engineering from the Georgia Institute of Technology.

Volunteers are needed for all AIAA activities, please contact cgsonwane@gmail.com

RSVP and Information: <https://conta.cc/2Y1WjyS>

AIAA LA LV 9/19 e-Town Hall Meeting

**Saturday, September 19,
2020, 10 AM PDT
([Add to Calendar](#))**

**University Cubesat
Work During
the COVID-19 Pandemic**



with

Prof. Scott Palo

*Victor Charles Schelke Endowed Professor
Ann and H.J. Smead Department of Aerospace Engineering Sciences
University of Colorado Boulder, and
Chair, AIAA Small Satellite Technical Committee (SmSTC)*
and

the students:

*MAXWELL – Matt Zola
CU-E3 (To be launched on Artemis-1) – Brodie Wallace
CIRBE – Evan Bauch*

***AeroDesign Team of USC:
The 2019-2020 AIAA DBF
1st Place Winners***

with

AeroDesign Team of USC

***Randi Arteaga, Program Manager,
Chair, AIAA USC Student Branch
Drew Hudock, Chief Engineer
Colton Bullard, Payloads Lead
Erin Pugh, Landing Gear Lead
Diana Salcedo-Pierce, Structures Lead
Jack Ahrens, Aerodynamics, Stability & Control Lead
Jackson Markow, Performance Lead
Mikell Myers, Propulsion Lead***

***The Nuclear Thermal Propulsion
Rocket (NTPR)***

with

Valerie Lawdensky

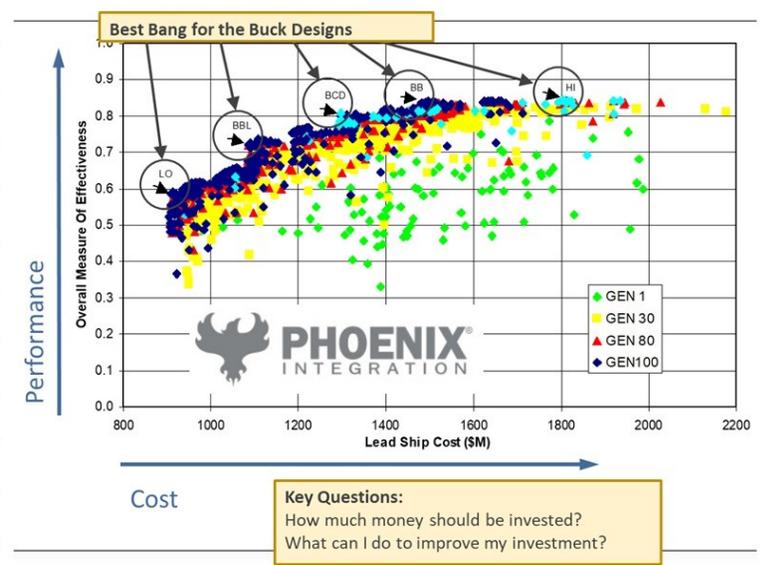
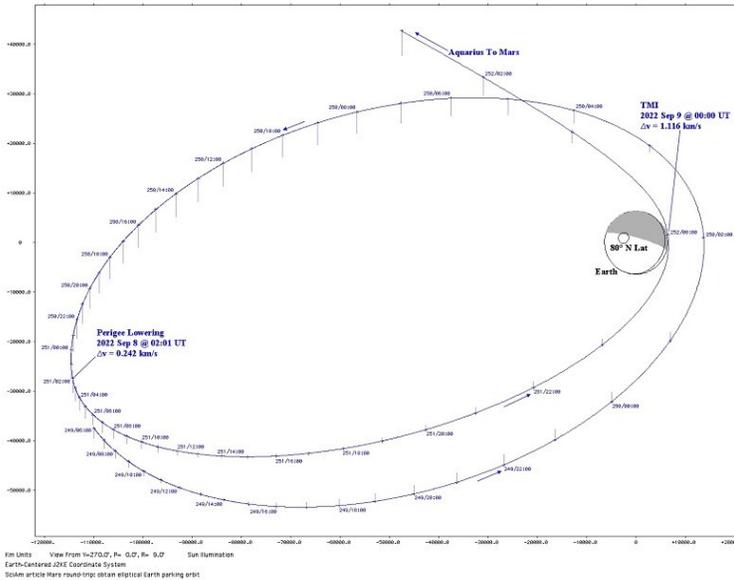
*PhD candidate in nuclear and thermal engineering at
UNLV
and
Graduate Research Assistant at Los Alamos National
Laboratory*

[events.aiaalav@gmail.com] [<http://aiaa-lalv.org/>]



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Volunteers are needed for all AIAA activities, please contact: cgsonwane@gmail.com



AIAA LA LV e-Town Hall Meeting 9/26
Saturday, September 26, 2020, 10 AM PDT (Add to Calendar)
Aquarius, a Reusable Water-Based Interplanetary Human Spaceflight Transport
by



Daniel R. Adamo
AIAA Distinguished Lecturer
AIAA Associate Fellow
Independent Astrodynamics Consultant
NASA JSC – Retired

ModelCenter: Performing Multidisciplinary Analysis and Optimization (MDAO) and enabling Model Based Systems Engineering (MBSE)

by



Tony Davenport

Regional Manager, Phoenix Integration

RSVP and Information: conta.cc/2BwZaaJ

Questions about Events/Program: events.aiaalalv@gmail.com



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engage.aiaa.org/losangeles-lasvegas

Volunteers are needed for all AIAA activities, please contact: cgsonwane@gmail.com



*AIAA LA-LV Career Development Webinar:
Tuesday, September 29, 2020, 12 - 1 PM PDT ([Add to Calendar](#))*

RSVP and Information: <https://conta.cc/2Zq3voY>

Finding Your Path: Career Development in Crisis Setting a Path through Times of Career Transitions

***Speaker: James E. Kowalski
AIAA LA-LV Career and Work Force Development Chair***



After 19 years at JPL, and 15 years in computer and semiconductor industry, Jim retired. Jim started his consulting firm, JKFGA, and worked for Maryland-based Intelligent Designs, Inc. and Transformational Security, Inc. on digital signal processing applications, including SDR. After 5 years, Jim was approached to work for Bastion Technologies, Inc., as a Subject Matter Expert in Reliability Analysis. He supported the Mars2020 processor, doing reliability analysis on the RAD750 single board computer, an upgrade of the Mongoose used in SRTM.

Questions about Events/Program: events.aiaalav@gmail.com

Volunteers are needed for all AIAA activities, please contact: cgsonwane@gmail.com

AIAA LA LV e-Town Hall Meeting 10/3

Saturday, October 3, 2020, 10 AM PDT (Add to Calendar)



Mission to Pluto and Beyond

by

Alice Bowman

AIAA Distinguished Lecturer

AIAA Associate Fellow

NASA New Horizons Mission Operations Manager (MOM),
Space Mission Operations Group supervisor,
Principal Professional Staff at the
Johns Hopkins Applied Physics Laboratory (APL)



"Electric Aircraft Survey, Applications and Trade-offs"

by

Dr. Rhon Williams

Program Manager at Northrop Grumman – Retired, Aviator,
FAA Safety Team Representative

RSVP and Information: conta.cc/38P1UfW

Questions about Events/Program: events.aiaalav@gmail.com

Volunteers are needed for all AIAA activities, please contact: cgsonwane@gmail.com
Saturday, October 10, 2020, 10 AM PDT ([Add to Calendar](#))



AIAA LA-LV e-Town Hall Meeting 10/10

Inventing the Joint Strike Fighter

by

Dr. Paul Bevilaqua

AIAA Fellow

AIAA Distinguished Lecturer

**Chief Engineer of the Skunk Works
Lockheed Martin Corporation**

Air Refueling

Mark R. Hasara, Lt Col, USAF, (ret)

***Author of Tanker Pilot: Lessons from
the Cockpit***

**Professional Speaker: Aviate, Navigate, and
Communicate**

**Founder of Wall Pilot: Aviation graphics for the walls of
your home or office**

RSVP and Information: conta.cc/3ep6vqa

Questions about Events/Program: events.aiaalav@gmail.com



Volunteers are needed for all AIAA activities, please contact: cgsonwane@gmail.com

Saturday, October 31, 2020, 10 AM PDT ([Add to Calendar](#))

AIAA LA LV Special Event **AIAA LA LV Celebrates the 20th Anniversary of the International Space Station**

with

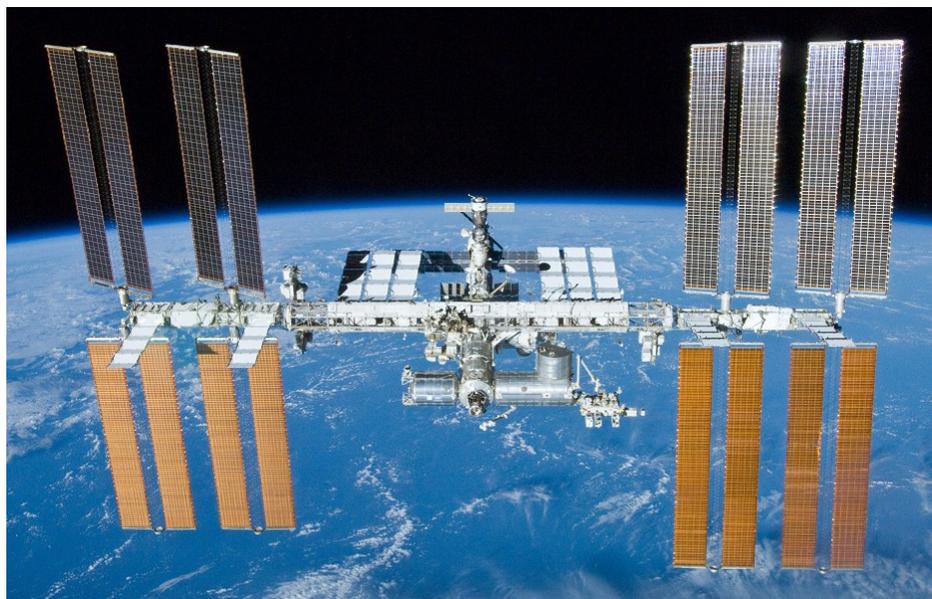
authors from the Outward Odyssey series of spaceflight history books:
[David Hitt \(Moderator\)](#), [Francis French](#), [Emeline Paat-Dahlstrom](#), [Jay Chladek](#)
(ISS and Beyond: A Historical Perspective on Life in Space)

[Larry A. Trager](#) and [Dr. Cheng-Yi Lu](#)
Aerojet-Rocketdyne
(Aerojet-Rocketdyne Space Station Power Systems)

[Mr. Liam Kennedy](#)
Inventor of the ISS-Above
Former President, Orange County Astronomers
Former Griffith Observatory Planetarium Lecturer
Former NASA/JPL Solar System Ambassador

(ISS-Above, a Raspberry Pi gizmo that presents a rich set of live information about the ISS including live video views of the earth)

RSVP and Information: conta.cc/2O1AaGu



(More Speakers TBD)

Questions about Events/Program: events.aiaalav@gmail.com

Volunteers are needed for all AIAA activities, please contact: cgsonwane@gmail.com
Saturday, November 7, 2020, 10 AM PDT (Add to Calendar)

AIAA LA-LV e-Town Hall Meeting 11/7

Perlan Project Glider Soars into History

with

Jim Payne

CHIEF PILOT | BOARD MEMBER

The Perlan Project

Test Pilot / Instructor, United States Air Force Academy - Retired

Consultant with NASA

Manager, Northrop's Global Hawk Program

Test Pilot, Northrop's Firebird Program

Test Pilot of the Year - Kincheloe Award, SETP.

2019 Guinness Book of Records Aviation Page

Inspiration and Patriotism Award, Living Legends of Aviation (2018)

RSVP and Information: <https://conta.cc/32Eu100>



SURFING IN THE SKY

Glider pilots have surfed on mountain waves since 1932. The process is like surfing on a wave in the ocean, except the glider is in the wave rather than on the surface of the wave. Einar Enevoldson, a NASA Test Pilot, saw evidence that in regions closer to the Poles, in winter, the waves could extend above the troposphere and well into the stratosphere. Previously, no one had searched for waves in the stratosphere in sub-polar regions in winter. From 1992 until 1998 he gathered more evidence that these waves existed, and might be strong enough to lift a sailplane to remarkable altitudes. In 1998 Dr. Elizabeth Austin joined Einar in the search for an understanding of stratospheric mountain waves. She found that the Polar Vortex, and one of its principal components, the stratospheric polar night jet, existing only in winter, provided the high speed wind in the stratosphere that powered incredibly high waves. The Perlan Project was formed to explore these waves and soar them to the edge of space.

Jim Payne started soaring at the Air Force Academy in 1971. At the Academy he made his first wave flight and was immediately hooked. His paper for his senior technical writing course was "A Report on High Altitude Sailplane Flight." He graduated Outstanding Cadet in Soaring in 1974. He flew the F-4, F-5, F-16, F-16XL among other aircraft for the Air Force. Jim was the first pilot selected to pioneer the Air Force Institute of Technology master's with a follow-on assignment to AF Test Pilot School. He turned down a full ride to Stanford since it was not coupled with TPS. In 1983 Jim earned his Gold and Diamond Altitude legs in a SGS 1-26 in the Tehachapi wave. When he was assigned to the staff at the US Air Force Test Pilot School he was part of the Soar Eagle Project. The team equipped a Grob 103 with a pressure suit system. Soaring in this sailplane Jim earned a Triple Lennie Pin for a flight to 42,200 feet. With the advent of GPS flight recorders, Jim pioneered wave speed records.

Volunteers are needed for all AIAA activities, please contact: cgsonwane@gmail.com

Saturday, November 14, 2020, 10 AM PDT (Add to Calendar)

AIAA LA-LV e-Town Hall Meeting 11/14

43rd Anniversary of the Voyagers 1 & 2

Voyager 1 & 2: Humanity's Most Distant Explorers

with Special Notes on Uranus and Neptune

by

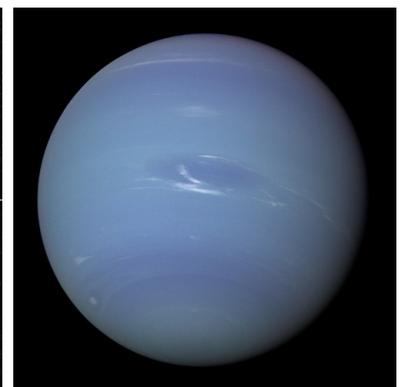
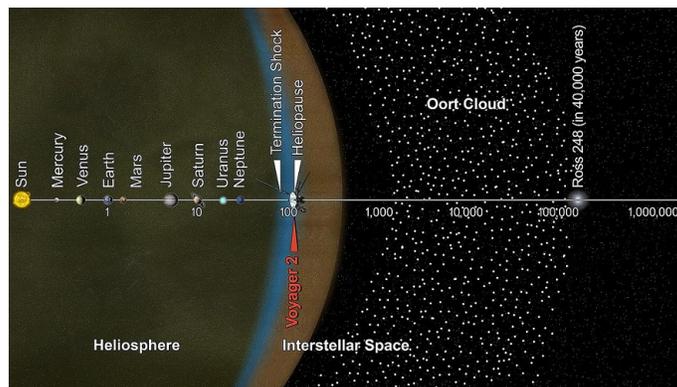
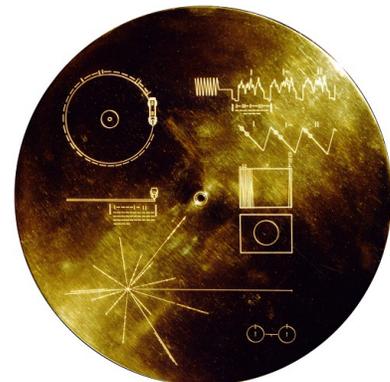
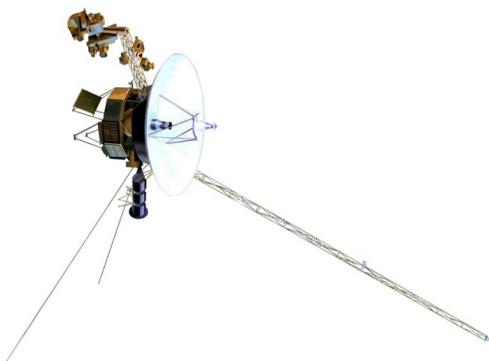
Todd Barber

AIAA Distinguished Lecturer

Senior Propulsion Engineer

NASA Jet Propulsion Laboratory

RSVP and Information: conta.cc/2OkJqe0



(More Speakers TBD)

Questions about Events/Program: events.aiaalav@gmail.com

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