

AIAA APRIL 2022

LOS ANGELES
- LAS VEGAS NEWSLETTER EL SEGUNDO, CA



DAN DUMBACHER

Congress must act
now to avert a
catastrophe in space

AX-1 MISSION

History's first private
mission to the International
Space Station

ROBERT ZUBRIN

How We Can Get
Clean Energy—Fuel
and Human Progress



04

(Cover Story) Ax-1 crew returns safely to Earth, successfully completing first all-private astronaut mission to ISS



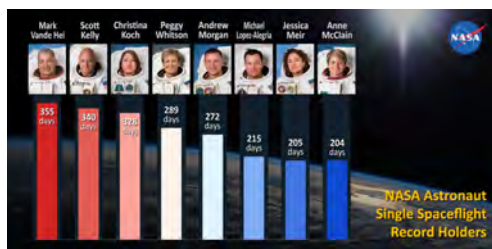
14

(Cover Story) How We Can Get Clean Energy—Fuel and Human Progress (Dr. Robert Zubrin)



23

Is Webb at Its Final Temperature?



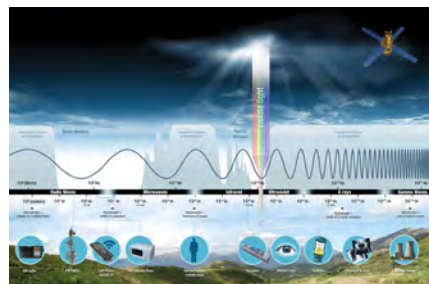
30

NASA Station Astronaut Record Holders



19

Pegasus
(by Dr. David H. Levy)



24

NASA Uses Moonlight to Improve Satellite Accuracy



31

Innovative 3D Telemedicine to Help Keep Astronauts Healthy



12

(Cover Story) Congress must act now to avert a catastrophe in space (Dan Dumbacher)



21

Webb reaches alignment
Perseverance Rover Captures Video of Solar Eclipse on Mars



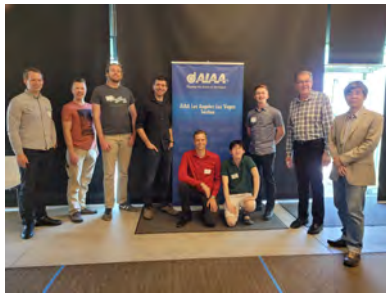
27

Record Broken: Hubble Spots Farthest Star Ever Seen



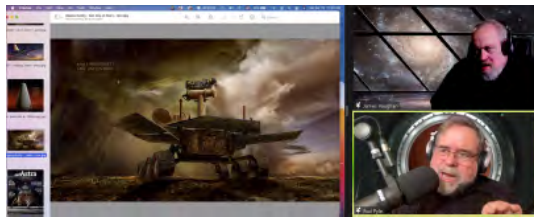
33

(April 1) AIAA LA-LV Section Exhibition Table/Booth in Washington Elementary School



35

(April 9) The Advent of Interplanetary Small Spacecraft (and the Enabling of COTS-based Robotic Explorers), by Dr. Andrew Klesh



37

(April 16) Aerospace Art with James Vaughan: Aerospace Art – Defense Illustration putting the 'G-Whiz' back in Aerospace Illustration (interview by Mr. Rod Pyle)



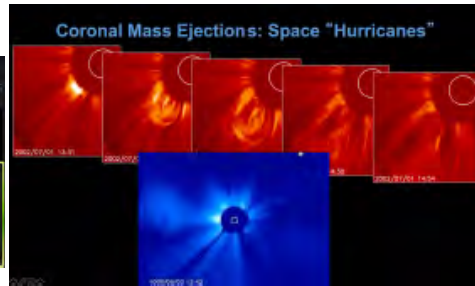
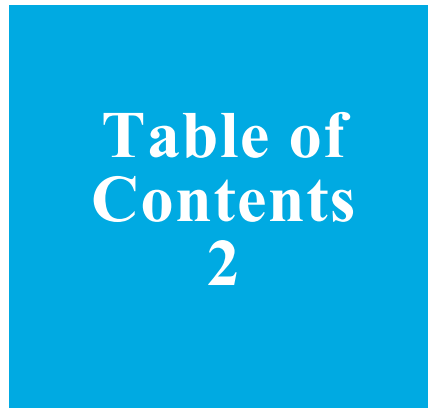
42

Congratulations to 2022 Class of AIAA Associate Fellow: Dr. David E. Lee



48

Professional activities: AIAA member, Distinguished Speaker, and X-15 Book Author, Ms. Michelle Evans; Exhibition in the Joe Walker Middle School 50th Anniversary Celebration



38

(April 23) AIAA LA-LV New Space mini-Conference 2022, with Keynote by Dr. Henry Garrett



43

Professional activities: Books authored by some AIAA members and aerospace professionals in recent years



51

AIAA LA-LV Aerospace News Digest



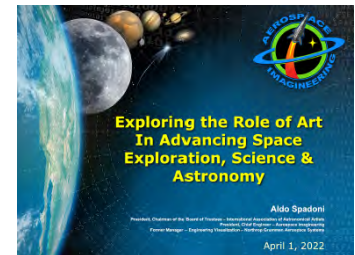
36

(April 13) AIAA LA-LV Aero-Alumni Meeting



41

Congratulations to 2022 AIAA Membership Upgrades, Anniversaries, and Awards!



46

Professional activities: AIAA member and aerospace artist, Mr. Aldo Spadoni: Exploring the Role of Art In Advancing Space Exploration, Science & Astronomy with Planetarium Negara in Malaysia in a celebration of Global Astronomy Month



52

Upcoming AIAA / LA-LV Events

(Cover Story) Ax-1 crew returns safely to Earth, successfully completing first all-private astronaut mission to ISS

by Axiom Space, 2022 April 25, <https://www.axiomspace.com/news/ax1-crew-returns-safely>



The Ax-1 astronauts safely returned to home to Earth on April 25th at 12:06 PM ET. (Courtesy of SpaceX)

HOUSTON 25 April 2022 - The Axiom Mission 1 (Ax-1) crew and the SpaceX Dragon spacecraft safely splashed down off the coast of Florida at 1:06 p.m. ET, Monday, April 25. The Ax-1 crew's arrival back to Earth officially concludes the first all-private astronaut mission to the International Space Station (ISS), successfully demonstrating Axiom Space's ability to integrate with the ISS and conduct meaningful research.

During their 17-day mission, Ax-1 Commander Michael López-Alegría, Pilot Larry Connor, and Mission Specialists Eytan Stibbe and Mark Pathy worked aboard the orbiting laboratory for 15 days. They flew approximately 6.3 million miles, about 240 orbits of Earth. Among the many highlights:

- Ax-1 supported 26 science payloads and technology demonstrations that had been curated with leading academic and research partners around the globe, including the Mayo Clinic, Montreal Children's Hospital, Cleveland Clinic, and the Ramon Foundation, as well as research investigations from Axiom's partners such as studying self-assembling technology for future space habitats, devices to purify air on space stations, and more;
- The Axiom astronauts served as research subjects to better understand the impacts of microgravity on the human body, as well as methods for maintaining connectedness to loved ones on Earth during space travel; and

Advertising space is available in the AIAA Los Angeles-Las Vegas Newsletter:

Business card, quarter page, half page, and full page.

The newsletter has over 8,200 subscribers, which is growing.

**To inquire about purchasing advertising, email Newsletter Editor at
editor.aiaalav@gmail.com**

(Cover Story) Ax-1 crew returns safely to Earth, successfully completing first all-private astronaut mission to ISS

- The Ax-1 crew shared the excitement of expanded access to space with a new generation of space explorers, participating in over 30 STEAM (science, technology, engineering, art and math) engagements. Outreach efforts were conducted in English, Hebrew, Spanish, French, and Arabic

In keeping with the mission's emphasis on scientific discovery, within hours of splashdown and recovery, the astronauts will take part in post-flight studies such as providing biomedical and physiological data for researchers at the Translational Research Institute for Space Health to gauge the effects of spaceflight on the human body, including changes in vision, balance, and perception.

"Axiom Space is incredibly proud of this mission and these astronauts, whose training rigor and commitment to a robust research portfolio set the standard for future private spaceflight," said Michael Suffredini, President and CEO of Axiom Space. "The Ax-1 mission is a pathfinder, showing the value of this new method of access to orbit and progress toward Axiom Station, a next generation platform in which the benefits and products of life, work and research in space will be available to a greater number of people."

Ax-1 is the first of several planned Axiom missions to the ISS and is an important step for Axiom Station, the first commercial space station that will serve as a global academic and commercial hub. The success of Ax-1 provides valuable insight as Axiom Space works toward Axiom Mission 2 (Ax-2), the details of which Axiom Space is negotiating with NASA.

"The success of this first private astronaut mission to the International Space Station is an important step in opening opportunities for space travelers and achieving NASA's goal of enabling commercial business off the planet in low-Earth orbit," said NASA Administrator Bill Nelson. "This progress has been made possible by NASA's work with private industry – especially the Commercial Crew Program. I'm incredibly proud of the NASA, SpaceX, and Axiom teams for safely completing this landmark mission. Welcome home, Ax-1!"

SpaceX's Falcon 9 launched Dragon and the Ax-1 crew to the ISS on Friday, April 8. Seventeen days later, Dragon and the Ax-1 crew undocked from the space station at 9:10 p.m. ET, Sunday April 24. The Ax-1 mission, the first all-private mission with a commercial spacecraft, highlights the important role of commercial companies to expand access to low-Earth orbit. Ax-1 represents the first of four private human spaceflights that Axiom Space has contracted with SpaceX to transport the crew to and from the orbiting laboratory.



The crew provided the following statements on their return:

Michael Lopez-Alegria, Ax-1 Commander, vice president of business development at Axiom Space, former NASA astronaut

"It's remarkable to think what was once a dream of visionaries is now a reality as we have officially opened a new era in human-spaceflight with Ax-1. This mission pushed the boundaries further and beyond and opened the door to a future that allows access to Space for a much broader and more international audience", noted Ax-1 Commander

(Cover Story) Ax-1 crew returns safely to Earth, successfully completing first all-private astronaut mission to ISS

Michael López-Alegría. "The Ax-1 mission would not have been possible without the remarkable team of professionals at Axiom Space, NASA, SpaceX, training teams, our personal friends and family, and so many others who, through sheer passion, enthusiasm, hard work, and resilience helped us to succeed and navigate this uncharted path. On behalf of myself and the Ax-1 Crew, we thank you all. Going to Space is an amazing adventure, but more than anything else, it offers perspective in the most literal sense. You see the world differently and come home with a new frame of reference- a new way of looking at the world. I am personally grateful to have had this opportunity once again, particularly to have shared this experience with Larry, Eytan, and Mark - Thank you! It's an incredible honor to share this journey with you all. Plvs Vltra."

Larry Connor, Ax-1 Pilot, entrepreneur and non-profit activist investor:

"I feel like our training prepared us for the logistics of space travel and the research for which we were responsible. And I feel like some of my previous endeavors prepared me for some of the unknowns that come with space travel. But I don't think there's anything that can truly prepare humans for the sights and feelings that come with circling the globe every 90 minutes. The ISS is a technical marvel. It is complex and busy. The amount of groundbreaking research happening in this flying orbiting laboratory is really breathtaking. And this isn't just for the United States, this is for all humanity. This was a humbling experience. I hope we've played a role – however small – in allowing future generations to have similar experiences," said Connor.

Eytan Stibbe, Ax-1 Mission Specialist, impact investor and philanthropist:

"I've had the honor of being part of Ax-1, the first private crew mission to the International Space Station, and leading the Rakia Mission. The underlying goal of Rakia is to recognize the prospective benefits of space exploration, through it we all aspired to draw on the curiosity associated with human space travel and unleash its creative potential. It aspires to raise awareness of the importance of preserving Earth's limited resources and fostering commitment to international collaborations and the advancement of space research" says Eytan Stibbe, Impact Investor, Philanthropist, and Ax-1 Mission Specialist. "During the mission days dozens of scientific experiments which were developed by Israeli researchers and scientists were conducted onboard the space station, and students, educators, researchers, intellectuals, and the general public were stimulated by the exposure to it, and to the demonstration of the use of Israeli technology. On the educational level, Rakia enabled live transmission of educational content to hundreds of thousands of Israeli students in Hebrew, for the very first time from the ISS. In addition, Rakia presented a unique opportunity to see Israeli art projects being formed and exhibited in space. Rakia Mission and the people behind it prove that "no dream is beyond reach". I am excited to see the impact of the mission continue for years to come and to meet the many partners that created this mission and contributed to its' success upon my return to Israel," said Stibbe.

Mark Pathy, Ax-1 Mission Specialist, entrepreneur, investor, and philanthropist:

"Joining the Ax-1 mission to the International Space Station has provided me with a unique platform to contribute to science that aims to tackle important issues affecting life on Earth, as well as contribute to the new era of space exploration we have entered," says Mark Pathy, investor, philanthropist and Ax-1 Mission Specialist. "Under the theme 'Caring for People and the Planet', I had the immense honour of collaborating with Canadian institutions and scientists who are paving the way for a better future. On orbit, I was able to take part in a total of 12 science research projects in partnership with six Canadian universities and their investigators, including clinician-researchers

(Cover Story) Ax-1 crew returns safely to Earth, successfully completing first all-private astronaut mission to ISS

at The Montreal Children's Hospital and Child Health Research at the Research Institute of the McGill University Health Centre; as well as technology proof-of-concepts with two technology startups, among them the world's first two-way holoportation demonstration. I also conducted Earth observation activities in partnership with the Royal Canadian Geographical Society and Western University. Last but not least, I experienced the wonders of space travel; of staring into space, literally; and of time spent aboard the ISS in the company of fellow astronauts from various missions, including my Ax-1 crew mates -- this was truly a life-altering experience that delivered well beyond my expectations. I return to Earth a changed person," said Pathy.

Axiom Space is guided by the vision of a thriving home in space that benefits every human, everywhere. The leading provider of human spaceflight services and developer of human-rated space infrastructure, Axiom operates end-to-end missions to the ISS today while privately developing its successor – a permanent commercial destination in Earth's orbit that will sustain human growth off the planet and bring untold benefits back home.



Ax-1 Departed from Space Station on April 24

(Cover Story) Ax-1 crew returns safely to Earth, successfully completing first all-private astronaut mission to ISS



SpaceX Dragon spacecraft with the Ax-1 Mission crew approaches the International Space Station. Credit: Raja Chari / NASA (2022 April 8)



SpaceX Falcon 9 and Dragon launch Ax-1 Mission to ISS (2022 April 8, Courtesy of SpaceX)



Ax1 Pilot Larry Connor enjoyed some remarkable views of our home planet from the cupola. The crew made sure to snap some photos to share these specials moments that really capture the essence of Earth's beauty. Credit: Michael López-Alegría (2022 April 21)



Ax-1 Pilot Larry Connor collects samples for aging and heart health research. Credit: Michael López-Alegría (2022 April 11)



Ax-1 Mission Specialist Eytan Stibbe working with CRISPR experiment which is part of Rakia Mission. Credit: Eytan Stibbe. (2022 April 11)



Ax-1 Mission Specialist Mark Pathy successfully conducted the first ever two-way holoportation session from the International Space Station, connecting with Canadian astronauts Dr. David Williams and Joshua Kutryk on the ground from NASA's Mission Control. Credit: Mark Pathy (2022 April 18)

(Cover Story) Ax-1 crew returns safely to Earth, successfully completing first all-private astronaut mission to ISS



Ax-1 Crew in Dragon (2022 April 8, Courtesy of SpaceX)



At the core of Axiom Space's mission is to enable the development of a diverse and robust commercial economy in low-Earth orbit. Axiom Space, a leader in human spaceflight and building the world's first commercial space station, proudly congratulates four of its partners whose proposals were selected by NASA in Focus Area 1A of the NASA Research Announcement (NRA) seeking In Space Production Applications (InSPA) flight demonstrations:

Ax-1 Mission Overview

Axiom Space's Axiom Mission 1 (Ax-1) will be the first all-private astronaut mission to the International Space Station (ISS) and a pivotal step toward Axiom Station, the world's first commercial space station. The multinational, four-person Axiom crew will participate in a 10-day mission, including eight days working and living on the orbiting laboratory. Axiom Space has contracted SpaceX to transport the Axiom crew via a Dragon spacecraft and Falcon 9 rocket.

MISSION HIGHLIGHTS

- **First Step for Axiom Station:** Axiom Space's Ax-1 mission is a critical step toward Axiom Station, the first private space station. This new method of access to orbit is progress toward a next generation platform initiative in which the benefits and products of life, work, and research in space are available to a global consumer. This low-Earth orbit (LEO) economy aims to magnify innovation, problem-solving and scientific discovery as humans venture farther for longer duration in space.
- **First All-Private Astronaut Mission to ISS:** Ax-1 will be the first mission to visit the space station with an all-private astronaut crew. The astronauts include Commander Michael López-Alegría of the USA/Spain, Pilot Larry Connor of the USA, Mission Specialist Eytan Stibbe of Israel, and Mission Specialist Mark Pathy of Canada. The Ax-1 crew members are pioneering a new path in space for more opportunities for individuals and nations around the world to work in microgravity.
- **Ten-Day Mission in Microgravity:** The Ax-1 crew will participate in a 10-day mission, including eight days working and living on the orbiting laboratory. Axiom Space has contracted SpaceX to transport the Axiom crew via a Dragon spacecraft and Falcon 9 rocket.
- **Adding Value:** The Axiom Space mission to the International Space Station will focus on science, education, and STEM outreach, conducting more than 25 experiments, collecting critical data, and dedicating more than 100 hours of human-tended research during their 10-day mission. Each crew member has completed between 700 and 1,000 hours of astronaut training to prepare for this mission.
- **First in a Series of Missions:** Ax-1 is a first-of-its kind private spaceflight mission to the International Space Station, one of several proposed Axiom missions – each contributing to Axiom Station and a sustainable low-Earth orbit economy.

FAST FACTS

- Ax-1 will be the first all-private astronaut mission to the ISS.
- Ax-1 is the first of several proposed missions to the ISS, and a critical precursor to Axiom Station, the first commercial space station.
- The Axiom astronauts are the first private astronauts to go through NASA's training flow. Each Ax-1 crew member completed between 700 and 1,000 hours of training in safety, health, ISS systems, launch site operations, and additional training for research and technology demonstration payloads to prepare for the mission.
- A robust science portfolio defines this mission, which will see more than 25 experiments completed aboard the ISS during the eight days on the space station. The Axiom astronauts are partnering with leading science organizations to complete experiments while aboard the ISS. These unique partnerships are opening new opportunities for scientists and researchers to conduct work in space.
- Ax-1 astronauts represent four countries and will complete outreach in five languages, expanding efforts to connect with more people around the world.

MISSION LAUNCH DETAILS

- Launch Location: Launch Complex 39A at NASA's Kennedy Space Center in Florida
- Crew: Commander Michael López-Alegría, Pilot Larry Connor, Mission Specialist Eytan Stibbe, Mission Specialist Mark Pathy
- Spacecraft: SpaceX Dragon
- Rocket: SpaceX Falcon 9

AXIOM STATION OVERVIEW

- Axiom Space is a leader in the commercial space era and a key partner in NASA's drive to commercialize low-Earth orbit, with a successful private mission to the ISS progressing.
- Axiom Space and NASA's successful collaboration on the first-ever private astronaut mission to the International Space Station is a historic moment that brings space closer to being accessible for all.
- In early 2020, NASA selected Axiom Space to provide at least one habitable commercial module for the International Space Station.
- The first Axiom Station module is under construction to attach to the ISS Node 2 forward port in late 2024.
- The Axiom-NASA early collaboration on low-Earth orbit operations and a successful Ax-1 mission set the stage for Axiom Station and further ensures a next-generation platform will be ready to succeed the ISS in time to avoid any gap.

ABOUT AXIOM SPACE

Axiom Space, the premier provider of human spaceflight services and developer of human-rated space infrastructure, is guided by the vision of a thriving home in space that benefits every human, everywhere. Founded in 2016, Axiom is opening new markets in low-Earth orbit through operating end-to-end missions to the International Space Station while privately developing its successor – a permanent commercial destination in Earth's orbit that will sustain human growth off the planet and bring untold benefits back home. More information about Axiom can be found at www.axiomspace.com.

(Cover Story) Congress must act now to avert a catastrophe in space

by Dan Dumbacher, AIAA Executive Director (2022 March 13)

<https://spacenews.com/op-ed-congress-must-act-now-to-avert-a-catastrophe-in-space/>

More than 1,500. That's the additional pieces of debris now floating around in low Earth orbit because of the reckless and irreversible Russian anti-satellite test last November.

Another 13,000 small satellites will be added by the Chinese when they deploy a large constellation to provide internet services.

Then consider the U.S.-licensed companies that have already launched more than 2,000 satellites of a planned tens of thousands of satellites over the next decade.

All of this must be added to the approximately 40,000 objects currently being tracked by U.S. Space Command. As an engineer, I can do math all day. I enjoy it. What's not so fun is facing the urgent problem that tens of thousands of objects traveling at roughly 17,500 mph in low Earth orbit threaten launch vehicles, space assets, and human lives.

It was just over a decade ago when the Iridium 33 and the derelict Russian military Kosmos 2251 communications satellites collided, creating thousands of new pieces of debris and an ongoing headache for the crews onboard the International Space Station (ISS). Since then, astronauts aboard the ISS have witnessed a significant number of near misses. It's only a matter of time before the next catastrophic event takes place – one in which lives, or key national security and commercial assets, are lost. How many more misses will it take before Congress acts? Do we have to wait for that catastrophe? For all our sake, I sure hope not.

It is not melodramatic to state that this is a four-alarm fire. We in the space sector smell the smoke and see the flames. The executive branch recognizes the emergency as well. Two successive U.S. presidential administrations have affirmed the need for the United States to develop a national space traffic management (STM) function. Space Policy Directive-3 (SPD3) charged the Department of Commerce (DOC) with making space safety data and services available to the public, while the Department of Defense maintains the authoritative catalog of space objects. The Office of Space Commerce (OSC) would be the civil agency to perform the STM tasks outlined in SPD-3, and this position was reaffirmed by a congressionally directed National Academy of Public Administration study. While the DOC has taken a few initial steps, including establishing an open architecture data repository, critical elements remain unresolved, which hinder U.S. industry's ability to anticipate what will be required for the responsible use of space. This is an unacceptable situation only Congress can solve.

That is why the American Institute of Aeronautics and Astronautics (AIAA) is leading an effort to advance the STM issue. We have assembled major stakeholders from the space industry, as well as the insurance, finance, international, legal, and technical sectors, all of whom have emphasized the urgency of this issue with key congressional staff.

Our positions and recommendations are straightforward:

- We strongly back full implementation of SPD-3.
- We call for Congress to authorize OSC as the government office responsible for civilian STM responsibilities.

(Cover Story) Congress must act now to avert a catastrophe in space

- In addition, OSC should be elevated to be a direct report to the Deputy Secretary of Commerce.
- OSC should be appropriated adequate funding to hire the necessary staff resources and to establish the required data systems.
- OSC should also eventually become a small bureau within the department and be led by an assistant secretary.

Such actions will give OSC the gravitas and agility to work at the highest levels of the department and across government agencies to coordinate and establish a domestic civil STM function, as well as authoritatively engage in multilateral discussions abroad.

I should acknowledge that the U.S. Senate has passed the SPACE Act, which codifies elements of SPD-3 by formally assigning civil space situational awareness responsibilities to the DOC. This is encouraging; however, more must be done. Time is running short. We can't afford to wait for a catastrophic event before proper steps are taken to address this matter.

The space community is unanimous: Congress needs to act now on space traffic management to provide stability and certainty, so the commercial sector can continue to innovate and invest in new ventures that continue building a robust space economy.

Dan Dumbacher is the executive director of the American Institute of Aeronautics and Astronautics.

We strongly back full implementation of SPD-3.

We call for Congress to authorize OSC as the government office responsible for civilian STM responsibilities.

(Covery Story) How We Can Get Clean Energy—Fuel and Human Progress

by Dr. Robert Zubrin, President at Pioneer Astronautics; Founder, The Mars Society (2022 April 14)

<https://quillette.com/author/robert-zubrin/>



(Photo by Nicolas HIPPERT on Unsplash)

Editor's note: this is the first in a three part series on how we can get clean energy. Part I details Biden's War on Fuel, Part II answers the question "Is Nuclear Power Safe?" and Part III provides an answer to "What Needs to Be Done?"

There are only two ways that modern industrial society can be powered: fossil fuels and nuclear power. The mastery of wind, water, animal, and solar power (via biomass), moved humanity from the Stone Age to the Enlightenment. It enabled global commerce under sail, the creation of metals, ceramics, glass, paper, and numerous other artificial materials (and all the devices and instruments that they enable,) and provided the mechanical energy to liberate the large majority of people—particularly in the West—from enslavement to lives of manual labor. But by the 19th century, these sources of energy were no longer sufficient to sustain the further growth of the very society that they had created.

That society, however, had the tools to give birth to a new one. Equipped with access to global knowledge, printed books, and literate populations wielding that science along with steel tools, drills, and other mechanisms, it was able to invent the technologies required to unleash the power of fossil fuels. Thus liberated from the limitations of pre-industrial energy sources, humanity was able to grow exponentially further in numbers, power, and knowledge—in sum creative capacity—to the point where it was able to discover and invoke the laws of chemistry and electricity. These, in turn, not only allowed the creation of new materials ranging from gasoline, plastics, fiberglass, aluminum, and silicon to uranium, but of scientific instruments unveiling deeper laws of nature, and, with them, new and still vaster powers hidden within the last of these.

(Covery Story) How We Can Get Clean Energy—Fuel and Human Progress

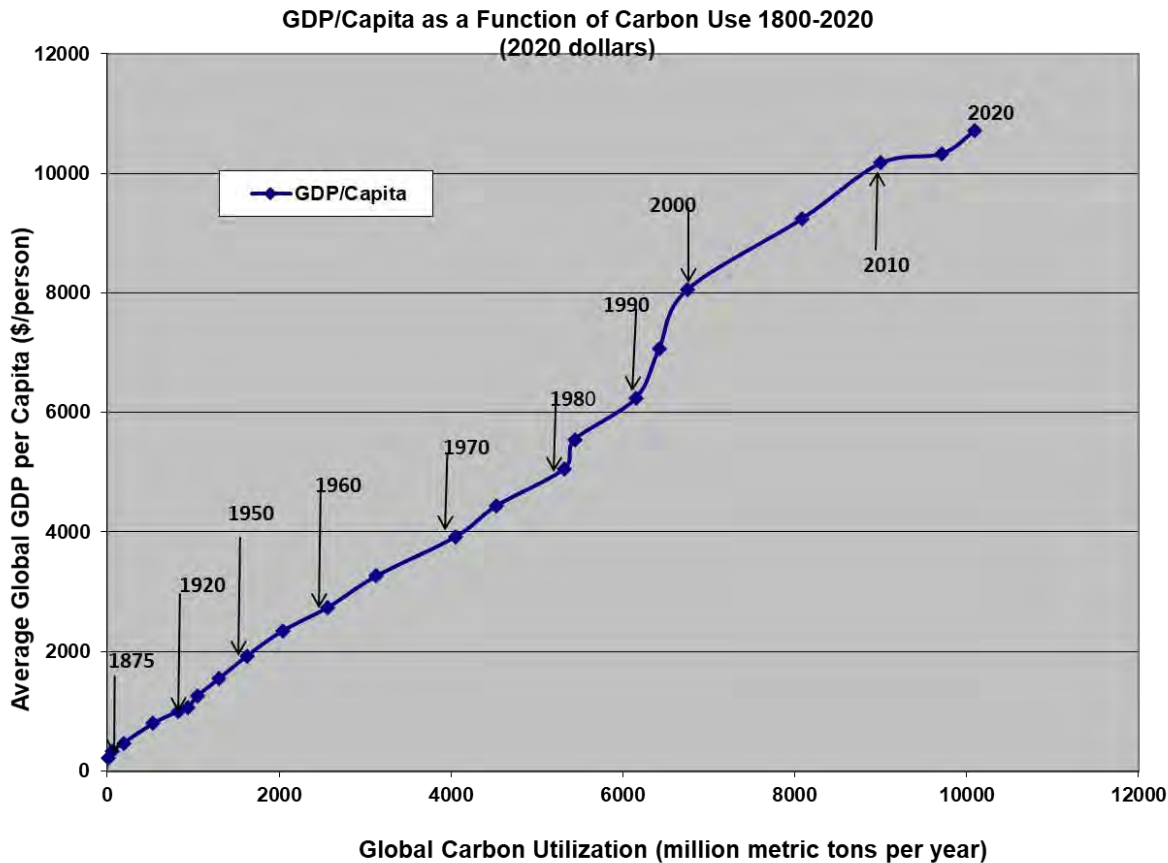
As Alex Epstein makes clear in his seminal book *The Moral Case for Fossil Fuels*, coal, oil, and gas have been of extraordinary benefit to humanity. Compared to what came before them, they have improved human life in every way, from doubling lifespans and unchaining mobility, to freeing us from living amidst of the unhealthy stench of animal waste. They have come with certain problems of their own, notably air pollution—particularly from coal—but these effluents are far smaller and less obnoxious than the pollution associated with a comparable amount of animal or biomass power.

But they are causing global warming. As a result of fossil fuel combustion global temperatures have risen an average of 1C since 1870. Fossil fuels are also changing the Earth's atmospheric chemistry, with CO2 enrichment of the atmosphere threatening to change the chemistry of the oceans, with potentially very negative effects on marine life.

Environmental activists concerned about these issues have focused on using carbon taxes or production limitations to increase fuel prices, thereby dissuading people of limited means from using fossil fuels. I believe this campaign to be unethical. The primary problem in the world today is poverty. Energy is a basic good, both in itself, and because food prices, being highly dependent on transport costs, largely track fuel prices. All sales taxes are regressive, but because they target basic goods, and do so on the basis of mass, rather than cost, carbon taxes are ultra-regressive. A \$50 discount store dress incorporates the same amount of carbon in its production as a \$500 high fashion dress. A conventional sales tax would hit the expensive dress 10 times as hard. A carbon tax would increase the cost of both by the same amount. So really, carbon taxes are just a scam for transferring the tax burden from the rich to the poor.

But whether or not you agree that carbon taxes are unethical, there can be no question that, as a method of reducing carbon emissions, they have been a spectacular failure. In the three decades since the early 1990s, when climate warming alarms first aroused world leaders to action, global CO2 emissions have doubled—just as they did from the 1960s to the 1990s, the 1930s to the 1960s, and 1900 to 1930. This is because energy use is fundamental to living standards, and people, not wishing to be poor, will do whatever it takes to position themselves to be able to use more of it.

(Covery Story) How We Can Get Clean Energy—Fuel and Human Progress



Human living standards have improved in direct proportion to worldwide fossil fuel use.

In 1920, the average global per capita income, in today's dollars, was \$1,000 per year, and the world used one billion metric tons of fossil fuels. Today, those figures have both grown twelvefold, to \$12,000 per year and 12 billion tons, respectively. That's an extraordinary improvement, but an annual income of \$12,000 per year, typical of countries like Brazil, is still not that much.

In the United States the average income is \$60,000 per year, and we still have a lot of poverty. Furthermore, \$12,000 is the average. There are many countries a lot poorer than Brazil. In order to raise the entire world to a decent standard of living, global energy consumption is going to need to at least quintuple—and that requirement does not even account for population growth. We still have another century to go, doubling our energy production every 30 years, to approach the necessary goal.

Regardless of all the global warming festivals, UN proclamations, and street antics of extinction movement activists, world energy use is likely to double by 2050. Unless something better is made available, that energy is going to need to be provided by fossil fuels.

Biden's war on fuel

The Biden administration approach to this situation has been to try to suppress North American oil and gas production. As Marc Thiessen wrote in the Washington Post on February 24th:

(Covery Story) How We Can Get Clean Energy—Fuel and Human Progress

He [Biden] prioritized climate change over energy independence and launched a policy of energy disarmament. Biden rejoined the Paris agreement and canceled the Keystone XL pipeline, which by itself would have transported 830,000 barrels of oil per day from Alberta to refineries on the Gulf Coast of Texas — far more than the 538,000 barrels we import every day from Russia). He suspended oil and gas leases in Alaska's Arctic National Wildlife Refuge and sought to deliver on his campaign promise to ban all "new oil and gas permitting on public lands and waters." And he made clear his intention to tax and regulate the fossil fuel industry out of business, promising that his administration would "end fossil fuel."

The effect of these policies is to drive up the price of fossil fuels, making the Russian and Saudi oil industries more lucrative, taxing the populations of the US, Europe, Japan, and most other Western nations, to enrich our enemies. It is a policy to increase funding for Russia's invasion of Ukraine. Furthermore, except for the depressing effect on global economic growth of higher oil prices, this policy will do nothing to reduce carbon emissions, as, contrary to the beliefs of Democratic Party thinktanks, neither Russian nor OPEC oil is carbon free.

There is, however, an alternative energy source that is far more abundant than fossil fuels, and which causes neither carbon emissions nor conventional air pollution. This is nuclear power.

Nuclear power is proof of a fundamental economic fact, to wit: There is no such thing as natural resources. *There are only natural raw materials. It is human creativity that transforms raw materials into resources.*

Fossil fuels are also proof of this statement. In Napoleon's time, no warlord contemplating territorial conquest would have considered oil or gas as significant resources of a target nation, or as vital resources of his own. Fossil fuels only became resources once we understood their potentials, developed technology to acquire them and transform them into attractive forms, and invented machines that could make good use of the product. But this change occurred well outside of living memory, so we now take it for granted that oil is a natural resource.

Nuclear power, however, makes the case more clearly. It is a technology born from scientific understanding of forces and phenomena invisible to the naked eye, offering energy in quantities vastly exceeding anything available from fossil fuels. The amount of nuclear energy in a kilogram of uranium is equivalent to that obtained by burning two million kilograms of oil. Ordinary granite typically contains five parts per million uranium, giving it 10 times the energy content of an equal amount of oil! Think about that. With the help of God, Moses reportedly drew water out of a rock. With the help of science, we can draw fire from rocks.

It is important to be clear on this point: The fire does not come from the rock. It comes from thought. That was also true of powers offered by fossil fuels, sails, and domesticated horses, for that matter. None of them existed before thought, either. But nuclear power is fire created purely from thought. It is dramatic proof of the unlimited power of the free human mind. Moreover, this fire comes without smoke.

Now, one would think that environmentalists, concerned about "the existential crisis of climate change," would support nuclear energy. But of course, they do not. In fact they seem to hate it with a passion—even exceeding their animus towards fossil fuels and all other technologies. Many people are understandably baffled by this. But the reason for it is simple. The environmentalists hate nuclear energy because it would solve a problem they need to have.

(Covery Story) How We Can Get Clean Energy—Fuel and Human Progress

The Biden administration, unfortunately, is beholden to environmentalist organizations for a significant chunk of its electoral funding and support. So it cannot cross them. Thus in February 2022, even as Putin was gearing up his fossil fuel funded invasion of Ukraine, the Biden administration's Nuclear Regulatory Commission moved to curtail the duration of the operating licenses of several nuclear power plants.

This is not the way the free world ought to be dealing with either the long-term problem of growing carbon emissions or the more immediate threat posed by Russia or other petrotyrannies.

Why are we making ourselves the captive customers of our enemies when we hold in our hands a far cleaner and vastly more abundant source of energy than anything they can provide?

The answer is terror. We have been scared out of liberating ourselves by those claiming that nuclear power is too dangerous to use. In the next part of this series we shall examine their scare stories and show that they contain no truth whatsoever.

Editor's Note: Part II in this three part series deals with the question "Is Nuclear Power Safe?" and Part III provides an answer to "What Needs to Be Done?"



Robert Zubrin

Robert Zubrin is an aerospace engineer and the author of eleven books on space exploration, with a particular focus on Mars. He received his Ph.D. from the University of Washington.

Pegasus

by Dr. David H. Levy, Comet and Asteroid Hunter, Co-Discoverer, Shoemaker-Levy 9 (2022 May article)



Pegasus: The original

In the late summer of 1964 I was leaving the Observatory of the Royal Astronomical Society's Montreal Centre with some friends, one of whom was David Zackon. I asked the group if they would like to drop by my house to observe with a 3.5-inch reflector. Before they had a chance to answer, David upped the ante by asking if we'd like to come by his house to look through an 8-inch reflector.

When we arrived at his place, we found a very competent 8-inch reflector with a focal ratio of 7. It gave us wide field views of Jupiter and Saturn plus a few other nice things to see. It was rather pleasant. Just a week later, David telephoned me to invite me for a second look. As we used the telescope to view Saturn, David was adjusting one of the mount's large bolts. As I looked at Saturn I remarked, "I think that's Titan," after seeing one of the planet's large moons. David looked up toward me and said, "No, it is still loose."

David told me that he was soon to leave for his university year, and each year he had a tradition of lending the 8-inch to someone who would use it. He then began asking me a few questions, and I told him that I had observed most of the planets, especially Jupiter.

"And the Moon, I suppose."

"Yes. And just a few weeks ago I completed the Lunar training program."

"The whole program? All three hundred craters?"

"Yes, and the 26 (lettered A to Z) mountain ranges, valleys, and the Straight Wall."

"You did all this with a 3 1/2-inch telescope?"

"Yes."

"David, you've just borrowed an 8-inch telescope."

Pegasus



Pegasus of Lario

It is difficult to describe the feeling of joy I felt as the new telescope and I returned home and I spent the rest of the night getting acquainted with it. The following day I decided to name it Pegasus, after the large satellites that NASA was launching at the time in on their new Saturn 1 rockets. When my grandfather found out about this a few days later he was thrilled. “I am especially proud of David, he said, “for having the insight to know that you would put it to good use.”

Over the next several months Pegasus was used heavily. When David returned from school, Constantine Papacosmas, another good friend, suggested that my parents purchase the telescope for me. David agreed, and we settled on a \$400 price for it.

On December 17, 1965, I used Pegasus to begin my comet searching program. Twenty-two years later, on the evening of October 11, 1987, Pegasus and I discovered Comet C/1987Y1.

The name Pegasus has since been attached to other fine Pegasus telescopes. One of them is a large 20-inch belonging to Lario Yerino from Kansas City. I used this fine telescope one autumn while attending the Heart of America Star Party.

The third Pegasus belongs to Carl Jorgensen, one of my closest friends and someone I have known since 1963. He brings it each year to our Adirondack Astronomy Retreat in the mountains near Lewis, NY. Under the peaceful and beautiful Adirondack sky, when my left eye touches the eyepiece of this telescope, my mind wanders back to those earlier years when I began using my Pegasus during the springtime of my life.



Pegasus of Carl

NASA's Perseverance Rover Captures Video of Solar Eclipse on Mars

by NASA (2022 April 20)

<https://www.nasa.gov/feature/jpl/nasa-s-perseverance-rover-captures-video-of-solar-eclipse-on-mars>



https://www.youtube.com/watch?list=PLTiv_XWHnOZqCrMU2ppcLjRn1zIDkNx3q&v=aKK7vS2CHC8

NASA's Perseverance Mars rover used its Mastcam-Z camera to shoot video of Phobos, one of Mars' two moons, eclipsing the Sun. It's the most zoomed-in, highest-frame-rate observation of a Phobos solar eclipse ever taken from the Martian surface.

Credits: NASA/JPL-Caltech/ASU/MSSS/SSI

The Mastcam-Z camera recorded video of Phobos, one of the Red Planet's two moons, to study how its orbit is changing over time.

NASA's Perseverance Mars rover has captured dramatic footage of [Phobos](#), Mars' potato-shaped moon, crossing the face of the Sun. These observations can help scientists better understand the moon's orbit and how its gravity pulls on the Martian surface, ultimately shaping the Red Planet's crust and mantle.

Captured with Perseverance's next-generation [Mastcam-Z camera](#) on April 2, the 397th Martian day, or sol, of the mission, the eclipse lasted a little over 40 seconds – much shorter than a typical solar eclipse involving Earth's Moon. (Phobos is about [157 times smaller than Earth's Moon](#). Mars' other moon, Deimos, is even smaller.)

The images are the latest in a long history of NASA spacecraft capturing solar eclipses on Mars. Back in 2004, the twin NASA rovers Spirit and Opportunity took [the first time-lapse photos of Phobos](#) during a solar eclipse. [Curiosity continued the trend](#) with videos shot by its Mastcam camera system.

But Perseverance, which landed in February 2021, has provided the most zoomed-in video of a Phobos solar eclipse yet – and at the highest-frame rate ever. That's thanks to Perseverance's next-generation Mastcam-Z camera system, a zoomable upgrade from Curiosity's Mastcam.

"I knew it was going to be good, but I didn't expect it to be this amazing," said Rachel Howson of Malin Space Science Systems in San Diego, one of the Mastcam-Z team members who operates the camera.

NASA's Perseverance Rover Captures Video of Solar Eclipse on Mars

Howson noted that although Perseverance first sends lower-resolution thumbnails that offer a glimpse of the images to come, she was stunned by the full-resolution versions: “It feels like a birthday or holiday when they arrive. You know what’s coming, but there is still an element of surprise when you get to see the final product.”

Color also sets this version of a Phobos solar eclipse apart. Mastcam-Z has a solar filter that acts like sunglasses to reduce light intensity. “You can see details in the shape of Phobos’ shadow, like ridges and bumps on the moon’s landscape,” said Mark Lemmon, a planetary astronomer with the Space Science Institute in Boulder, Colorado, who has orchestrated most of the Phobos observations by Mars rovers. “You can also see sunspots. And it’s cool that you can see this eclipse exactly as the rover saw it from Mars.”

As Phobos circles Mars, its gravity exerts small tidal forces on the Red Planet’s interior, slightly deforming rock in the planet’s crust and mantle. These forces also slowly change Phobos’ orbit. As a result, geophysicists can use those changes to better understand how pliable the interior of Mars is, revealing more about the materials within the crust and mantle.

Scientists already know that Phobos is doomed: The moon is getting closer to the Martian surface and is destined to crash into the planet in tens of millions of years. But eclipse observations from the surface of Mars over the last two decades have also allowed scientists to refine their understanding of Phobos’ slow death spiral.

More About the Mission

A key objective for Perseverance’s mission on Mars is [astrobiology](#), including the search for signs of ancient microbial life. The rover will characterize the planet’s geology and past climate, pave the way for human exploration of the Red Planet, and be the first mission to collect and cache Martian rock and regolith (broken rock and dust).

Subsequent NASA missions, in cooperation with ESA (European Space Agency), would send spacecraft to Mars to collect these sealed samples from the surface and return them to Earth for in-depth analysis.

The Mars 2020 Perseverance mission is part of NASA’s Moon to Mars exploration approach, which includes [Artemis](#) missions to the Moon that will help prepare for human exploration of the Red Planet.

NASA’s Jet Propulsion Laboratory, which is managed for the agency by Caltech in Pasadena, California, built and manages operations of the Perseverance rover. Arizona State University leads the operations of the Mastcam-Z instrument, working in collaboration with Malin Space Science Systems in San Diego.

Is Webb at Its Final Temperature?

by Thaddeus Cesari, NASA (2022 April 21) <https://blogs.nasa.gov/webb/2022/04/21/is-webb-at-its-final-temperature/>

The Mid-Infrared Instrument (MIRI) on NASA's James Webb Space Telescope is now cooled by a gaseous helium cryocooler to under 7 kelvins. With the cooler in its final state, the Webb team is operating the MIRI instrument this week as part of seventh and final stage of the telescope alignment. When the instrument is operating, the detectors and electronics produce heat, which is balanced by the cryocooler to keep MIRI at a stable, and very cold, operating temperature. The near-infrared instruments also warm up during operations and have to dissipate heat, although for these instruments this is done with passive cooling; the heat from the detectors and electronics is radiated into deep space.

Now that the instruments are at their operating temperatures, the telescope mirrors will also continue cooling down to their final temperatures, but they are not quite there yet. The primary mirror segments and the secondary mirror are made of beryllium (coated with gold). At cryogenic temperatures, beryllium has a long thermal time constant, which means that it takes a long time to cool or to heat up. The primary mirror segments are still cooling, very slowly.

The secondary mirror, hanging out on the end of its support structure a long way from any heat sources, is the coldest mirror, currently at 29.4 kelvins. The 18 primary mirror segments range in temperature from 34.4 kelvins to 54.5 kelvins. An advantage of beryllium mirrors is that they don't change shape with temperature the way glass mirrors would at these temperatures, so the temperature range does not affect the telescope alignment process.

Currently, four of the 18 mirror segments are above 50 kelvins: at 52.6, 54.2, 54.4, and 54.5. These four mirror segments emit some mid-infrared light that reaches the MIRI detectors. Since all the mirror temperatures are now below 55 kelvins, it is expected that MIRI will be sensitive enough to perform its planned science, but any additional cooling of these mirrors will only enhance its performance. The Webb team hopes to see the mirrors cool by an additional 0.5 to 2 kelvins.

When we point the telescope at an astronomical target, the telescope and sunshield move together. The angle that the sunshield presents to the Sun is called the pointing "attitude." The tiny amount of residual heat that makes its way through the five-layer sunshield to the primary mirror depends on this attitude, and since the mirror segment temperatures change very slowly, their temperatures depend on the attitude averaged over multiple days.

During commissioning, Webb is currently spending most of its time pointed at the ecliptic poles, which is a comparatively hot attitude. During science operations, starting this summer, the telescope will have a much more even distribution of pointings over the sky. The average thermal input to the warmest mirror segments is expected to go down a bit, and the mirrors will cool a bit more.

Later in commissioning, we plan to test the thermal dependence of the mirrors on the attitude. We will point Webb at a hot attitude for several days, and point Webb at a cold attitude for several days, in a process called the thermal slew. This will inform us how long it takes for the mirrors to cool down or heat up when the observatory is at these positions for any given amount of time.

Is Webb at its final temperature? The answer is: *almost!*

—Jonathan Gardner, Webb deputy senior project scientist, NASA's Goddard Space Flight Center

NASA Uses Moonlight to Improve Satellite Accuracy

by Abby Graf, NASA's Earth Science News Team (2022 Apr 4) (Editor: Ellen Gray)

<https://www.nasa.gov/feature/esnt/2022/nasa-uses-moonlight-to-improve-satellite-accuracy>



NASA's ER-2 aircraft shown ready for fueling and flight preparations. Photo Credit: Ken Ulrich

NASA's airborne Lunar Spectral Irradiance, or air-LUSI, flew aboard NASA's ER-2 aircraft from March 12 to 16 to accurately measure the amount of light reflected off the Moon. Reflected moonlight is a steady source of light that researchers are taking advantage of to improve the accuracy and consistency of measurements among Earth-observing satellites.

"The Moon is extremely stable and not influenced by factors on Earth like climate to any large degree. It becomes a very good calibration reference, an independent benchmark, by which we can set our instruments and see what's happening with our planet," said air-LUSI's principal investigator, Kevin Turpie, a research professor at the University of Maryland, College Park.

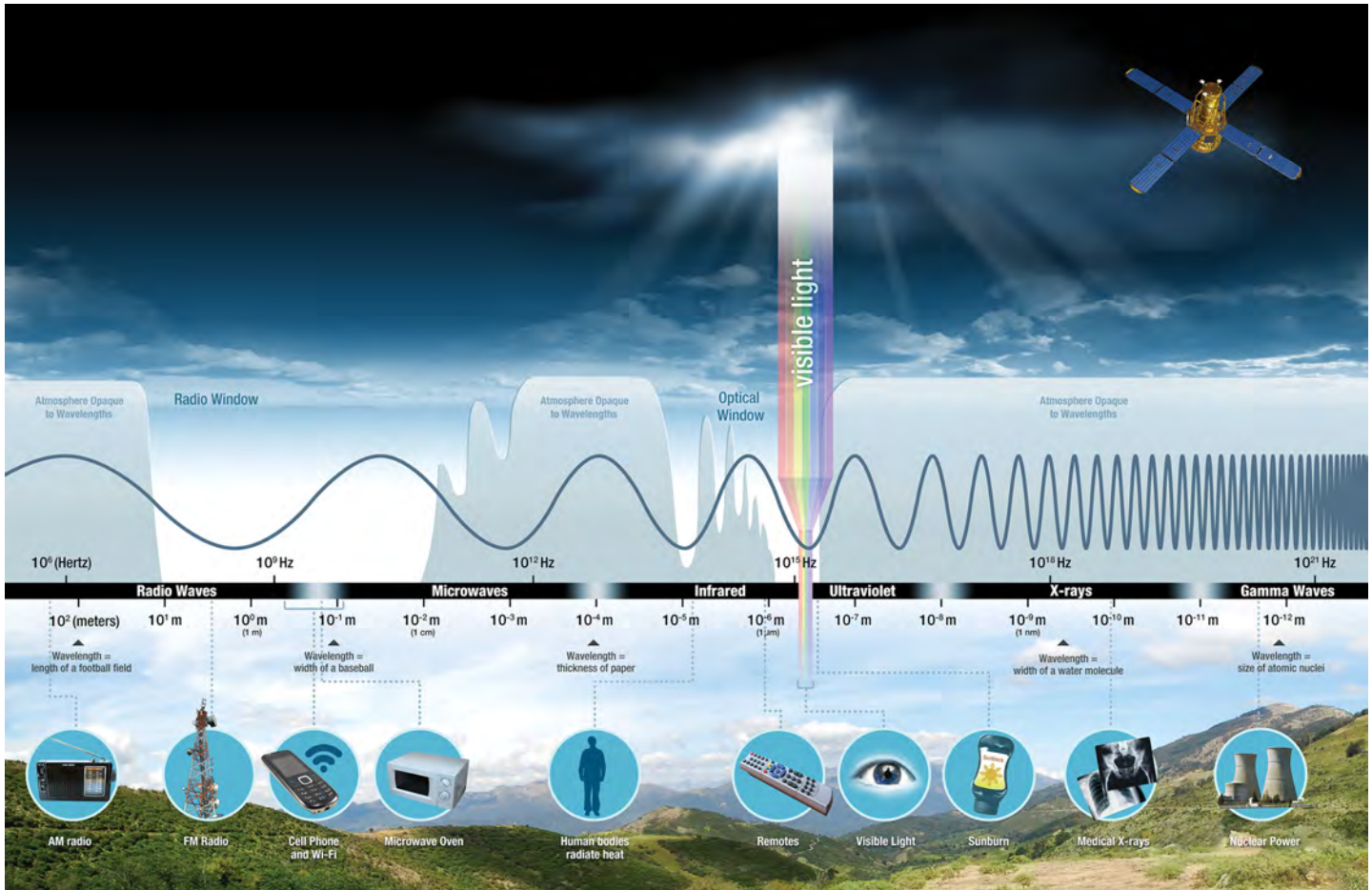
The air-LUSI flights are part of NASA's comprehensive satellite calibration and validation efforts. The results will compliment ground-based sites such as [Railroad Valley Playa](#) in Nevada, and together will provide orbiting satellites with a robust calibration dataset.

NASA has more than 20 Earth-observing satellites that give researchers a global perspective on the interconnected Earth system. Many of them measure light waves reflected, scattered, absorbed, or emitted by Earth's surface, water and atmosphere. This light includes visible light, which humans see, as well as invisible ultraviolet and infrared wavelengths, and everything in between. Like musical instruments in an orchestra, the individual satellite instruments need to be "in tune" with each other in order for researchers to get the most out of their data. By using the Moon as a "tuning fork," scientists can more easily compare data from different satellites to look at global changes over long periods of time.

That's where air-LUSI comes in. Developed in partnership with the [National Institute of Standards and Technology](#) (NIST), [U.S. Geological Survey](#) and [McMaster University](#), air-LUSI is a telescope that measures how much light is reflected off the lunar surface to assess the amount of energy Earth-observing satellites receive from moonlight. It was mounted aboard the ER-2 aircraft managed by and flying out of NASA's Armstrong Flight Research Center in Palmdale, California. The ER-2 is a high-altitude aircraft that flew at 70,000 feet, above 95% of the atmosphere, which can scatter or absorb the reflected sunlight. This allowed air-LUSI to collect very accurate, [NIST traceable](#) measurements that are analogous to those a satellite would make from orbit. In order to improve the accuracy of lunar reflectance models, air-LUSI measurements are accurate with less than 1% uncertainty. During the March flights, air-LUSI measured the Moon for four nights just before a full Moon.

This airborne approach has the advantage of studying moonlight during different phases of the Moon while being able to bring the instrument back between flights for evaluation, maintenance, and, if necessary, repair.

NASA Uses Moonlight to Improve Satellite Accuracy



This electromagnetic spectrum shows how energy travels in waves; Humans can only see visible light, but the entire spectrum is used by NASA instruments to observe Earth and more. Credits: NASA

Making Improvements for Better Accuracy

The air-LUSI spectrometer is hermetically sealed within an enclosure that keeps the instrument constantly at sea level temperature and pressure. Light collected by a telescope enters an integrating sphere which directs the light to the spectrometer, which is an instrument that measures variances of light waves. The air-LUSI first flew in similar flights in [November 2019](#). Since then, the air-LUSI team has continued to improve the instrument's accuracy.

The team improved the internal monitor so they can better check instrument accuracy over a greater range of wavelengths, from the ultraviolet to the near infrared. They were also able to redesign the integrating sphere to remove small effects of changing temperature.

“This will help the instrument make measurements with the more than 99% accuracy levels we’re looking for,” said Turpie.

Making these changes was challenging. Delays from the COVID-19 pandemic caused the chief engineer, who was working on the instrument updates and repairs, to develop a new remote work plan. Both he and the principal investigator received special permission to have parts delivered directly to their homes so they could work on the instrument and be prepared for the 2022 flights.

NASA Uses Moonlight to Improve Satellite Accuracy



Shown is the air-LUSI telescope positioned to measure a simulated Moon in a laboratory for testing and calibration before and after the flight campaign. Credits: Kevin Turpie

Using the Moon as a Common Standard

The data from 2019 and 2022 together has the potential to assist scientists in making Earth-observing satellite data in the ultraviolet to near-infrared range more consistent. In addition, the common Moon standard would make it easier to compare and fine-tune current and future satellite observations. NASA's upcoming Plankton, Aerosol, Cloud, ocean Ecosystem ([PACE](#)) mission is planning on using the Moon as a common benchmark to make its observations more accurate and inter-consistent with other satellite measurements of Earth. Over the next decade, PACE and the future orbiting sensors of NASA's [Earth System Observatory](#) will help create a more cohesive picture of our planet.

“Having a common calibration source outside of the Earth will help us reach this objective,” said Turpie. “Once air-LUSI measurements are used to improve the accuracy of the total amount of light coming from the Moon, we can take extensively more accurate measurements of Earth using current and future space-borne observatories.”

Record Broken: Hubble Spots Farthest Star Ever Seen

by NASA (2022 March 30) (Editor: Andrea Gianopoulos)

<https://www.nasa.gov/feature/goddard/2022/record-broken-hubble-spots-farthest-star-ever-seen>

Lee esta nota de prensa en español [aquí](#).

NASA's Hubble Space Telescope has established an extraordinary new benchmark: detecting the light of a star that existed within the first billion years after the universe's birth in the big bang – the farthest individual star ever seen to date.

The find is a huge leap further back in time from [the previous single-star record holder](#); detected by Hubble in 2018. That star existed when the universe was about 4 billion years old, or 30 percent of its current age, at a time that astronomers refer to as “redshift 1.5.” Scientists use the word “redshift” because as the universe expands, light from distant objects is stretched or “shifted” to longer, redder wavelengths as it travels toward us.

The newly detected star is so far away that its light has taken 12.9 billion years to reach Earth, appearing to us as it did when the universe was only 7 percent of its current age, at redshift 6.2. The smallest objects previously seen at such a great distance are clusters of stars, embedded inside early galaxies.



The [previous record holder's](#) light took 9 billion years to reach Earth. It's an enormous blue star nicknamed “Icarus.”

Earendel should not be confused with [the oldest known star](#), nicknamed “Methuselah,” discovered by Hubble in 2013.

Hubble also holds [the cosmic distance record for a galaxy](#). Its light took 13.4 billion years to reach Earth.

“We almost didn’t believe it at first, it was so much farther than the previous most-distant, highest redshift star,” said astronomer Brian Welch of the Johns Hopkins University in Baltimore, lead author of [the paper](#) describing the discovery, which is published in the March 30 journal Nature. The discovery was made from data collected during [Hubble’s RELICS \(Reionization Lensing Cluster Survey\) program](#), led by co-author Dan Coe at the Space Telescope Science Institute (STScI), also in Baltimore.

“Normally at these distances, entire galaxies look like small smudges, with the light from millions of stars blending together,” said Welch. “The galaxy hosting this star has been magnified and distorted by gravitational lensing into a long crescent that we named the Sunrise Arc.”

After studying the galaxy in detail, Welch determined that one feature is an extremely magnified star that he called Earendel, which means “morning star” in Old English. The discovery holds promise for opening up an uncharted era of very early star formation.

“Earendel existed so long ago that it may not have had all the same raw materials as the stars around us today,” Welch explained. “Studying Earendel will be a window into an era of the universe that we are unfamiliar with, but that led to everything we do know. It’s like we’ve been reading a really interesting book, but we started with the second chapter, and now we will have a chance to see how it all got started,” Welch said.^a

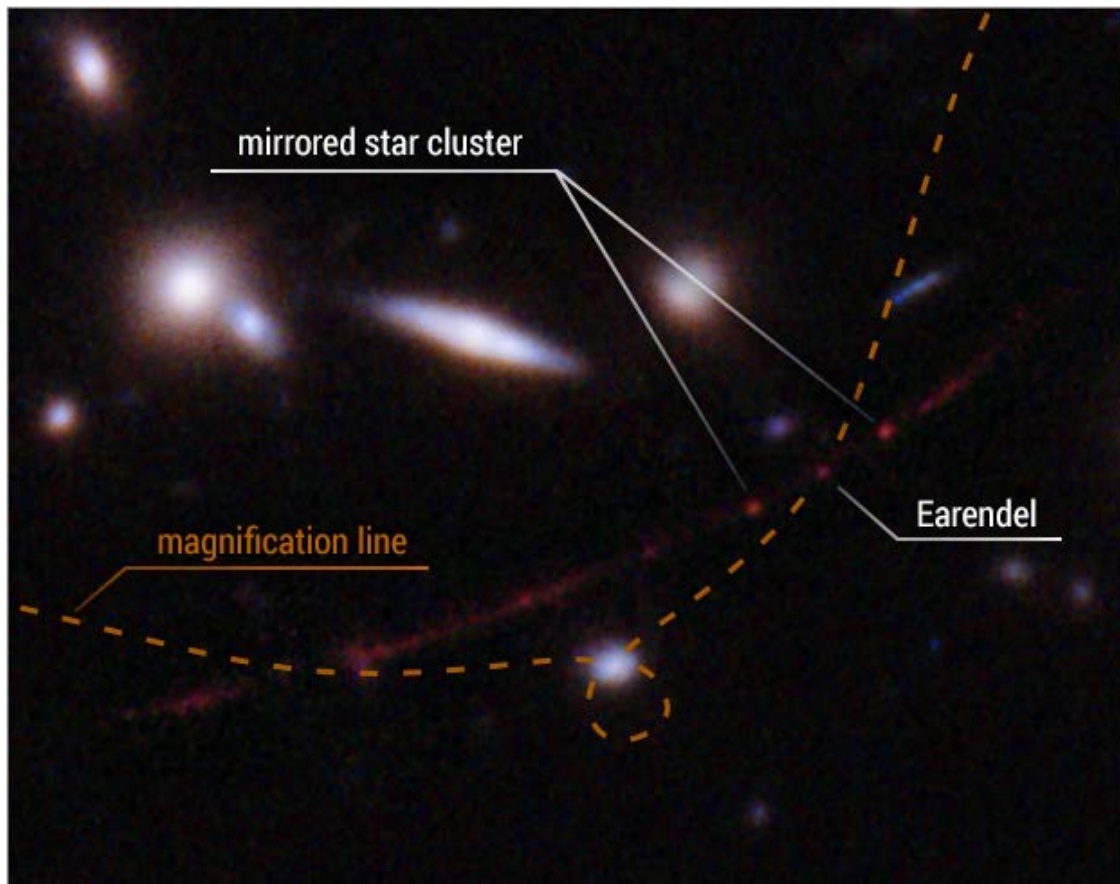
Record Broken: Hubble Spots Farthest Star Ever Seen

When Stars Align

The research team estimates that Earendel is at least 50 times the mass of our Sun and millions of times as bright, rivaling the most massive stars known. But even such a brilliant, very high-mass star would be impossible to see at such a great distance without the aid of natural magnification by a huge galaxy cluster, WHL0137-08, sitting between us and Earendel. The mass of the galaxy cluster warps the fabric of space, creating a powerful natural magnifying glass that distorts and greatly amplifies the light from distant objects behind it.

Thanks to the rare alignment with the magnifying galaxy cluster, the star Earendel appears directly on, or extremely close to, a ripple in the fabric of space. This ripple, which is defined in optics as a “caustic,” provides maximum magnification and brightening. The effect is analogous to the rippled surface of a swimming pool creating patterns of bright light on the bottom of the pool on a sunny day. The ripples on the surface act as lenses and focus sunlight to maximum brightness on the pool floor.

This caustic causes the star Earendel to pop out from the general glow of its home galaxy. Its brightness is magnified a thousandfold or more. At this point, astronomers are not able to determine if Earendel is a binary star, though most massive stars have at least one smaller companion star.



This detailed view highlights the star Earendel's position along a ripple in space-time (dotted line) that magnifies it and makes it possible for the star to be detected over such a great distance—nearly 13 billion light-years. Also indicated is a cluster of stars that is mirrored on either side of the line of magnification. The distortion and magnification are created by the mass of a huge galaxy cluster located in between Hubble and Earendel. The mass of the galaxy cluster is so great that it warps the fabric of space, and looking through that space is like looking through a magnifying glass—along the edge of the glass or lens, the appearance of things on the other side are warped as well as magnified.

Credits: Science: NASA, ESA, Brian Welch (JHU), Dan Coe (STScI); Image processing: NASA, ESA, Alyssa Pagan (STScI)

Record Broken: Hubble Spots Farthest Star Ever Seen

Confirmation with Webb

Astronomers expect that Earendel will remain highly magnified for years to come. It will be observed by NASA's James Webb Space Telescope. Webb's high sensitivity to infrared light is needed to learn more about Earendel, because its light is stretched (redshifted) to longer infrared wavelengths due to the universe's expansion.

"With Webb we expect to confirm Earendel is indeed a star, as well as measure its brightness and temperature," Coe said. These details will narrow down its type and stage in the stellar lifecycle. "We also expect to find the Sunrise Arc galaxy is lacking in heavy elements that form in subsequent generations of stars. This would suggest Earendel is a rare, massive metal-poor star," Coe said.

Earendel's composition will be of great interest for astronomers, because it formed before the universe was filled with the heavy elements produced by successive generations of massive stars. If follow-up studies find that Earendel is only made up of primordial hydrogen and helium, it would be the first evidence for the legendary Population III stars, which are hypothesized to be the very first stars born after the big bang. While the probability is small, Welch admits it is enticing all the same.

"With Webb, we may see stars even farther than Earendel, which would be incredibly exciting," Welch said. "We'll go as far back as we can. I would love to see Webb break Earendel's distance record."



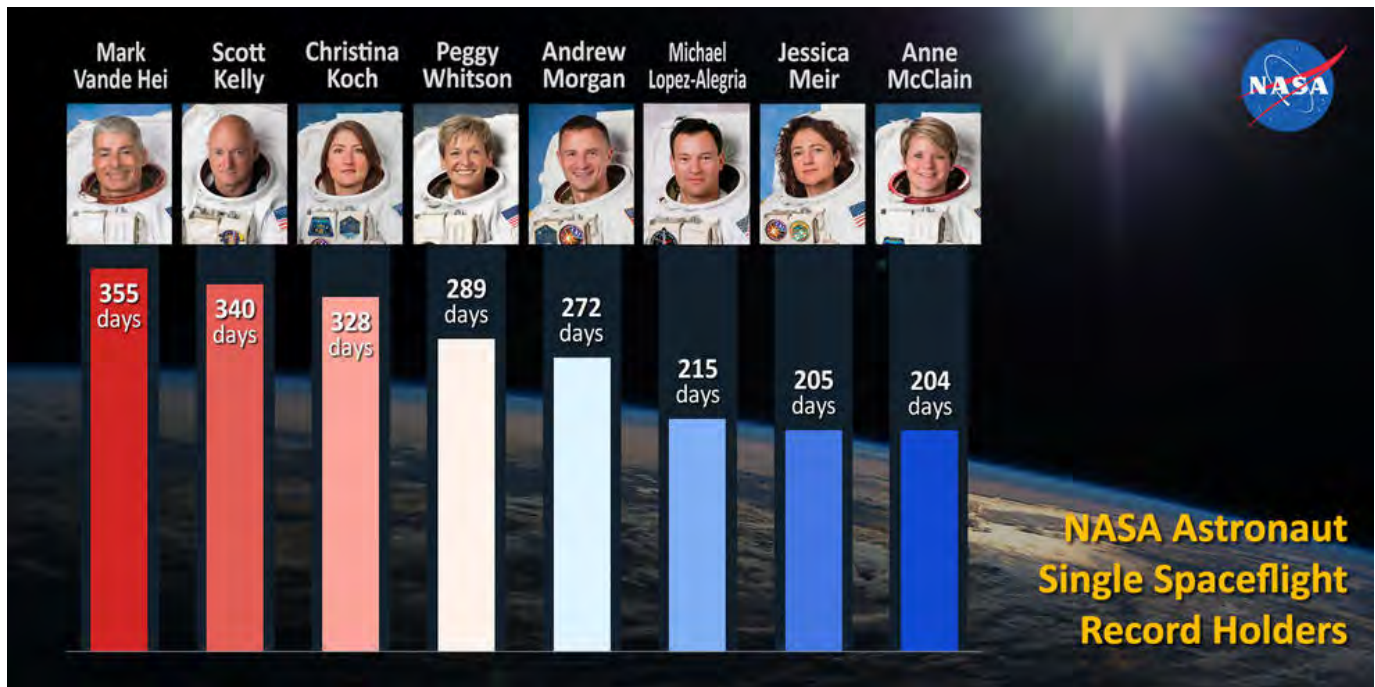
<https://youtu.be/OYMRuh772IA> Credits: NASA's Goddard Space Flight Center, Lead Producer: Paul Morris

The Hubble Space Telescope is a project of international cooperation between NASA and ESA (European Space Agency). NASA's Goddard Space Flight Center in Greenbelt, Maryland, manages the telescope. The Space Telescope Science Institute (STScI) in Baltimore, Maryland, conducts Hubble science operations. STScI is operated for NASA by the Association of Universities for Research in Astronomy in Washington, D.C.

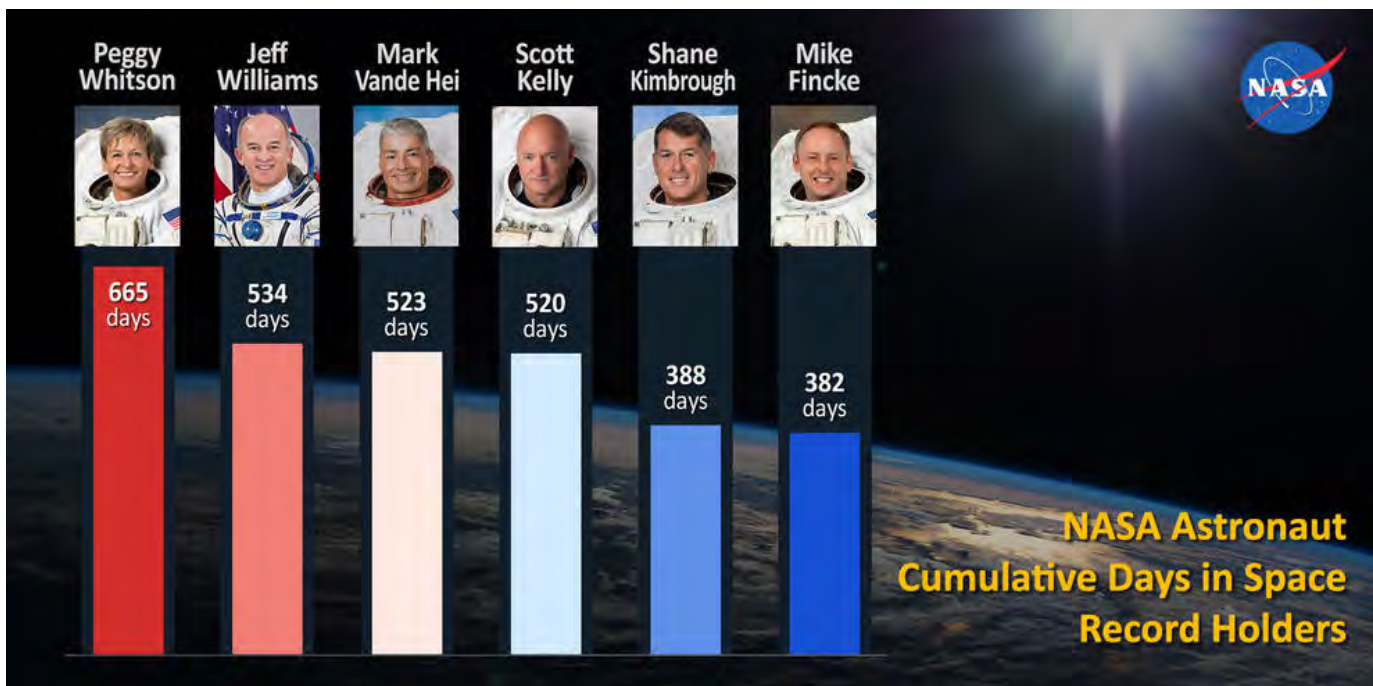
NASA Station Astronaut Record Holders

by NASA (2022 March 30, Last Updated: 2022 Apr 20) (Editor: Mark Garcia)

<https://www.nasa.gov/feature/nasa-station-astronaut-record-holders>



NASA astronaut Mark Vande Hei completed a single mission aboard the International Space Station of 355 days on March 30, 2021. NASA astronaut Scott Kelly's final mission aboard the orbiting lab ended after 340 days on March 1, 2016.



Peggy Whitson set the record on Sept. 2, 2017, for most cumulative days living and working in space by a NASA astronaut at 665 days.

Innovative 3D Telemedicine to Help Keep Astronauts Healthy

by NASA (2022 Apr 8) (Editor: Mark Garcia)

<https://www.nasa.gov/feature/innovative-3d-telemedicine-to-help-keep-astronauts-healthy>



NASA flight surgeon, Dr. Josef Schmid gives a space greeting Oct. 8, 2021, as he is holoported on to the International Space Station. Credits: ESA (European Space Agency) astronaut Thomas Pesquet

During almost two-years of the COVID-19 pandemic, the growth of telemedicine and new ways of reaching people has changed and developed. In October 2021, NASA flight surgeon Dr. Josef Schmid, industry partner AEXA Aerospace CEO Fernando De La Pena Llaca, and their teams were the first humans “holoported” from Earth into space.

Using the Microsoft HoloLens Kinect camera and a personal computer with custom software from Aexa, ESA (European Space Agency) astronaut Thomas Pesquet had a two-way conversation with live images of Schmid and De La Pena placed in the middle of the International Space Station. This was the first holoportation handshake from Earth in space.

Holoportation is a type of capture technology that allows high-quality 3D models of people to be reconstructed, compressed and transmitted live anywhere in real time, Schmid said. When combined with mixed reality displays such as HoloLens, it allows users to see, hear, and interact with remote participants in 3D as if they are actually present in the same physical space. Holoportation has been in use since at least 2016 by Microsoft, but this is the first use in such an extreme and remote environment such as space.

“This is completely new manner of human communication across vast distances,” Schmid said. “Furthermore, it is a brand-new way of human exploration, where our human entity is able to travel off the planet. Our physical body is not there, but our human entity absolutely is there. It doesn't matter that the space station is traveling 17,500 mph and in constant motion in orbit 250 miles above Earth, the astronaut can come back three minutes or three weeks later and with the system running, we will be there in that spot, live on the space station.”

Innovative 3D Telemedicine to Help Keep Astronauts Healthy



Holoportation team members are seen projected virtually on the International Space Station, Oct. 8, 2021. From left are Andrew Madrid, Dr. Fernando De La Pena Llaca, Rihab Sadik, Dr. Joe Schmid, Kevin Bryant, Mackenzie Hoffman, Wes Tarkington. Credits: ESA (European Space Agency) astronaut Thomas Pesquet

NASA is demonstrating this new form of communication as a precursor for more extensive use on future missions. Plans are to use this next with two-way communication, where people on Earth are holoported to space and astronauts are placed back on earth. “We’ll use this for our private medical conferences, private psychiatric conferences, private family conferences and to bring VIPs onto the space station to visit with astronauts.”

The next step after that is to combine holoportation with augmented reality, to truly enable Tele-mentoring.

“Imagine you can bring the best instructor or the actual designer of a particularly complex technology right beside you wherever you might be working on it. Furthermore, we will combine augmented reality with haptics. You can work on the device together, much like two of the best surgeons working during an operation. This would put everyone at rest knowing the best team is working together on a critical piece of hardware,” Schmid said.

Holoportation and tools like it could have great implications on the future of deep space travel. As plans shape up for missions to Mars, an obstacle to overcome will be the communication delays that are present during the travel to and from Mars. A delay of up to 20 minutes each way will present a unique challenge to communication whether through simple radio transmissions, video streams or new methods such as Holoportation. Communication is critical, whether for medical or mission support reasons, or staying in touch with family members. The crew will need to be connected with Earth and Mission Control, no matter where humans explore.

There are also direct applications here on Earth. Whether in other extreme environments such as Antarctica, offshore oil rigs or military operation theaters, this type of technology may help people in such situations communicate, bringing people together no matter the distance or environmental challenges.

(April 1) AIAA LA-LV Section Exhibition Table/Booth in Washington

Elementary School *(Photos with words from the volunteers)(No photos with clear faces of the young adults are posted here.)*

<https://www.aiaa-lalv.org/2022-april-1-aiaa-la-lv-exhibition-table-booth-in-washington-elementary-school/>



Mr. Karteek Tavarageri, volunteer for the AIAA LA-LV Section Exhibition Table/Booth, showing the visitors about AIAA and the excitement of aerospace. "It was great seeing all the kids pick up the different model airplanes, and getting them excited about space travel and engineering. Looking forward to doing it again!" - Karteek Tavarageri



"It is an exciting time to be in the Aerospace Industry and for the students at Washington Elementary, in Redondo Beach, CA it was an exciting time to be at school. AIAA LA-LV was one of the participants at the schools STEAM expo, which took place on April 1. Instead of getting ready for April Fool's Day, these students were getting ready to understand what it takes to be a future aerospace professional. The A in STEAM is for Arts and the most impressive art I saw at this event was the arrangement of model airplanes that were located at the AIAA LA-LV booth. A boy excitedly picked up a fighter jet and exclaimed that his grandfather designed one of the defense systems. Another boy was at first shy to ask questions, but when his father reminded him that it was his chance, he then began asking questions that would have challenged most seasoned space specialists. We had available a video game where the students could stimulate driving on Mars and had available a drone, that was small enough that it could not hurt anybody, on Earth. The wind had its own plans on this day for our drone. It was good we had students willing to chase down our out-of-control drone throughout the event. If only those who control the Ingenuity helicopter were this fortunate. It was exciting to meet all the future aerospace professionals at Washington Elementary school on April 1 and we should all look forward to working with them some day." - Mr. Mike Nugren (Right in this photo with Karteek), Volunteer at the AIAA LA-LV Section Table on April 1.

(April 1) AIAA LA-LV Section Exhibition Table/Booth in Washington Elementary School *(Photos only) (No photos with clear faces of the young adults are posted here.)*



(Right) Visitors picking up and reviewing the AIAA Membership brochures and other displayed items; (Right) Ms. Apie Ovsepyan, AIAA LA-LV K-12 STEAM Outreach Chair and award-winning STEM Educator, participating online talking to the some visitors.



Enthusiastic visitors stopping by the AIAA LA-LV Section Exhibition Table/Booth, playing around with displayed items and chatting with the table staff volunteers.



(Left) Visitors enjoying the beautiful sunset and the table/booth displays; (Right) After all the fun and excitement, time for packing/wrapping up. See you next time !

(April 9) The Advent of Interplanetary Small Spacecraft (and the Enabling of COTS-based Robotic Explorers), by Dr. Andrew Klesh

(plus a general comment on the civilian astronaut application process) *(Photos only)*

<https://www.aiaa-lalv.org/2022-april-9-the-advent-of-interplanetary-small-spacecraft-and-the-enabling-of-cots-based-robotic-explorers-by-dr-andrew-klesh/>



(Left) Dr. Andy Klesh giving the fun and inspiring talk, explaining the issues involved; (Right) Mr. Doug Stewart (Film Producer of the award-winning documentary film/DVD "*Chesley Bonestell, A Brush with the Future*") volunteering and sitting at the Check-in Table.



(Left) Attendees listening to the exciting presentation and enjoying the event; (Right) Dr. Klesh explaining the exciting mission using MarCo and the potential use of Cubesats in interplanetary missions.

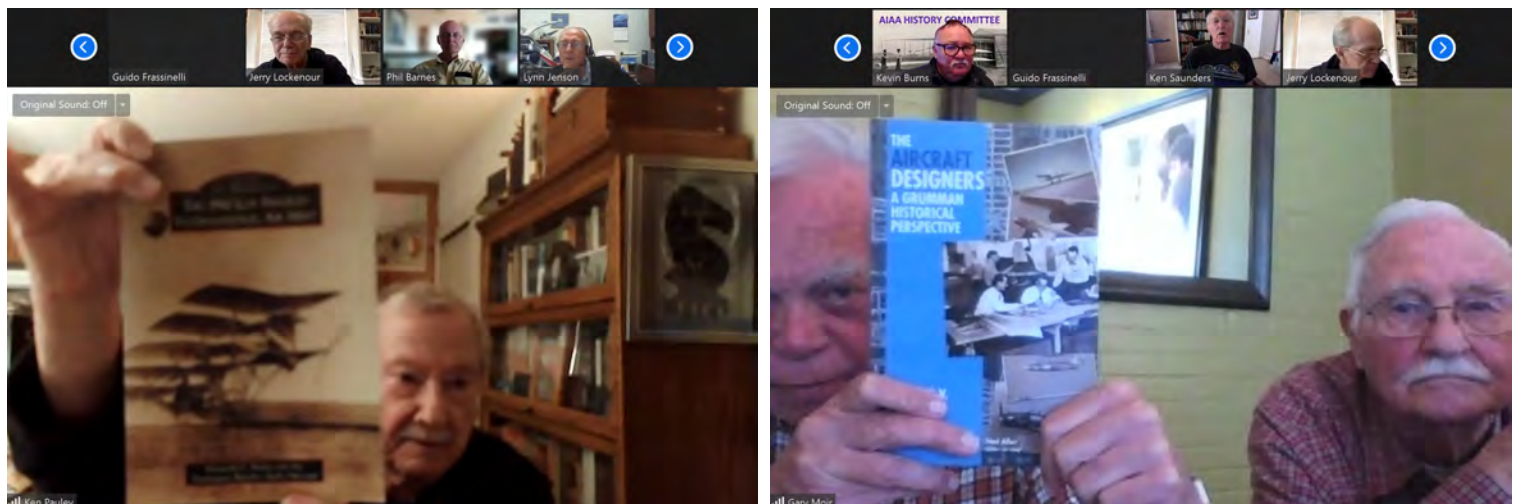


(Left) Enthusiastic attendees lining up asking very insightful questions; (Right) It was such fun that some attendees stayed and network with the speaker and other attendees, taking a group photo for a life-time memory!

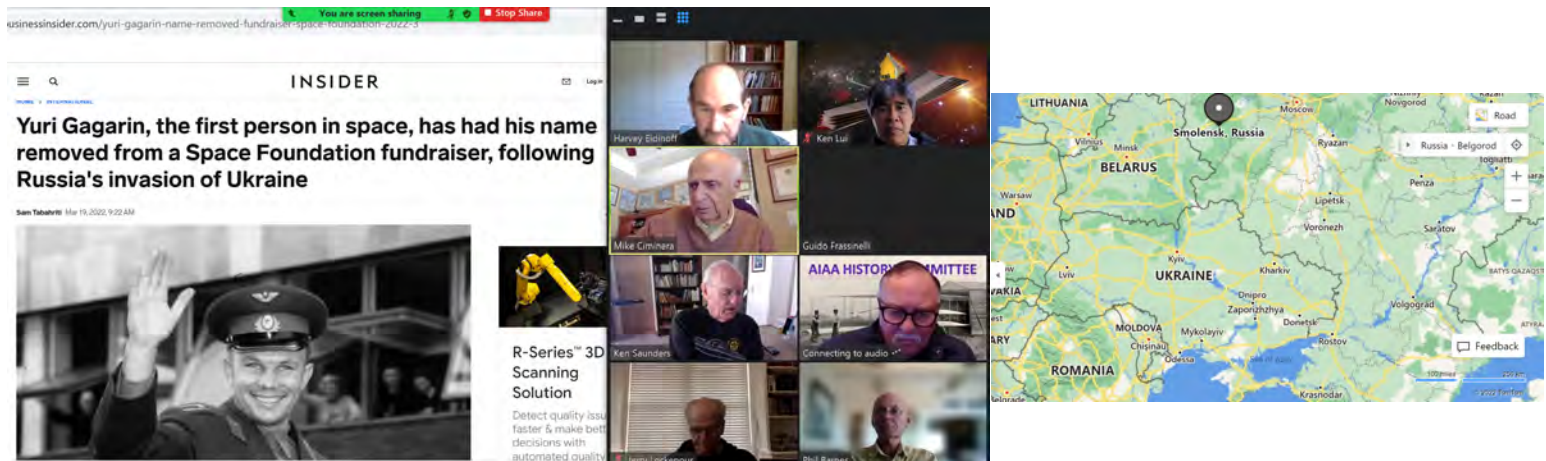
(April 13) AIAA LA-LV Aero Alumni Meeting (Screenshots Only)



Aero alumni/retiree attendees discussing and sharing various activities and thoughts on recent news, such as the Ukraine Crisis.



Attendees discussing interesting professional activities, like book publications. (Right) Mr. Gary Moir showing the AIAA book by Mike Ciminera..



Aero alumni / retiree attendees caring about the situations in Ukraine, discussing the recent news, including the news about Yuri Gagarin's being removed from the Colorado-based Space Foundation, and his birth place in Smolensk, Russia, near Ukraine and Belarus.

(Screenshots Only) <https://www.aiaa-lalv.org/2022-april-16-aerospace-art-with-james-vaughan-aerospace-defense-illustration-putting-the-g-whiz-back-in-aerospace-illustration-interview-by-mr-rod-pyle/>

The image consists of two side-by-side photographs of Chris Kraft. The left photograph shows him in a full NASA spacesuit, standing on a reddish, hilly surface under a starry sky. The suit has a NASA patch and the name 'ALDRIN' on the chest. The right photograph is a close-up of his face, showing him wearing glasses and a head-mounted display. His hands are clasped in front of him. The background is a plain, light-colored surface.



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

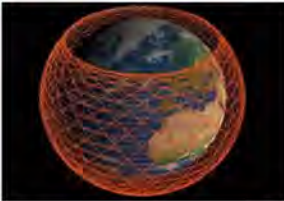

(April 23) AIAA LA-LV New Space mini-Conference 2022,
with Keynote by Dr. Henry Garrett (Screenshots Only)

<https://www.aiaa-lalv.org/aiaa-la-lv-new-space-mini-conference-2022-with-keynote-by-dr-henry-garrett/>

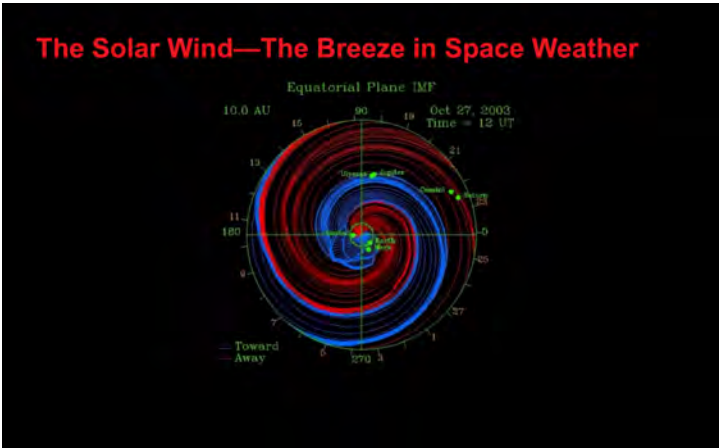
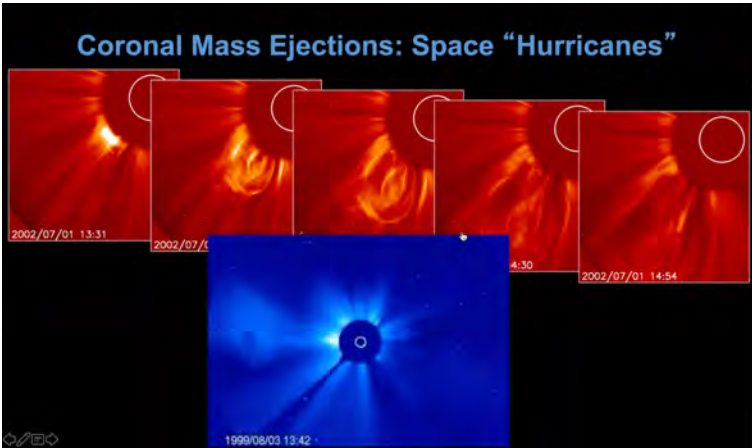
Editor's Note: This the post-event posting of the events/activities, not the advertisement for the upcoming events. For more details of this event, multiple reminders/flyers have been sent out and the details are not repeated here. please see the link above or <https://conta.cc/3tz69br>

THE SPACEX STARLINK PROBLEM

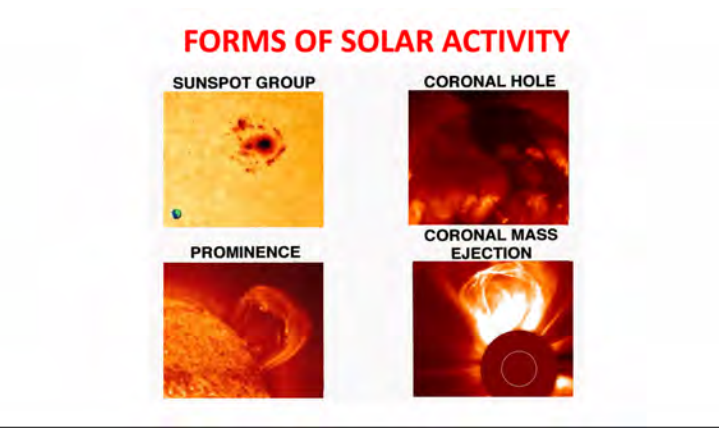
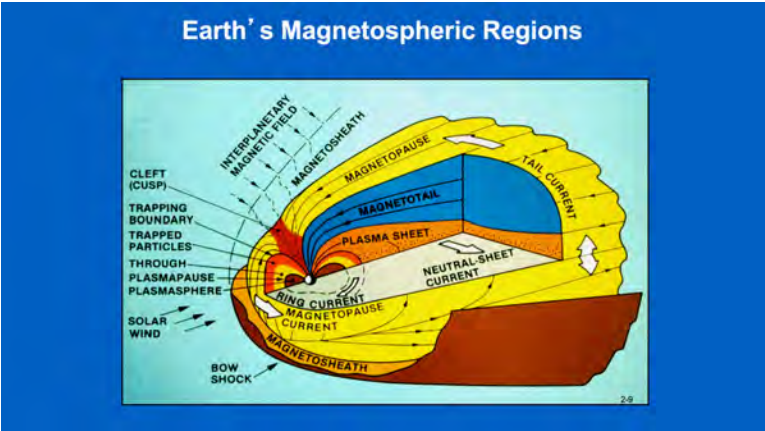
- **SATELLITE DESCRIPTION:** 260 Kg (570 Lbs). Size: small coffee table. Constellation of ~30,000 will provide high-speed, low-latency broadband global internet.
- **PROBLEM:** 49 SpaceX Starlink satellites were launched on Feb. 3 into a 209 km (130 mi.) parking orbit. 40 have re-entered or will shortly.
- **CAUSE:** A Coronal Mass Ejection (CME) occurred on 29 January and reached Earth on 2-3 Feb. Associated with the CME was a G1-class solar geomagnetic storm which increased the Starlink drag by 50%.
- **MITIGATION:** Re-positioned satellites so large flat solar arrays edge-forward to minimize drag. Maneuver worked for 9 of 49 satellites.

Dr. Henry Garrett talking about the issues and physics behind the recent SpaceX Starlink launch anomaly and loss of 40 satellites.



(Left) The "Chain Smoker" video (blue) and Coronal Mass Ejections / Space "Hurricanes"; (Right) The Solar Wind - The Breeze in Space Weather.



(Left) The structure and importance of the Earth's Magnetospheric Regions; (Right) Forms of Solar Activities.

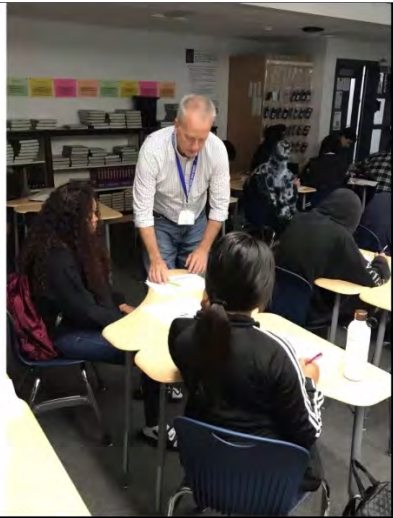
**(April 23) AIAA LA-LV New Space mini-Conference 2022,
with Keynote by Dr. Henry Garrett (Screenshots Only)**

TEACH, TUTOR, MENTOR.

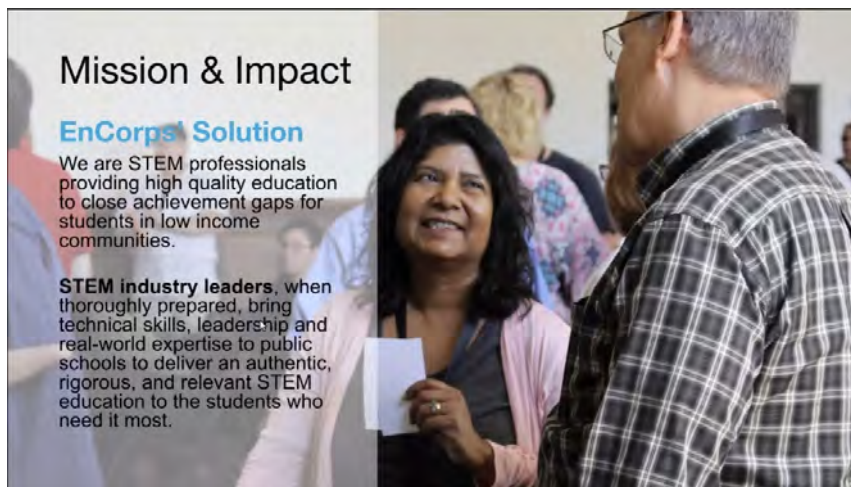
www.encorps.org/apply

Upcoming deadline: MAY 13TH

Leah Rodriguez
Teaching Fellowship Recruiter
leah.rodriguez@encorps.org
219-413-6589

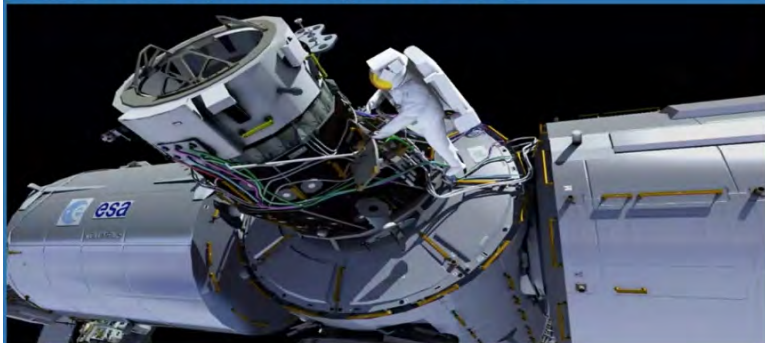


Ms. Leah Rodriguez (Right) giving the briefing / exhibit for EnCorps, an organization providing teachers' training and STEM resources.

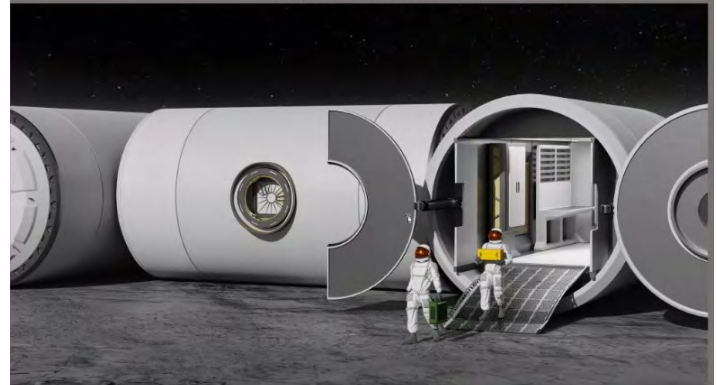


(Left) Ms. Leah Rodriguez talking about the mission and impact for helping closing the achievement gaps for students in low income communities; (Right) Mr. Peter Humphries (contact@asms.space), President of ASMS, Inc., did VR booth for ASMS before Pandemic.

International Docking Adapter (IDA)-2 installed onto Pressurized Mating Adapter (PMA)-2, at the forward end of the space station's Harmony node. Image Credit: NASA



ASMS Gateway Space Logistics Module, Reconfigured as a Lunar Research Module



Mr. Peter Humphries and his Space Manufacturing company, ASMS Inc., have very exciting proposals for universal multi-purpose space modules, which could be used in space on orbits, or on the surfaces of Moon and Mars etc.

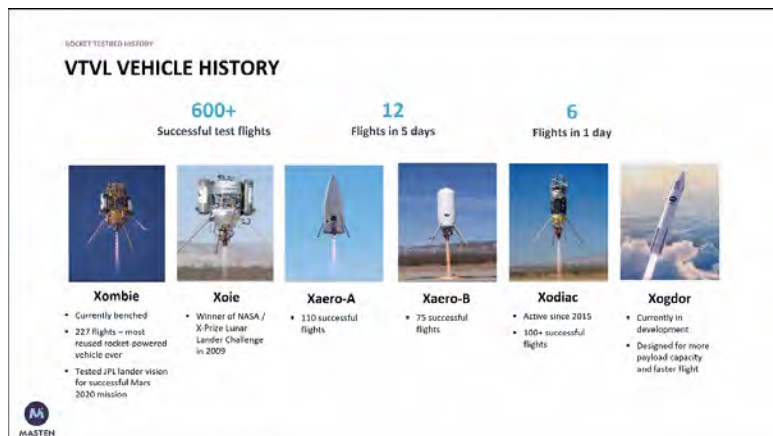
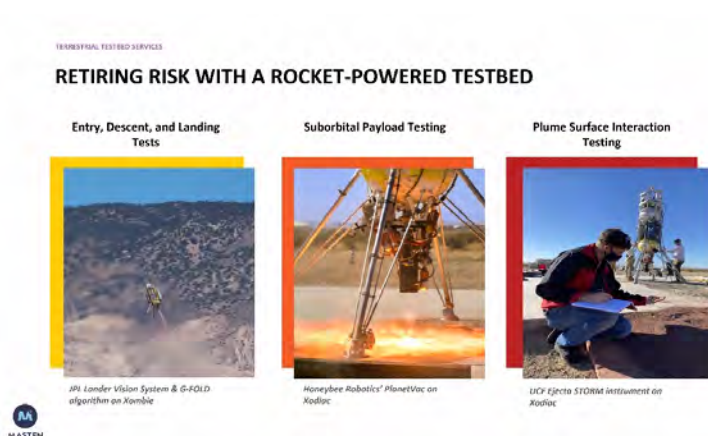
**(April 23) AIAA LA-LV New Space mini-Conference 2022,
with Keynote by Dr. Henry Garrett (Screenshots Only)**



Mr. Dennis Leung talking about various exciting applications and usages of Virtual Reality (VR/AR/MR) in aerospace industries (left), as well as the obstacles for mass adoption in aerospace.



(Left) Contact information for Mr. Dennis Leung, who will give a more detailed talk and make some demo on May 14 in person (see event information at the end of this newsletter, please join us! (<https://conta.cc/3EwFgsz>); (Right) Mr. Joe Perrella providing the contact information for Masten Space Systems, which have been doing wonderful jobs advancing aerospace technologies, especially for the Artemis and other interplanetary missions.



Mr. Joe Perrella talking about the exciting development in Masten Space Systems for retiring risk with a rocket-powered testbed (left), and the VTVL (Vertical Take-off Vertical Landing) capabilities in Masten Space Systems, including the most recent fast-paced effort on Xogdor. Very exciting! Keep the wonderful efforts! And please come back again and share with AIAA/LA-LV folks about the excitement / accomplishments!

Congratulations to 2022 AIAA Membership Upgrades, Anniversaries, and Awards!

Some of those Honorees will attend the AIAA LA-LV Section Annual Awards Dinner 2022 on May 5th (see the event page and the end of this newsletter. Please join us and cheer for them, and network with them.

2022 AIAA LA-LV Membership Upgrades:

Dr. David E. Lee, Northrop Grumman Space Systems

Mrs. Judith Gallman, Northrop Grumman Aerospace Systems

2021 Service Awards:

Mr. Dean Davis

2022 Major Membership Anniversaries:

80 years:

Reuben G. Klammer

70 years:

Thomas B. Shoebottom

Stephen R. Smith

60 years:

Dr. Michael K. Gauthier

Gordon L. Hamilton

John L. Norton

Dr. Arthu J. Schiewe

Dr. William Sollfrey

John R. Straton

John H. Tinley

50 years:

Dr. William F. Ballhaus

Mr. David G. Mitchell

Dr. George A. Paulikas

Mr. Joseph P. Provenzano

Mr. Lawrence Trupo

40 years:

Ward J. Lantier

David M. Ostrom

James H. Sloan

25 years:

Andrew B. Freeborn

James G. Maser

Ted W. Nye

Congratulations to 2022 Class of AIAA Associate Fellow: Dr. David E. Lee



Dr. David E. Lee, AIAA Class of 2022 Associate Fellow
*For leadership and professional practice in the
 development of electrodynamic tether propulsion
 systems, nuclear power and propulsion technologies and
 an educator in the fields of space systems design,
 manufacturing engineering and systems engineering*

David E. Lee is a program manager and lead systems engineer for multiple programs and manages the Integrated Concept Development Facility at Northrop Grumman Space Systems in Redondo Beach, California. He was the principal investigator for the FSPOT-X (Full Spectrum Power for Optical/Thermal Exergy) Project funded by the Department of Energy's ARPA-E FOCUS Program and served as space vehicle lead for the Next Mars Orbiter (NeMO) study contract with NASA/JPL. He is the area lead for space nuclear/thermal power and propulsion development and space tether technologies and systems within Northrop Grumman.

His research interests and technical foci include: next generation systems modeling, multi-int data fusion, autonomous systems operations, scalable space architectures, electrodynamic tethers, solar thermal energy production, integrated power and water generation.

As an educator, Dr. Lee is the lead instructor for the Spacecraft Systems Design and Analysis as well as the Space Mission Systems Engineering courses offered through UCLA Extension's Astronautical Engineering Certificate Program. He is currently a lecturer for the Introduction to Manufacturing Processes course in UCLA Mechanical and Aerospace Engineering.

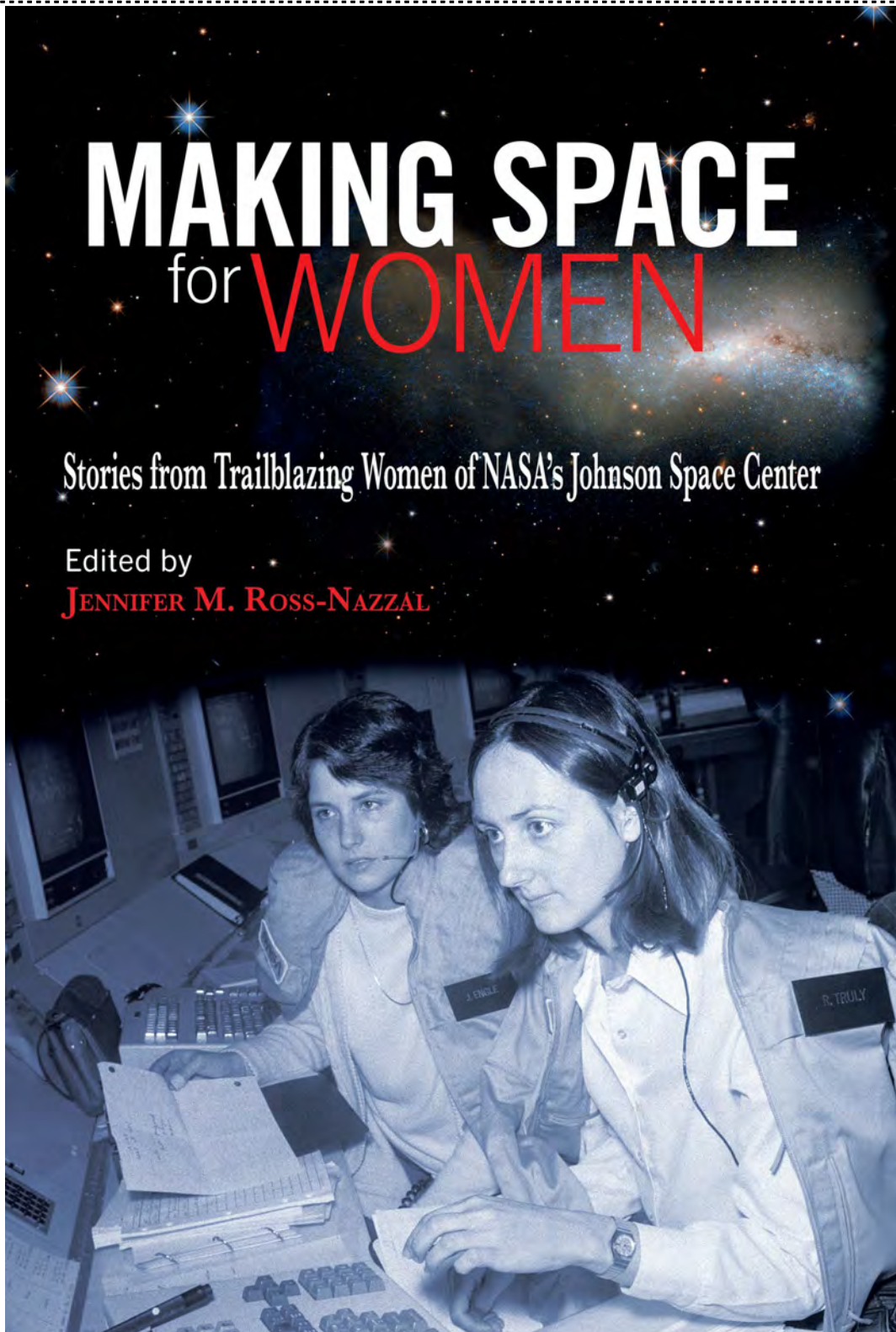
He serves on the Judges Advisory Committee for the California State Science & Engineering Fair and is a past Chair for the Board on Early Career Development within ASME's Student and Early Career Development Sector. He is a mentor for the West Torrance Robotics team in Torrance, California.

Dr. Lee completed his dissertation in Mechanical Engineering through the Integrated Manufacturing Engineering Program for Advanced Transportation Systems at UCLA. He received his B.A. in Mathematics and M.S. in Manufacturing Engineering all from UCLA.

He is a Fellow of the American Society of Mechanical Engineers and Associate Fellow of the American Institute of Aeronautics and Astronautics. Dr. Lee is a member of ACM, IEEE, INCOSE and NDIA.



Professional activities: Books authored by some AIAA members and aerospace professionals in recent years



<https://www.amazon.com/Making-Space-Women-Trailblazing-Trailblazers/dp/1623499933>

Dr. Jennifer M. Ross-Nazzal is Historian in NASA Johnson Space Center, and speaker in the AIAA LA-LV Neil's Day / Apollo 11 Moon Landing and Vikings Mars Landing Anniversary 2021 (<https://conta.cc/3gQa6B2>)

Professional activities: Books authored by some AIAA members and aerospace professionals in recent years

Books by Prof. George Bibel

Beyond the Black Box: The Forensics of Airplane Crashes

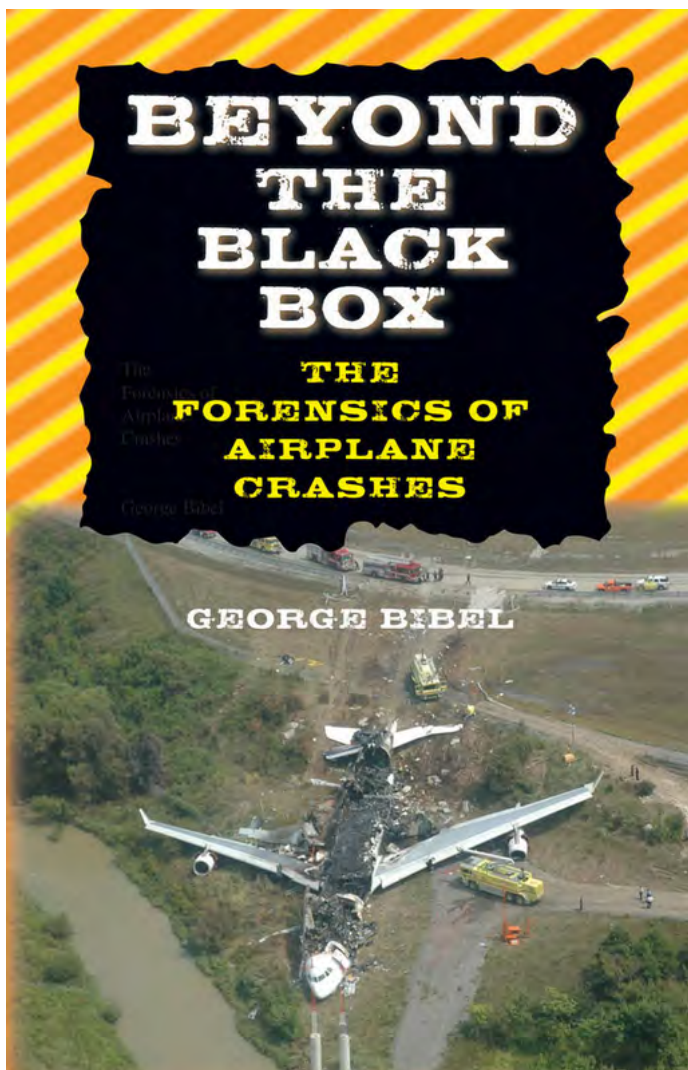
54 Amazon ratings 4.8/5

Plane Crash: The Forensics of Aviation Disasters Along with Robert Hedges; certified Boeing/Airbus Captain

36 Amazon ratings 4.5/5

Published by Johns Hopkins University Press

The point of my books is telling interesting and insightful engineering stories in simple terms. The first two chapters of Black Box and first chapter of plane crash are available on Amazon



Preface

1... The Crash Investigation Process

2... How Planes (Often) Crash

3... In-Flight Breakup

4... Pressure, Explosive Decompression, and Burst Balloons

5... Jet Propulsion, Burst Engines, and Reliability

6... Metal Fatigue: Bending 777s and Paper Clips

7... Combustion: Fire and Explosion

8... Crash Testing

9... Human Tolerances to G Loads and Crash Forces

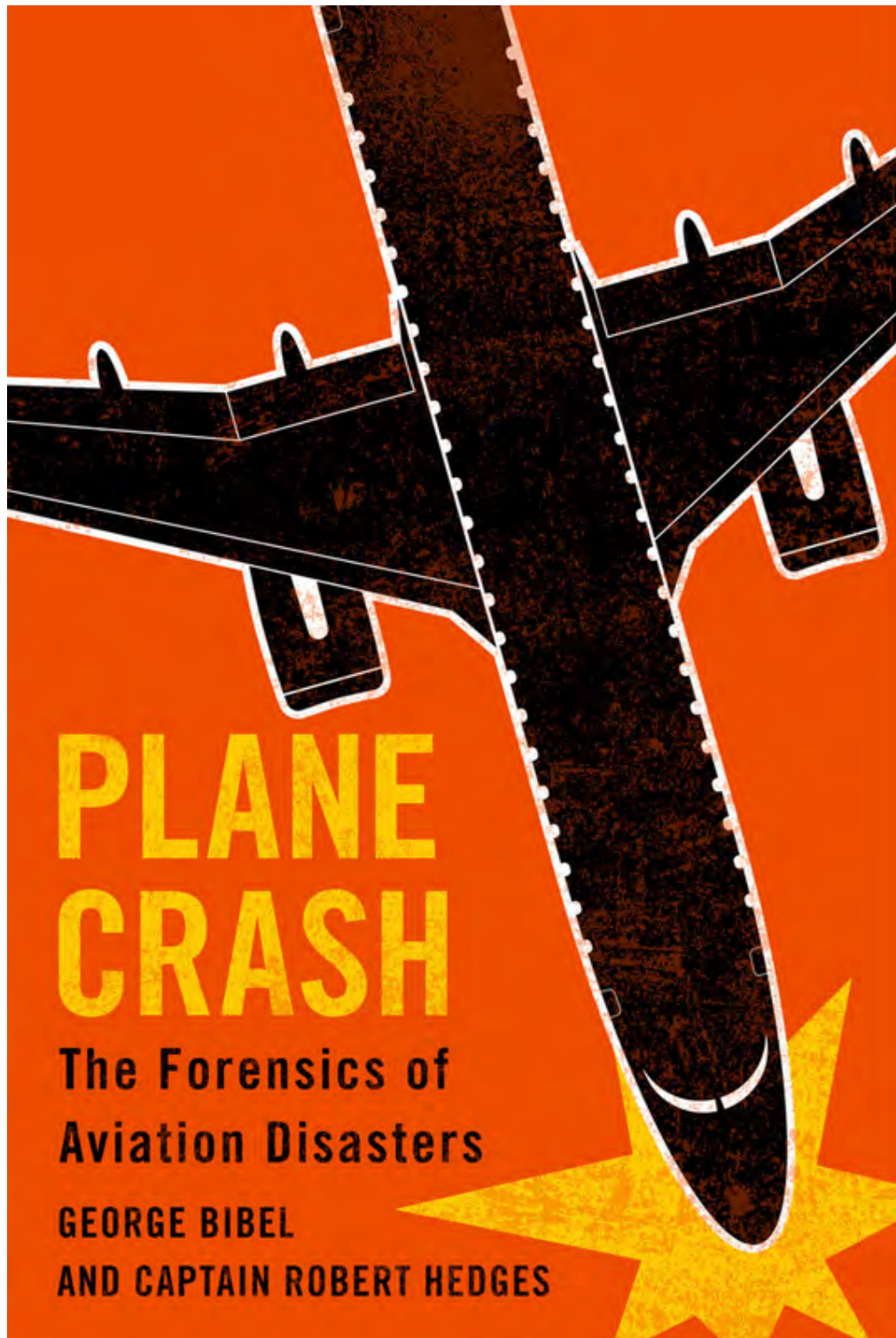
Notes

References

Index

<https://www.amazon.com/Beyond-Black-Box-Forensics-Airplane-ebook-dp-B07DFMMRH3/dp/B07DFMMRH3>

Professional activities: Books authored by some AIAA members and aerospace professionals in recent years



<https://www.amazon.com/Plane-Crash-Forensics-Aviation-Disasters-dp-1421424487/dp/1421424487>

Prof. George Bibel is Professor of Mechanical Engineering at the University of North Dakota, and former AIAA Distinguished Lecturer/Speaker. He will speak in person on May 21 (see the event posting in this newsletter and the email notices, RSVP and Information: <https://conta.cc/3LXua27>. Please join us and meet the author/speaker on May 21 !

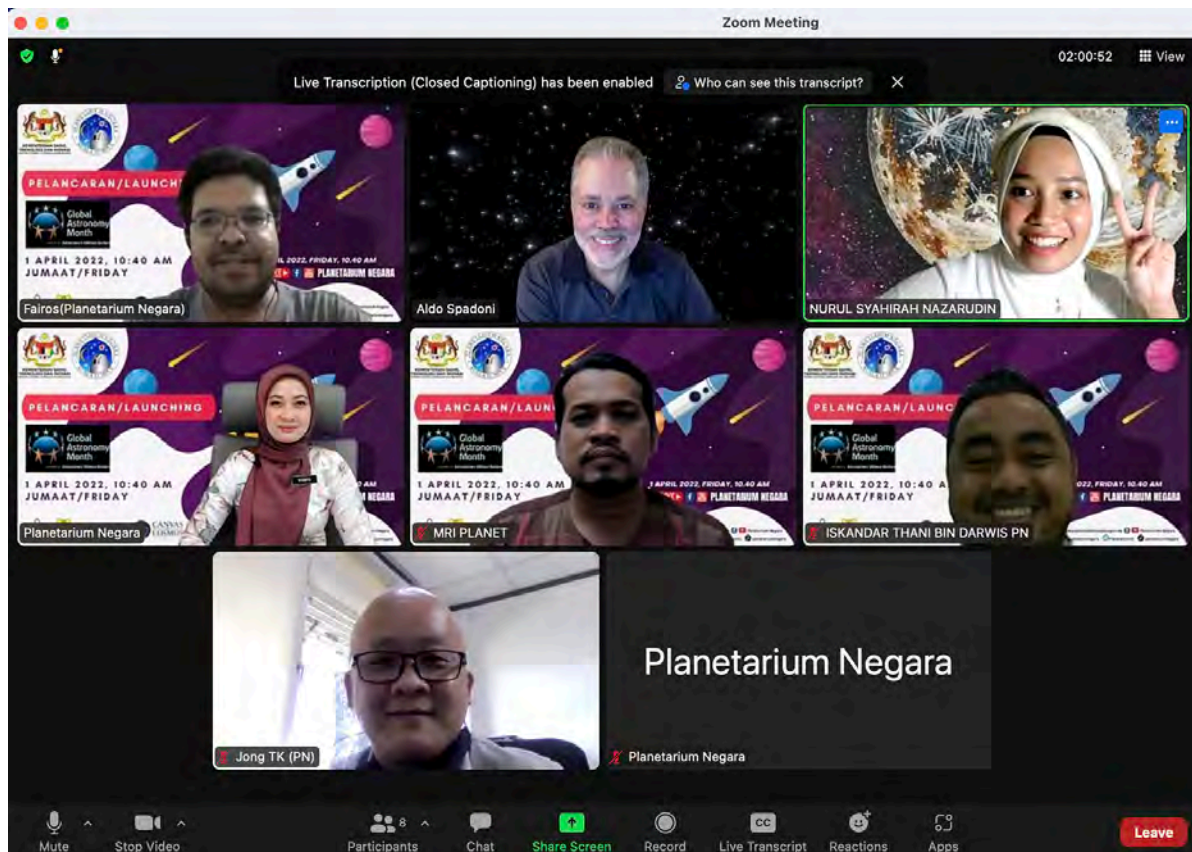
Professional activities: AIAA member and aerospace artist, Mr. Aldo Spadoni: Exploring the Role of Art In Advancing Space Exploration, Science & Astronomy with Planetarium Negara in Malaysia in a celebration of Global Astronomy Month

I was recently invited by the Planetarium Negara in Malaysia to participate in a celebration of Global Astronomy Month. I was asked to talk about Exploring the Role of Art In Advancing Space Exploration, Science & Astronomy. I had a good time doing this presentation to such a receptive audience. I'm grateful to my friend and fellow artist Syahirah Stargazer for all her hard work to make this event happen. For anyone interested, you can see the presentation here:

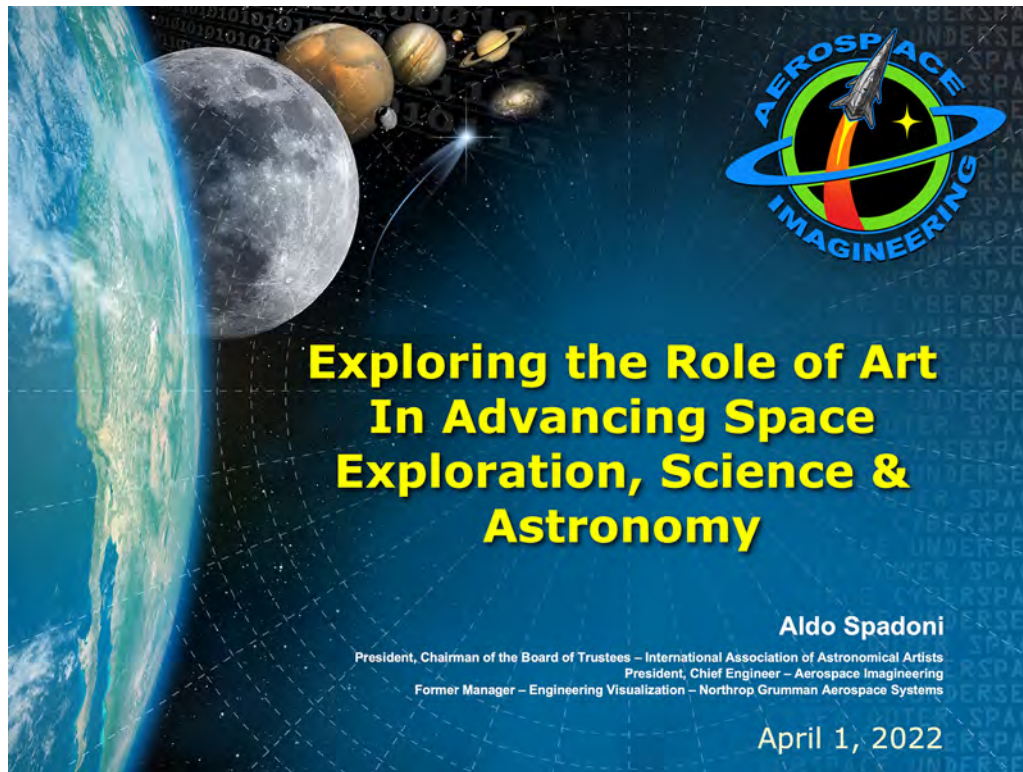
https://www.facebook.com/watch/live/?ref=watch_permalink&v=959473584761294

The event begins in the Malay language and transitions to English. Syahirah's wonderful presentation on Comet Leonard and her artwork starts at around 12:00. She then introduces me at 32:45 and my presentation begins around 34:45 and ends around 1:10:45, followed by Q&A. I'm grateful to Mhd Fairos bin Asillam, Senior Principal Assistant Director at Planetarium Negara for hosting us.

As president of the IAAA but also as an AIAA member, I was keen on participating in this particular event because I feel we really need to expand our engagement with people in non-English speaking countries. Space artists think about and create art on a scale that encompasses the entire Universe. It's our playground. On this planet, in our struggle to think of ourselves as One Humanity, I think part of our Artist mission should be to break down language and time-zone barriers to the extent we're able to.



Professional activities: AIAA member and aerospace artist, Mr. Aldo Spadoni:
Exploring the Role of Art In Advancing Space Exploration, Science & Astronomy
with Planetarium Negara in Malaysia in a celebration of Global Astronomy Month




**WEBINAR: THE IAAA AND THE ROLE OF ART
 IN ADVANCING SPACE EXPLORATION, SCIENCE AND ASTRONOMY**


ALDO SPADONI
 PRESIDENT OF AEROSPACE
 IMAGINEERING AND INTERNATIONAL ASSOCIATION
 OF ASTRONOMICAL ARTIST (IAAA) (USA)


NURUL SYAHIRAH BINTI NAZARUDIN
 ARTIST MEMBER OF IAAA
 DARK SKY ADVOCATE OF DARK SKY MALAYSIA AND
 INTERNATIONAL ASSOCIATION (IDA), EDUCATOR

1 APRIL 2022, FRIDAY, 10.40 AM

LIVE STREAM   **PLANETARIUM NEGARA**

www.planetariumnegara.gov.my  Planetarium Negara
[planetariumnegara](https://www.instagram.com/planetariumnegara)  PlanetariumKL  planetariumnegara

Professional activities: AIAA member, Distinguished Speaker, and X-15 Book Author, Ms. Michelle Evans: Exhibition in the Joe Walker Middle School 50th Anniversary Celebration <http://www.mach25media.com/jwms.html>

Joe Walker was honored several years after he lost his life in a [midair collision](#), with the naming of [Joe Walker Middle School](#) in [Quartz Hill](#), in 1972. This is in the Antelope Valley, near Edwards AFB, where Joe served as a test pilot.

In 2022, there were several major events held in honor of the 50th anniversary of the school's founding.

— Joe Walker Day, 25 February 2022 —

First up was Joe Walker Day. On this occasion numerous stations were setup around the school where the students were rotated every 40 minutes so that they could experience each in turn throughout the very busy day.



A large display set up by Michelle Evans highlighting the legacy of the X-15 and Joe Walker.



Michelle speaking with the students in the Joe Walker Middle School gymnasium.



After each talk, and the Q&A session, the students were invited to come up to see the photos, models, and artifacts up close, and to ask more questions of Michelle and Cherie.

Professional activities: AIAA member, Distinguished Speaker, and X-15 Book Author, Ms. Michelle Evans: Exhibition in the Joe Walker Middle School 50th Anniversary Celebration <http://www.mach25media.com/jwms.html>

— Joe Walker School 50th Anniversary Celebration, 2 April 2022 —

The final event to celebrate the school's 50th anniversary was held on Saturday 2 April 2022. The day prior to that Michelle also did her presentation "The X-15 Rocket Plane, Flying the First Wings into Space" at the Quartz Hill Library.



Cherie and Michelle speak with two special guests on 1 April 2022 prior to the start of Michelle's X-15 talk at the Quartz Hill Library: Milton (Mac) McKay and Susan McKay Bishop. They are two of eight children of X-15 pilot [Jack McKay](#).

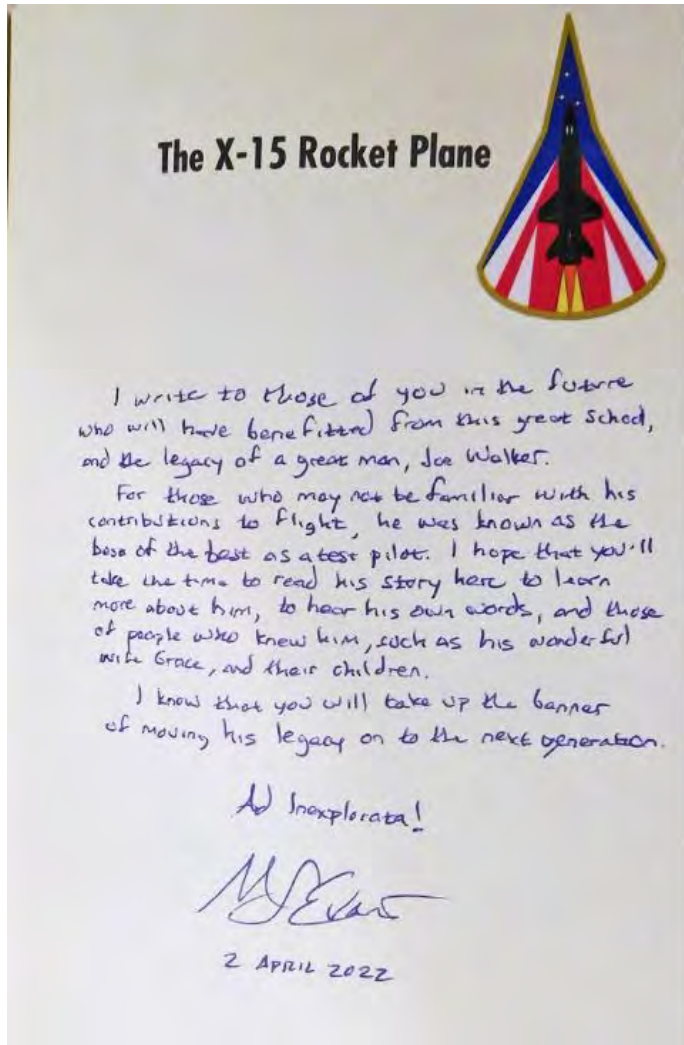


Taking questions at the end of my X-15 talk at the Quartz Hill Library.

Professional activities: AIAA member, Distinguished Speaker, and X-15 Book Author, Ms. Michelle Evans: Exhibition in the Joe Walker Middle School 50th Anniversary Celebration <http://www.mach25media.com/jwms.html>

— The 2022 Time Capsule —

On 2 April 2022, a new time capsule was sealed, to be opened by the Joe Walker School in 2072. It is an honor to have a copy of my book on the X-15 and Joe Walker, along with all the others who made the program a reality, is now a part of this capsule. It is a humbling thought to know that the parents of the students who will one day open this new time capsule will not even be born until the 2040s or even into the 2050s.



The title page inscription on the copy of Michelle's book that will rest within the Joe Walker Middle School Time Capsule through 2072.



The book that is placed into the 2072 time capsule.



Michelle with her X-15 book on 2 April 2022, and the time capsule where it will reside for 50 years.

I write to those of you in the future who will have benefitted from this great school, and the legacy of a great man, Joe Walker. For those who may not be familiar with his contributions to flight, he was known as the best of the best as a test pilot. I hope that you'll take a moment to read his story here to learn more about him, to hear his own words, and those of people who knew him, such as his wonderful wife Grace, and their children. I know that you will take up the banner of moving his legacy on to the next generation.

Ad Inexplorata!

M L Evans

2 April 2022

AIAA LA-LV Aerospace News Digests by Dr. Ken Lui, AIAA LA-LV Section



(Apr. 21) U.S. Fast-Tracker 'Phoenix Ghost' Drone Being Sent to Ukraine



(Apr. 20) Russia test-fired its new 'Son of Satan' ICBM to threaten the West during its Ukraine war



(Mar. 28) All You Need To Know About The Starstreak Missiles Now In The Hands Of Ukrainian Troops



(Apr. 21) Norway Has Sent Its Mistral Anti-Aircraft Missiles To Ukraine



(Apr. 22) Elon Musk's Starlink Fought off Russian Jamming Attack in Ukraine



(Apr. 25) Twitter accepts Elon Musk's buyout deal



(Apr. 20) SpaceX shut down a Russian electromagnetic warfare attack in Ukraine last month — and the Pentagon is taking notes



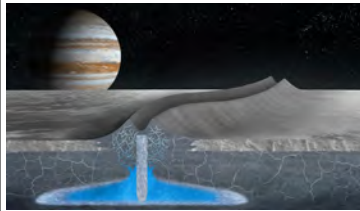
(Apr. 21) NASA enlists SpaceX and Amazon to help develop next-gen space communications



(Apr. 20) Ukraine in Talks to Get US MQ-9 Reaper Armed Drones: Report



(Apr. 25) U.S. Navy Gears Up for the Race to Develop New Hypersonic Weapons



(Apr. 20) Europa's similarity to Greenland hints that Jupiter moon could harbor life



(Apr. 17) New 'Helical Engine' could reach 99% the speed of light



(Apr. 18) Google denies Ukrainian reports it unblurred satellite Maps imagery in Russia



(Apr. 20) Loaded With 'Live Missiles', US Deployed F-15 Heavy-Weight Fighters In Response To Chinese J-20 Combat Patrols



(Apr. 19) Experts: China Deploying J-20 Fighters in Asia to Counter US F-35s



(Apr. 2) Can the F-15EX 'Super Interceptors' Outclass the Chinese J-20 Stealth Fighters?



(Apr. 22) China military PR video hints at 3rd aircraft carrier launch



(Apr. 19) Rocket Lab Secures Multi-Launch Contract with HawkEye 360, Confirms First Launch Planned from Virginia



(Apr. 4) (F-35) Flying High for More Than 500,000 Hours



(Apr. 4) ZeroAvia Solves Green Hydrogen Chicken-&-Egg Conundrum

RSVP and Information: (<https://conta.cc/3tzjHUt>)

AIAA LA-LV 5/5 Section Special Hybrid-Event

(Hybrid: In-Person and also online on Zoom)

Thursday, 2022 May 5, **5:30 PM PDT** (US and Canada)

AIAA LA-LV Annual Awards Dinner

The Proud Bird (The Mission Room, 1st Floor), 11022 Aviation Blvd, Los Angeles, CA 90045

(East of LAX & Pacific Coast Hwy 1, North of 105/Imperial Hwy, West of 405 Hwy, South of W. Century Blvd/Hwy 10) (Free Parking)

Please join us for our annual Awards Dinner

Recognizing Excellence in our Chapter

To be presented:

2022 AIAA LA-LV Excellence Awards

First Place:

James Webb Space Telescope (Northrop Grumman)

Second Place (2):

Neutron Reusable Rocket (Rocket Lab)

and

DragRacer Small Satellites (Millennium Space Systems)

(recognizing recent accomplishments)

also

Best Event Award

The James Wertz Scholarship

STEM Student Awards

AIAA SSTC Middle School Essay Contest Recognition

Recognition of 2022 Chapter Honorees



Disclaimer: The views of the speakers do not represent the views of AIAA or the AIAA Los Angeles-Las Vegas Section.

Contact: Dr. Ken Lui, Events/Program Chair, LA, AIAA LA-LV Section (events.aiaalav@gmail.com)

<https://aiaa-lalv.org/events>, <https://engage.aiaa.org/losangeles-lasvegas>, <https://aiaa-lalv.org/download>



Scott P. Willoughby

*Vice President of Program Excellence
Space Systems Sector*

Scott P. Willoughby is the vice president of Program Excellence serving Northrop Grumman's Space Systems sector, a premier provider of space and launch systems serving national security, civil and commercial customers. In this role, Willoughby is responsible for driving excellence in quality and customer satisfaction across Space Systems.

Prior to assuming this role, Willoughby served as the vice president of Operations for the company's Strategic Space Systems division. In this role, he oversaw all aspects of production capabilities and enabling digital transformation strategies across manufacturing, integration and test, mission assurance, global supply chain, manufacturing and operations.

During this time, he also held the role of vice president and program manager for the James Webb Space Telescope overseeing all aspects of the program.

Prior to his current responsibilities, Willoughby served as the P858 program manager in the Advanced Concepts, Technology and Emerging Systems division. His primary responsibilities were to drive process improvements and delivery of this critical and strategic program. He oversaw program management including financial management, human resources, capital, customer and subcontractor interfaces at all levels of contract management.

Before his leading role on P858, Willoughby was the program manager for the Advanced Extremely High Frequency (AEHF) program, where he led the team on early deliveries to Lockheed Martin for two AEHF payloads, Flight 1 and Flight 2, and positioned the program for a subsequent early delivery of Flight 3.

Additionally, Willoughby was responsible for the Milstar program which included payload support for a constellation of five operational satellites. He also served as the AEHF deputy program manager for Flight 1 payload production and delivery. Willoughby had overall responsibility and complete authority for day-to-day activities associated with completing the Flight 1 AEHF to include payload hardware and software manufacturing, production, testing, integration and delivery.

Throughout his long career, Willoughby has accumulated broad experience across many areas including systems engineering; integration, test and launch; antenna products; and project and functional management. He was the director for Integration, Test and Launch within Northrop Grumman Space Technology's Production and Supply Chain (PSC) organization, where he focused on improving best practices across sector programs.

Early in his career, Willoughby led the PSC Production Control Directorate, developing common tools and processes for production schedule planning and execution. Moreover, Willoughby supported both commercial and milsatcom systems having directed the Astrolink Antenna Products and Integration and Test teams. He also served as the Milstar offsite manager for the

integration of the first Block II payloads and as a systems engineer on Milstar Block and the lead systems engineer on APSTAR.

Willoughby joined Northrop Grumman in 1989 as a member of the technical staff of TRW, a heritage Northrop Grumman company. He received a bachelor's degree, summa cum laude, in electrical engineering from Lehigh University in 1989 and a master's degree in communication systems from the University of Southern California in 1991. He is also a graduate of the UCLA Executive Program at the Anderson School of Management.

Northrop Grumman is a technology company, focused on global security and human discovery. Our pioneering solutions equip our customers with capabilities they need to connect, advance and protect the U.S. and its allies. Driven by a shared purpose to solve our customers' toughest problems, our 90,000 employees define possible every day.



Amy S. Lo

*JWST Deputy Space Vehicle Director
Northrop Grumman, Space Systems*

Amy Lo is the Deputy Director for the Vehicle Engineering IPT of the James Webb Space Telescope. She is responsible for execution in support of the Space Vehicle Director for cost, schedule and management of all Space Vehicle elements, as well as ensuring technical execution and process compliance for all Vehicle Engineering disciplines supporting the Webb program. Prior to this role, Lo served as the Alignments Thread Lead for Webb, responsible for all aspects of mechanical alignments for the Observatory.

Lo joined Northrop Grumman in 2005 and has been involved in a variety of optical design and simulation projects with large deployables. Her expertise includes mathematical simulations, mission architecture development, mission analysis and system engineering. Prior roles include Mission Performance Thread Lead for the Next Generation Polar program, system engineering for the CERES program and she has provided support to the business development efforts of Northrop Grumman's technology development and civil systems business areas. During her time at the company, Lo has also worked on developing the New Worlds Observer mission concept, which uses a "Starshade" to occult nearby stars and enable the detection of Earth-like planets.

Lo earned her bachelor's degree in Physics at Brown University and her Ph. D. in Astrophysics from UCLA. Her doctoral thesis was on the Cosmic Microwave Background. Lo is a member of the American Astronomical Society, the Institute of Electrical and Electronics Engineers and the American Institute of Aeronautics and Astronautics. She has more than 30 technical publications in the subjects of Astrophysics and Exoplanet Detection Technology.

Northrop Grumman solves the toughest problems in space, aeronautics, defense and cyberspace to meet the ever-evolving needs of our customers worldwide. Our 90,000 employees define possible every day using science, technology and engineering to create and deliver advanced systems, products and services.



Lars Hoffman
Senior Vice President, Rocket Lab

As Senior Vice President, Lars is responsible for Rocket Lab's global business and government affairs. With more than 30 years of experience in national security and aerospace, Lars brings a deep knowledge of the global space industry and U.S. Government space requirements.

Before joining Rocket Lab, Lars was an executive at SpaceX, from 2014 to 2018. At SpaceX, Lars facilitated certification of the Falcon 9 and Falcon Heavy launch vehicles and he led the capture of more than \$2 billion of national security space business.

Prior to joining industry, Lars completed a distinguished career in the United States Air Force, as a U-2 reconnaissance pilot, a test pilot, and in senior leadership roles at The Pentagon.

Lars holds advanced engineering degrees from the United States Air Force Academy, U.S. Air Force Institute of Technology, and U.S. Air Force Test Pilot School. Lars also earned national security degrees from MIT, Air University, and National Defense University, and a Master of Business Administration degree from UCLA.

About Rocket Lab:

Founded in 2006, Rocket Lab is an end-to-end space company with an established track record of mission success. We deliver reliable launch services, spacecraft components, satellites and other spacecraft and on-orbit management solutions that make it faster, easier and more affordable to access space. Headquartered in Long Beach, California, Rocket Lab designs and manufactures the Electron small orbital launch vehicle and the Photon satellite platform and is developing the Neutron 8-ton payload class launch vehicle. Since its first orbital launch in January 2018, Rocket Lab's Electron launch vehicle has become the second most frequently launched U.S. rocket annually and has delivered over 100 satellites to orbit for private and public sector organizations, enabling operations in national security, scientific research, space debris mitigation, Earth observation, climate monitoring, and communications. Rocket Lab's Photon spacecraft platform has been selected to support NASA missions to the Moon and Mars, as well as the first private commercial mission to Venus. Rocket Lab has three launch pads at two launch sites, including two launch pads at a private orbital launch site located in New Zealand, one of which is currently operational, and a second launch site in Virginia, USA which is expected to become operational in 2022.



Dr. Patrick Kelly
Astrodynamics Group Lead
Millennium Space Systems

Dr. Patrick Kelly leads the Astrodynamics group at Millennium Space Systems in El Segundo, CA. Patrick and his team investigate novel orbital solutions for current and future flight programs, supporting civil, defense, and commercial space applications. His focus areas include space domain awareness, autonomous systems, and small satellite development. Patrick is the program manager for the DRAGRACER flight experiment designed to investigate orbital debris mitigation possibilities using space tether technology. DRAGRACER launched 20 November 2020 and successfully deorbited a 6U CubeSat module over the course of eight months. After DRAGRACER, Patrick hopes to explore other innovative techniques to address the growing challenges of space congestion in our shared, finite orbital environment. Patrick earned his PhD in Aerospace Engineering from the University of Florida.

AIAA LA-LV 5/11 Section Aero Alumni (hybrid) Meeting

Wednesday, 2022 May 11, **11:00 AM - 1 PM PDT** (US and Canada)

Aero Alumni Meeting

Hybrid in-person luncheon and Zoom online meeting

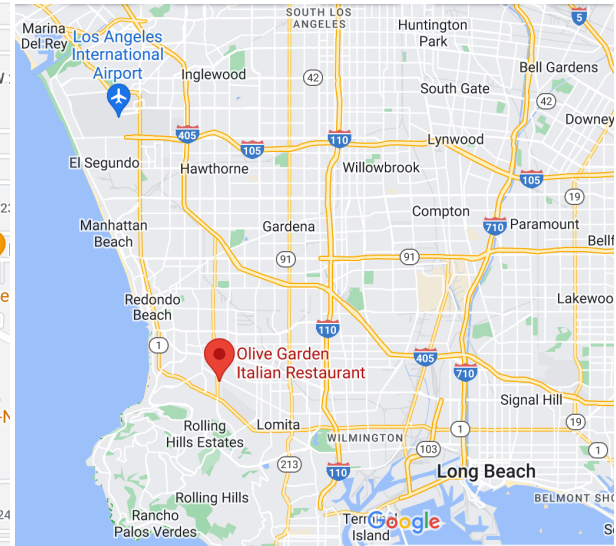
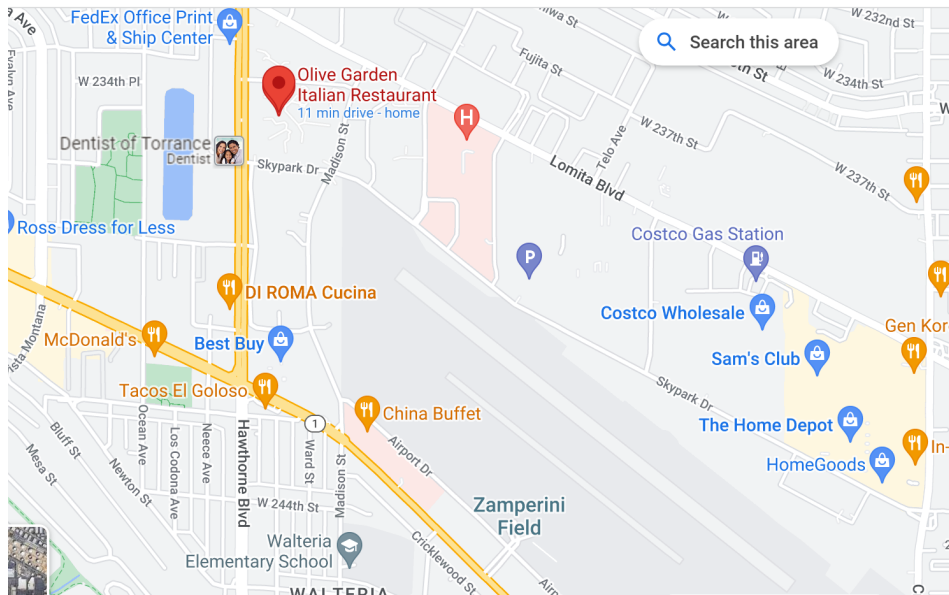
Our monthly Aero Alumni Zoom meeting is at 11 am May 11. (The 2nd Wednesday of May) It will be a hybrid meeting (both in-person there and on-line) at the Olive Garden in Torrance, 23442 Hawthorne Blvd., Torrance, CA 90505. Covid is again allowing a hybrid meeting. If you can, please join me at the Olive Garden. I'll meet you there. If you can't, you can use the Zoom link below. It will take a few minutes to set up the link. You can chat among yourselves until it's ready.

In-Person in:

Olive Garden in Torrance

23442 Hawthorne Blvd., Torrance, CA 90505

(South of 105/405 Hwy, West of 101 Hwy, North of Pacific Coast Hwy (1))



Online on Zoom:

Join Zoom Meeting <https://aiaa.zoom.us/j/86294268986?pwd=S3RvdFlqNkZ6bmlmWFJ6a1RqMVp0dz09>

Meeting ID: 862 9426 8986

Passcode: 462451

One tap mobile

+13462487799,,86294268986# US (Houston) +17207072699,,86294268986# US (Denver)

Dial by your location

+1 346 248 7799 US (Houston) +1 720 707 2699 US (Denver) +1 253 215 8782 US (Tacoma)

+1 312 626 6799 US (Chicago) +1 646 558 8656 US (New York)

+1 301 715 8592 US (Washington DC) 877 853 5257 US Toll-free 888 475 4499 US Toll-free

Find your local number: <https://aiaa.zoom.us/u/kdg68m0a4>

Contact: Mr. Gary Moir, (gary.moir@ingenuir.com)

RSVP and Information: (<https://conta.cc/3EwFgsz>)

AIAA LA-LV 5/14 Section (Town Hall) hybrid-Meeting

(Hybrid: In-Person and also online on Zoom)

Saturday, 2022 May 14, 12:40 PM PDT Check-in (US and Canada)

Virtual Reality (VR/AR/MR) in aerospace w/demo

plus

Early Career / Young Professionals Networking

presentation/demo:

Mr. Dennis Leung

Founding partner of Dibashi Consulting

Formerly with Northrop Grumman Space Divisions

Formerly with NASA Dryden Research Center (Hypersonic Vehicle Division)

(The speaker will present in person.)

(More presentations/demo/exhibition might be announced.)

Location (also on line on Zoom) (This event is not sponsored by the Manhattan Beach Library)

Manhattan Beach Library (Meeting Room)

1320 Highland Avenue, Manhattan Beach, CA 90266

(South of 105 Hwy and West of 405 Hwy/Pacific Coast Hwy (1))

(also online on Zoom for an hybrid event)

(If you are sick or don't feel well, please stay home and attend online on Zoom.)(This event is not sponsored by the Manhattan Beach Library)



Disclaimer: The views of the speakers do not represent the views of AIAA or the AIAA Los Angeles-Las Vegas Section.

Contact: Ms. Courtney Best, Young Professional (YP)/ Early Career Professional (ECP) Chair, (courtney.best@boeing.com)

Dr. Ken Lui, Events/Program Chair, LA (events.aiaalav@gmail.com)

<https://aiaa-lalv.org/events>, <https://engage.aiaa.org/losangeles-lasvegas>, <https://aiaa-lalv.org/download>

RSVP and Information: (<https://conta.cc/3LXua27>)

AIAA LA-LV 5/21 Section (Town Hall) hybrid-Meeting

(Hybrid: In-Person and also online on Zoom)

Saturday, 2022 May 21, 10:30 AM PDT Check-in (US and Canada)

Aviation/Aircraft Safety

*(Discussion of cases in history similar to the recent incidents of flights
MU5735, and AF447 etc.; Lessons learned.)*

by

Prof. George Bibel

Professor of Mechanical Engineering at the University of North Dakota

(Former AIAA Distinguished Lecturer/Speaker)

(The speaker will present in person.)

(Please try to attend in person if possible.)

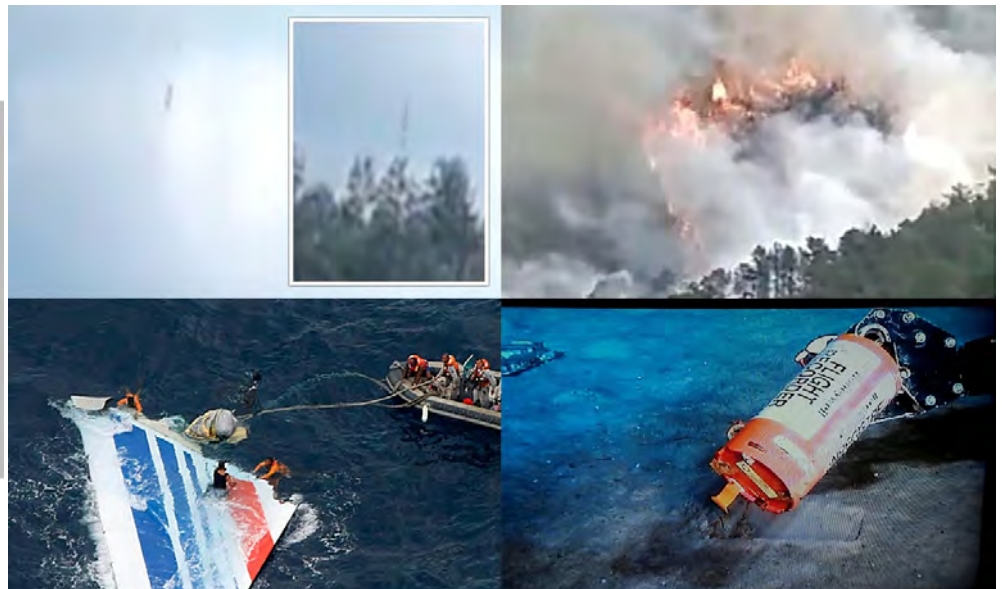
Location (also on line on Zoom) (This event is not sponsored by the Lawndale Library)

Lawndale Library (Meeting Room)

14615 Burin Ave., Lawndale, CA 90260

(South of 105 Hwy and East of 405 Hwy/Pacific Coast Hwy (1))

(Near SpaceX Hawthorne)



Disclaimer: The views of the speakers do not represent the views of AIAA or the AIAA Los Angeles-Las Vegas Section.

Contact: Dr. Ken Lui, Events/Program Chair, LA (events.aiaalav@gmail.com)

<https://aiaa-lalv.org/events>, <https://engage.aiaa.org/losangeles-lasvegas>, <https://aiaa-lalv.org/download>

RSVP and Information: (<https://conta.cc/3HwND5>)

AIAA LA-LV Online Virtual Gallery Exhibition

March 26 - May 31, 2022

Women in Space Art Online Virtual Gallery Exhibition

Participating Artists:

Adrianna Allen (Michigan)

Patty Avalon (Virginia)

J. Benn (New Hampshire)

Marilynn Flynn (Arizona)

Robin Hart (California)

Barbara Amelia King (Georgia)

Linda Landers (UK)

Nurul Syahirah Binti Nazarudin (Malaysia)

Michelle Rouch (Arizona)(AIAA Associate Fellow)

Danielle Rose (Oregon)

Nicole Stott (Florida) (Astronaut)

Priscilla Chase Thomas (Arkansas)

Lucy West (Idaho)



Disclaimer: The views of the speakers do not represent the views of AIAA or the AIAA Los Angeles-Las Vegas Section.

Contact: Dr. Ken Lui, Events/Program Chair, LA, AIAA LA-LV Section (events.aiaalav@gmail.com)

<https://aiaa-lalv.org/events>, <https://engage.aiaa.org/losangeles-lasvegas>, <https://aiaa-lalv.org/download>