

2023 FEBRUARY EDITION

AIAA LA-LV

NEWSLETTER

EL SEGUNDO, CA



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OR BREAKAWAY?**

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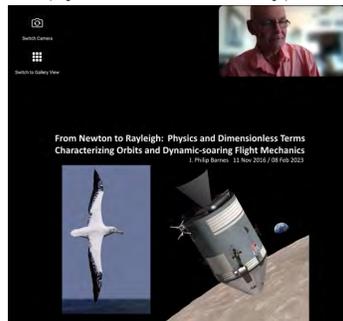
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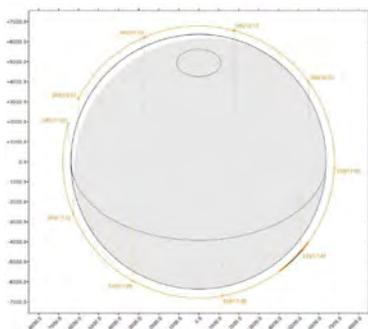
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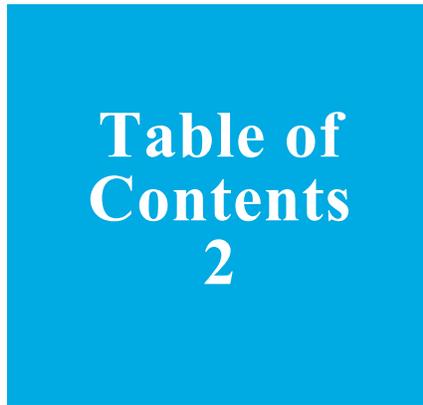
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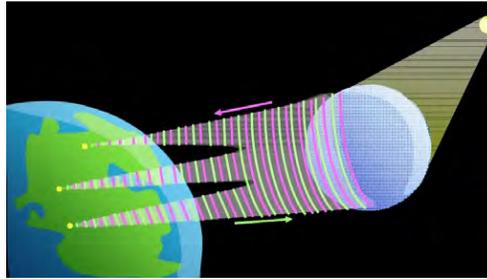
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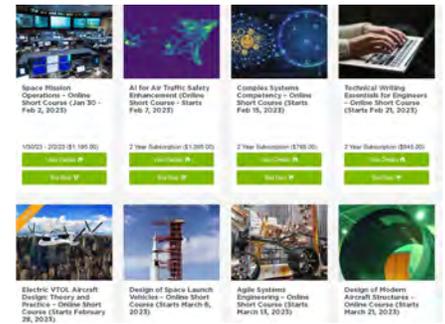
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(Cover Story) Chinese balloon over the United States

-- A lesson from the history of overhead reconnaissance. Project GENETRIX

by Mike Gruntman, Professor of Astronautics at USC (February 7)

<https://www.linkedin.com/pulse/chinese-balloon-over-united-states-lesson-from-history-gruntman>



Pilot Took a Selfie With the Chinese Spy Balloon One Day Before Military Shot It Down. Photo: U.S. Department of Defense (public domain photos: (<https://www.dvidshub.net/image/7644960/u-2-pilot-over-central-continental-united-states>))

A story about a Chinese reconnaissance balloon hovering over the continental United States dominated the news in early February 2023.

Was it worth the purpose? As President Eisenhower noticed more than 65 years ago the reconnaissance balloons had given “more legitimate grounds for irritation than” for anything else. Or, was such irritation exactly the purpose of the Chinese Communist Party? And, perhaps, probing the capabilities and testing response of the United States?

Some historical background (excerpts from “Blazing the Trail,” pp. 388, 390, 391) follows.

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(Cover Story) Chinese balloon over the United States

-- A lesson from the history of overhead reconnaissance. Project GENETRIX

by Mike Gruntman, Professor of Astronautics at USC (February 7)

“The importance of peacetime overhead reconnaissance in the postwar world was recognized by a number of military officers, scientists, and industrial leaders. An American veteran of World War II aerial reconnaissance, Richard S. Leghorn, became a leading proponent of strategic overflights. The new intercontinental weapons were changing the very nature of armed conflict. As early as 1946 when he was invited to speak at the dedication of the Boston University Optical Research Laboratory (BUORL), Leghorn argued for importance of defensive reconnaissance overflight of the territory of potential adversaries, if needed without their permission ... In 1951–1952, the Air Force conducted a special study that focused, in part, on national reconnaissance needs. This important assessment, known as the Beacon Hill study ... strongly endorsed aerial reconnaissance in peacetime and urged development of high-altitude aircraft that would operate, if required, in the denied Soviet airspace.

The overflights by balloons, Project GENETRIX, would come first however. The balloon program, also known as WS-119L, started in November 1955 and lasted for half a year. After release, the balloons reached altitudes between 50,000 and 100,000 ft (15–30 km), above the contemporary fighter plane capabilities, and drifted across the Soviet Union and communist China. It was planned to recover the balloons over friendly territory.

The GENETRIX balloon development was coordinated with other balloon research programs of the U.S. Air Force studying airflows over the continental United States. As operational ceiling of aircraft was continuously increasing, one needed to know the conditions at high altitudes. Studies of air currents provided a reasonable cover for balloon development for reconnaissance and could plausibly explain carrying photographic cameras allegedly for recording cloud patterns. High-altitude balloons required production of quality thin polyethylene film without weak spots. Mastery of this critical technology did not come easily because industry saw little incentive to tackle the problem, with the big money being in the wraps for groceries and not in esoteric military and reconnaissance applications.

The first balloons were launched for flights over Soviet and Chinese territories in January 1956. By the end of February, a total of 516 balloons had been sent in the sky. The program produced a storm of international protests and adverse publicity. Winds often carried balloons away from the target areas, and many balloons were shot down or landed in wrong places.

Only 34 balloons, or 7% of the total number, succeeded in obtaining useful photographs covering more than one million square miles. President Eisenhower pragmatically summarized that “the balloons gave more legitimate grounds for irritation than could be matched by the good obtained from them” (Pedlow and Welzenbach 1998, 86).

The balloon program had been terminated, and a new, more powerful means of photoreconnaissance was coming. Clarence L. “Kelly” Johnson's team at the Lockheed's Skunk Works in Burbank, California, was completing crash development of a revolutionary high-altitude aircraft CL-282 that would become known as the U-2 ...”

More info at http://astronauticsnow.com/bttp/btt_pp_390-391.pdf

(February 21) Surveillance Balloon or Breakaway Airship ? A Chinese Conundrum !

<https://www.aiaa-lalv.org/blogs/2023-blogs/february/2023-february-21>

**Surveillance Balloon or Breakaway Airship ?
A Chinese Conundrum !**



Prof. Rajkumar S. Pant
Department of Aerospace Engineering, IIT Bombay, India
21st February 2023



Prof. Rajkumar Pant greeted everyone from India online, with a group of students there, almost midnight there.

Outline

- About LTA Systems & Balloons
- Sequence of recent events
- Aftermath of the incidents
- Other UFO sightings
- Balloon v/s Satellites
- Why Missile was used ?
- Takeaways



Prof. Pant outlined the subtopics in his talk.

Chinese Balloon



Components of the Balloon

Width ~ Size of 3 Buses



The components and sizes of the Chinese balloon in the recent headline media were explained examined.

(February 21) Surveillance Balloon or Breakaway Airship ? A Chinese Conundrum ! with Prof. Rajkumar Pant

Trajectory of the 1st Chinese Balloon



- Jan 28- Enters US Airspace (US does not acknowledge the balloon)
- Jan 30-Enters Canadian Airspace
- Jan 31-Floats over US Airspace in Idaho (US considers shooting it down but decide against it)
- Feb 1-Flies over Montana near Air Force Base
- Feb 2- US discloses that the balloon has been flying in US airspace for quite sometime
- Feb 4- US shoots down the balloon



The 1st Chinese balloon in the recent news entered the US Airspace on Jan. 28, passing over Canadian's, and shot down on Feb over US.

Other Sightings of such Vehicles



Unidentified Balloon over Port Blair, India in Jan-22



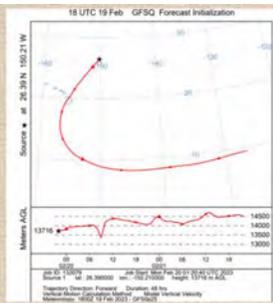
Three more flying objects downed between Feb 10-12 2023

- > Six Russian Balloons shot down by Ukraine during the war
- > U.S. forces in the Middle East spotted a Chinese HAB floating through Fall 2022
- > US has shot four unidentified balloons over the last two years



There were at least 4 recent sighting over US/Canada, and more around the world. And it was not the first time US shot down an unidentified balloons.

Latest sighting at Hawaii



Future trajectory over the next 48 hours for an object being steered by the wind

- Large white balloon 40k - 50k ft, ~ 600 miles east of Hawaiian Isles
- Alerts to pilots issued at 7:46 AM local time Hawaii, 20th Feb
- Further details awaited



Just one day before this meeting, a large white balloon was spotted just east of Hawaiian Isles, triggering alerts to pilots.

(February 21) Surveillance Balloon or Breakaway Airship ? A Chinese Conundrum ! with Prof. Rajkumar Pant

Balloon v/s Satellite

BALLOONS	SATELLITE
➢ Closer to Earth (11 miles)	• Far from Earth (62 miles)
➢ Far less expensive (~ few \$1000)	• Far more expensive (~\$400 million)
➢ Lower Space debris	



Prof. Pant is the world-leading expert in Lighter-Than-Air (LTA). He analyzed the pro and cons between a balloon and a satellite.

Why was a missile used to shoot it down?

- F-22 max altitude: 52800 feet (10 miles).
- Balloon altitude: 65000 feet (12.31miles) ,i.e., 12200 ft above
- F-22's 20 mm M61A2 Vulcan rotary cannon has effective range of only 2,000 ft !
- AIM-9X Sidewinder is the smallest and cheapest air-to-air missile in the USAF arsenal



Altitude is a main factor why an expensive missile AIM-9X was used to shoot down this Chinese balloon.

Takeaways

USA	CHINA
• Cost of F-22 per hour : \$68,322	• Balloon cost (South Carolina) : ~\$10,000
• Estimated cost of one Sidewinder short-range air-to-air missile: \$400,000	• Possibly collected sensitive information



It's an important and timely subject and discussion, with several key takeaways and messages.

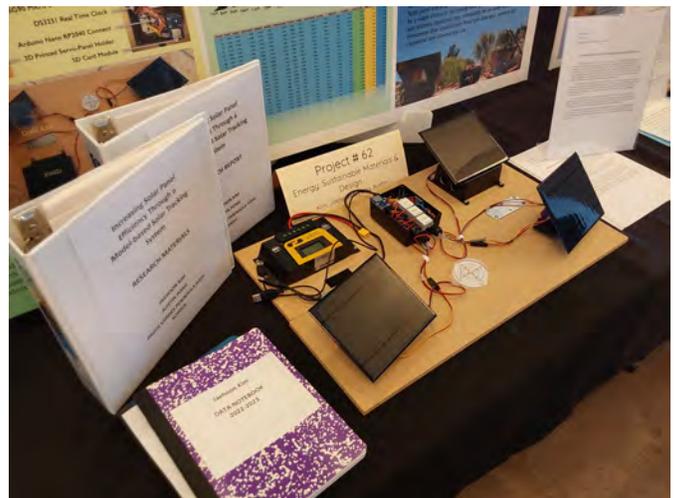
AIAA LA-LV Outreach and Judging in the Palos Verdes Peninsula School District Annual Science Fair (February 2) *(screenshots only)* <https://www.aiaa-lalv.org/blogs/2023-blogs/february/2023-february-2>



Judges, teachers, and students gathered on this beautiful day of February 2 for an interesting Science Fair with the Palos Verdes Peninsular Unified School District.

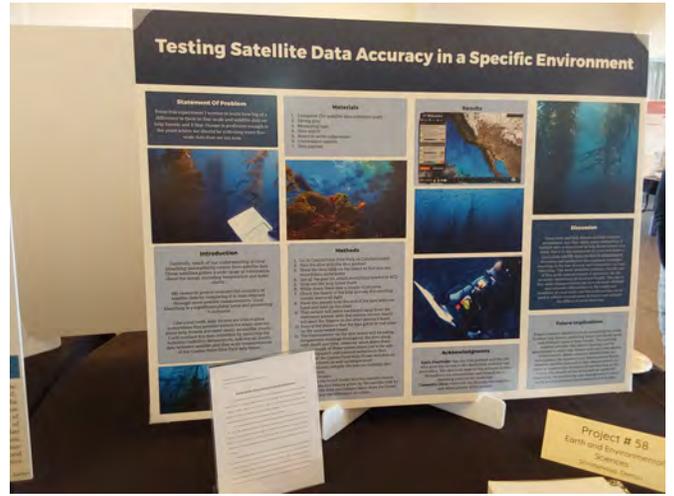


Judges got together to discuss and understand the criteria and processes.

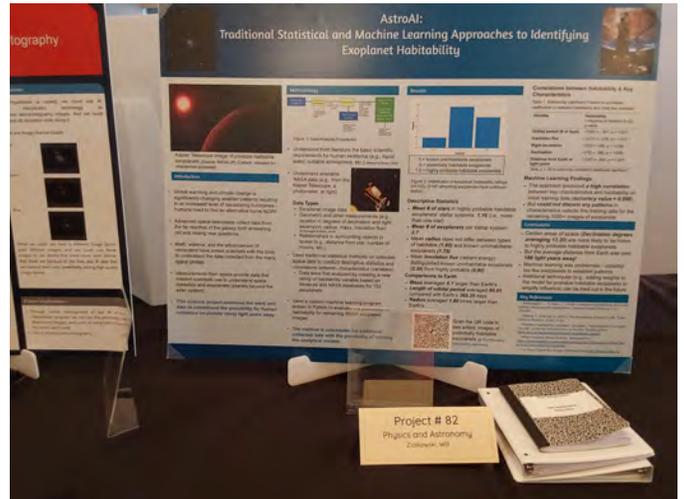
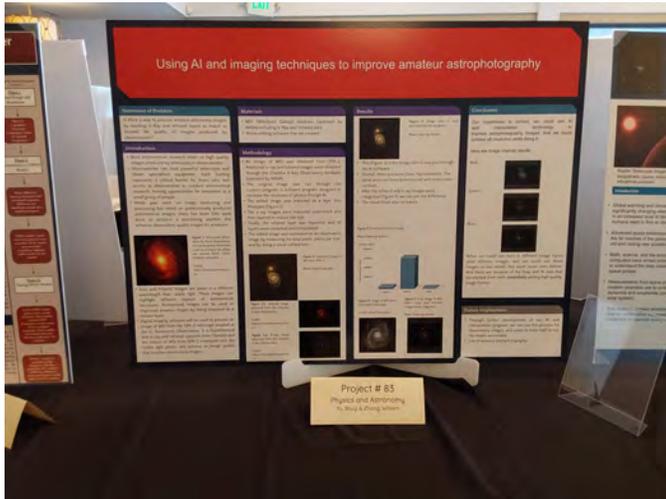


(Left) Participating students were waiting outside the exhibition hall before the interview / judging sessions began shortly. (Right) Some students brought their project setup for displays.

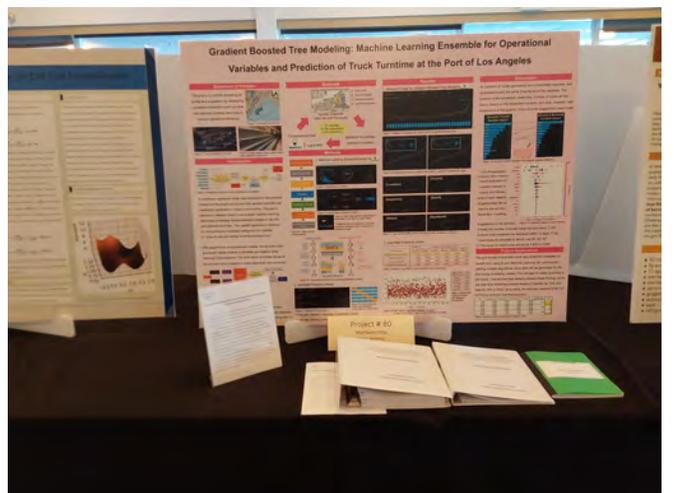
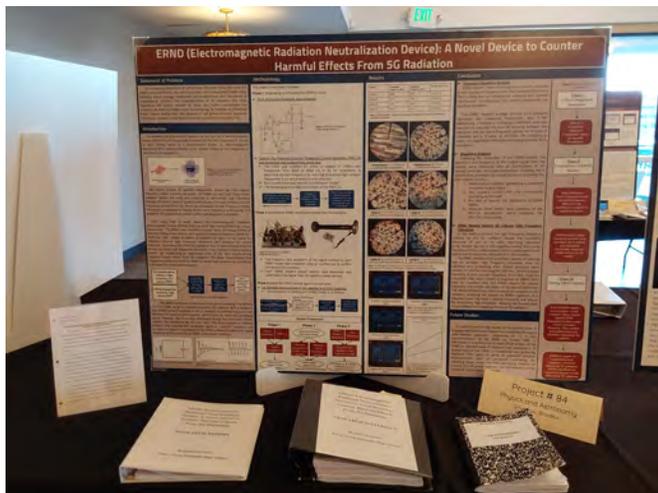
AIAA LA-LV Outreach and Judging in the Palos Verdes Peninsula School District Annual Science Fair (February 2) *(screenshots only)*



(Left) This year there were quite some participating projects, almost back to the pre-Pandemic number, if not more than that. (Right) A project related to astronautics about satellites.



(Left) A project about amateur astrophotography using AI. (Right) A projecting using AI to build the model for screening habitable exoplanets.



(Left) A project on how to mitigate the electromagnetic radiation from cell phones. (Right) An interesting math model that helped the Port of Los Angeles to solve the truck congestions and actually saved money.

Of comets, more comets, and Fritz Zwicky

by Dr. David H. Levy, Comet and Asteroid Hunter, Co-Discoverer, Shoemaker-Levy 9 (2023 March article)



(Left) This photo shows the 200-inch dome at Palomar at sunset, taken from the opened dome of the 18-inch, from where Zwicky (and later the Shoemakers and the author, Dr. David Levy) observed.

Since October 1965, when I spotted my first comet, Comet Ikeya-Seki, I have seen 227 different comets. Near the dawn of my passion for the night sky, watching that mighty comet rise, apparently right out the St. Lawrence River, was a sight I shall never forget. The two most recent comets I have seen share the same name; they are both called Comet ZTF for Zwicky Transit Facility. This project uses a new camera that offers a very wide field of view. The camera is attached to the large 48-inch Oschin Schmidt camera at Palomar.

This project has a rich history. It is loosely named for astronomer Fritz Zwicky, one of the founding astronomers at Palomar and one of the foremost scientists of the last century. He developed not the big Schmidt but the original smaller 18-inch Schmidt camera, the very first telescope atop that mountain. Since this project is named after Zwicky, why are its comets called “ZTF” instead of just Zwicky? It is because the comets are named for the project, not the man.

Of comets, more comets, and Fritz Zwicky

by Dr. David H. Levy, *Comet and Asteroid Hunter, Co-Discoverer, Shoemaker-Levy 9 (2023 March article)*

The historical Zwicky actually had little interest in comets. His career leaned towards the big questions of cosmology, the study of the large-scale issues of the Universe. But he was the first regular user of Palomar's 18-inch Schmidt camera, the telescope Gene and Carolyn Shoemaker and I used to discover our comets, including the one that collided with Jupiter in 1994. That in itself was a tribute to Zwicky, for it offered insights into how comet impacts contributed to the origin of life on different worlds. Zwicky was not into comets, but he was deeply concerned with the distant explosions of massive stars that he and colleague Walter Baade called supernovae. When he began using the 18-inch there were 12 known supernovae. He discovered 121 supernovae with the 18-inch, 120 by himself and one with Paul Wild.

Even though I never met Zwicky, I can share three aspects of him, not including the most famous one in which he called anyone he did not like a "spherical bastard." The expression was intended to mean that no matter from which angle you look, that person is (or was) a bastard. One story I heard from Walter Hass, founder of the Association of Lunar and Planetary Observers, who said that when Zwicky was having a quiet chat in a corridor at Caltech with another astronomer, one could hear him two blocks away. The other involved Zwicky's observing coat, which he left in a closet at the 18-inch observatory building. One night as I was about to observe alone there, as Gene Shoemaker left the building he said "If you get too cold, you can wear Zwicky's coat! The thought of that coat haunted me all night. Third, my friend David Rosseter named his large 25-inch diameter reflector Fritz, after Zwicky's first name. It is a wonderful telescope named for a brilliant man.

Of comets, more comets, and Fritz Zwicky

by Dr. David H. Levy, Comet and Asteroid Hunter, Co-Discoverer, Shoemaker-Levy 9 (2023 March article)

In January, the ion or gas tail of Comet ZTF showed a sort of disconnection in which the part of the tail closest to the comet was a thin line which suddenly broadened to a larger fan further out. This “disconnection event” was closely tied to a sudden increase in sunspot activity. This ZTF comet teaches us how comets interact with the solar wind.

As this article goes to press, there is not one ZTF comet, but two. David Rossetter and I saw the other one at our club’s dark observing site. The second one is much fainter, visible as an amorphous smudge of small slowly moving haze. As I looked at this second comet, I tried to understand and appreciate the seminal role that Zwicky played in his time. And in our time, that role has expanded to explore in still greater detail the night sky that he loved.

SCALE: Helping Aerospace Startups Reach New Heights

(2023 February 6 @5:30 PM PST) <https://www.aiaa-lalv.org/blogs/2023-blogs/february/2023-february-6-530-pm-pst>



The AIAA LA-LV Section welcomed the attendees on this wonderful day of February 6 to enjoy 2 interesting talks / meetings.



(Left) Ms. Brijja Johnson presented the SCALE program and discussed with the attendees. (Right) Attendees in the front seats.

(Right) One of the approaches of the AIAA LA-LV Section Career and Workforce Development program is to help people understand the opportunities and resources for their professional development, including entrepreneurship.

STARBURST

DESIGNED TO INSPIRE A GENERATION OF ENTREPRENEURS
SCALE Will Help Launch The Next Generation of Aerospace Ventures in California

Early-Stage, Aerospace Focused Accelerator
SCALE's 13-week intensive program with multiple cohorts over the next 3 years will serve as a platform for entrepreneurs to launch and scale their businesses here in California. Each cohort selected for the program will receive personalized instruction and opportunities to engage with corporate clients and investors.

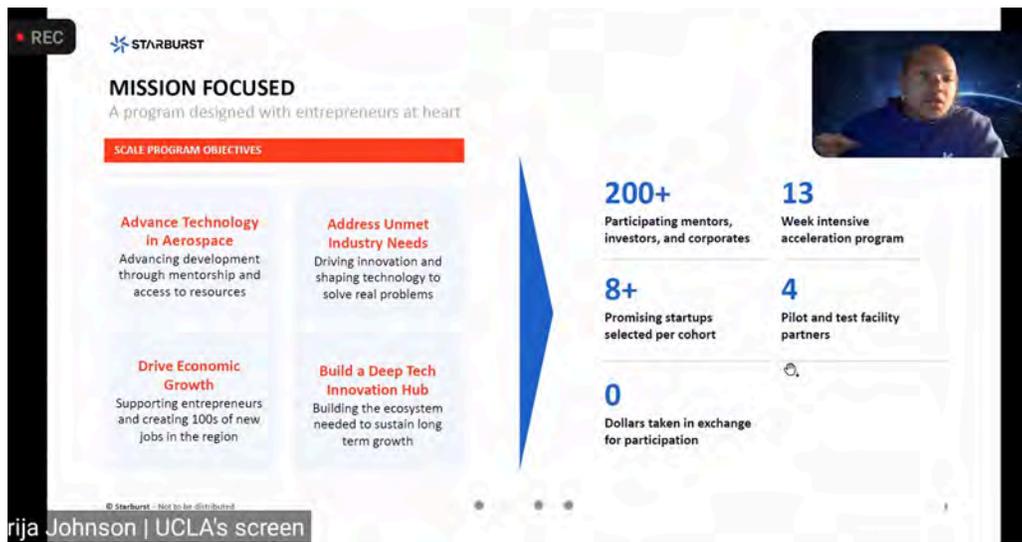
Led By Starburst, In Collaboration With UCLA
With the support of UCLA's Samueli School of Engineering, SCALE is truly a one-of-a-kind initiative for industry, government, innovators, academia, and investors to accelerate early-stage aerospace startups across the Los Angeles region.

Backed By The Department of Commerce
SCALE is backed by federal funding from the Department of Commerce's 'Build to Scale' Venture Challenge and made possible with support from the State of California, Congress, the Los Angeles EDC, the Cities of Los Angeles & El Segundo, and a coalition of federal labs including MITRE, RAND and more.

Logos for: UCLA, Samueli School of Engineering, City of El Segundo, LAEDG, RAND, MITRE, LAW, NASA, JPL.

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Johnson | UCLA's screen

SCALE: Helping Aerospace Startups Reach New Heights (2023 February 6 @5:30 PM PST) *(photos, screenshots only)*



Ms. Brijia Johnson explained the focus of the SCALE Mission to help start-ups and entrepreneurs.

The next SCALE cohort applications would on February 15th and will remain open until the March 15th deadline.

SCALE is designed to inspire a generation of students, entrepreneurs, and investors to pursue entrepreneurship for the development and advancement of novel technologies with aerospace applications and to build businesses here in Los Angeles.

Each team selected for the program will receive personalized instruction and engage with potential corporate clients and investors. The 13-week program is designed to help teams set milestones, develop products, find the market fit and get customer traction, and secure the next round of funding. Teams will have access to Starburst’s huge network of aerospace companies and become part of an ecosystem that includes Starburst and UCLA alumni, established aerospace entrepreneurs, investors, corporate partners, customers, academic researchers, and more.

Applications are now open!

Focus areas: Space, Aviation, Defense, and Enabling Technologies (e.g. Cybersecurity, Connectivity/Sensors, Antennas/IoT, Big Data, AI, Robotics, Industry 4.0, Quantum Computing)

Who should apply: Pre-seed and Seed stage companies in CA or who are interested in expanding business operations in CA

Visit our website here to apply. To learn more please register for our SCALE Ask Me Anything seminar online and in-person, March 1st, 2023 from 5-6p PT and we will be happy to answer any questions you may have.



SCALE: Helping Aerospace Startups Reach New Heights (2023 February 6 @5:30 PM PST) *(photos, screenshots only)*

STARBURST

KEY DETERMINANTS OF SUCCESS

Measured outcomes

- Proven Track Record of Success**
Operating successful accelerators since 2015: partner goals are met and 40% of startups close rounds within six months of graduation
- Aerospace Focus**
Specialists' know-how, industry expertise, and the right corporate & government partners at hand
- 13-Week Cohorts With Emphasis on Product-Market Fit and Fundraising**
Starburst team dedicated to the success of each startup, bringing a mix of aerospace industry leaders, subject matter experts, and business mentors
- Access to the Largest VC Network With Aerospace Interest**
Leveraging Starburst's aerospace-focused VC and CVC networks in the region and around the world
- Connected Nodes In A Global Aerospace Ecosystem**
Access to a worldwide aerospace ecosystem of Starburst alumni companies, mentors, universities, government labs, and industry leaders

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It's not just to provide the resources to get started. How to monitor and help the entrepreneurs remain on the right track for successes is also very important.



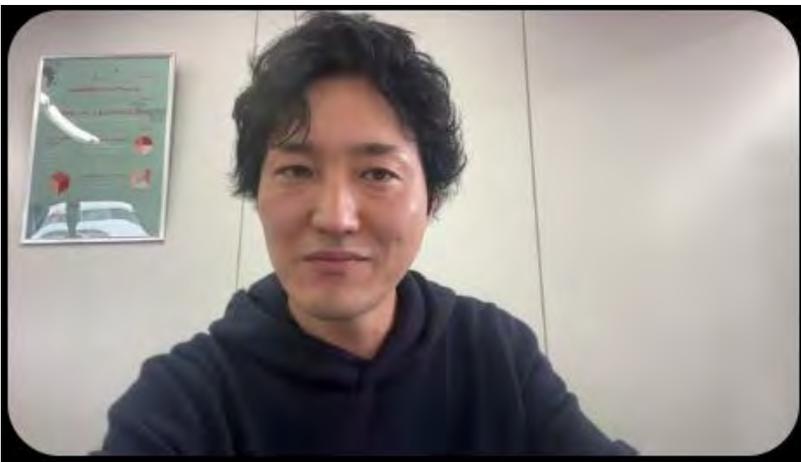
(Left) Attendees listened carefully to the explanations of the SCALE program. (Right) Attendees were very interested in this talk, also bringing up some very good questions, including those from the on-line attendees.

Frontier of the Air Mobility revolution (2023 February 6 @6:30 PM PST)

<https://www.aiaa-lalv.org/blogs/2023-blogs/february/2023-february-6-630-pm-pst>



(Left) Air Mobility is a very interesting topic and people (in-person and on-line) were very enthusiastic to learn more about the development. (Right) Attendees continued to enjoy the second talk of the event.



(Left) Mr. Shohei Komatsu, the speaker, welcomed everyone. He opened the event mentioning his previous AIAA publication and the award he got for it, followed by the market analysis for the related businesses and technologies.



(Left) Mr. Komatsua got awarded for his AIAA publication. Here is Mr. Komatsu's award-winning AIAA presentation "Power Transmission to a Micro Aerial Vehicle."

<http://www.al.t.u-tokyo.ac.jp/papers/AIAA-2007-1003.pdf>

Press release issued by the University of Tokyo on the occasion of the award. (Department of Aeronautics and Astronautics)

<http://www.aerospace.t.u-tokyo.ac.jp/topics/20070706.html>

Frontier of the Air Mobility revolution (2023 February 6 @6:30 PM PST)

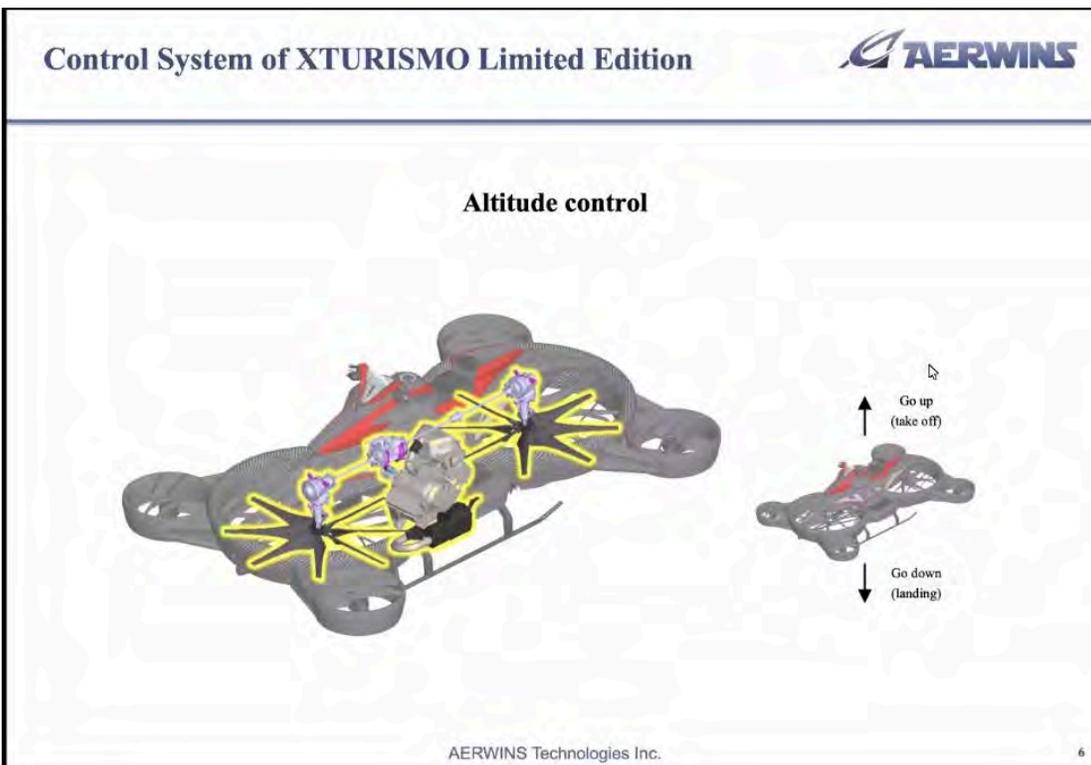
(photos, screenshots only)

Specification of XTURISMO Limited Edition



AERWINS's XTURISMO combined several key aeronautics technologies and components.

Control System of XTURISMO Limited Edition



The aeronautics control / maneuverability and safety are crucial in the successful development.

Frontier of the Air Mobility revolution (2023 February 6 @6:30 PM PST)

(photos, screenshots only)



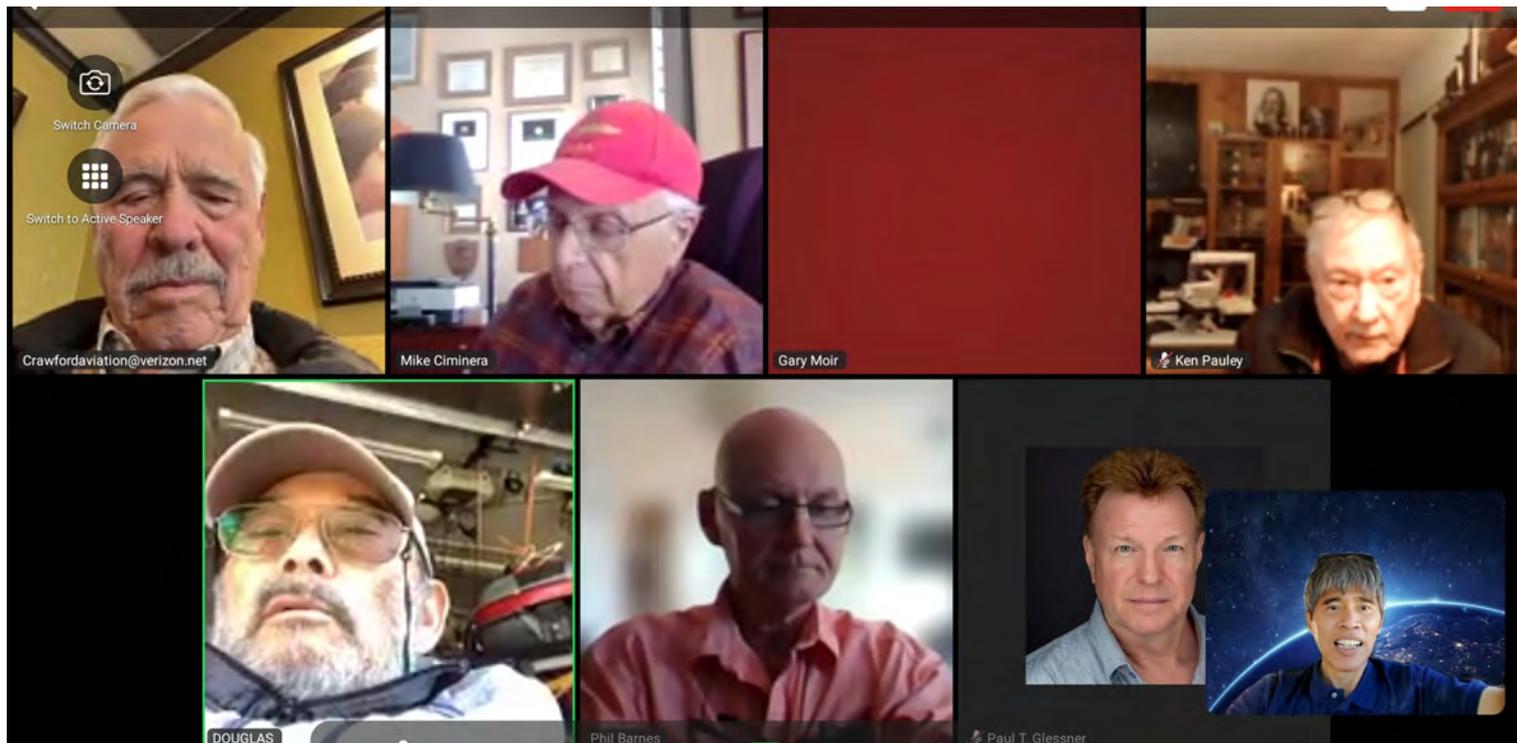
Demonstration of the AERWINS XTURISMO with the iconic Mt. Fuji in the background!



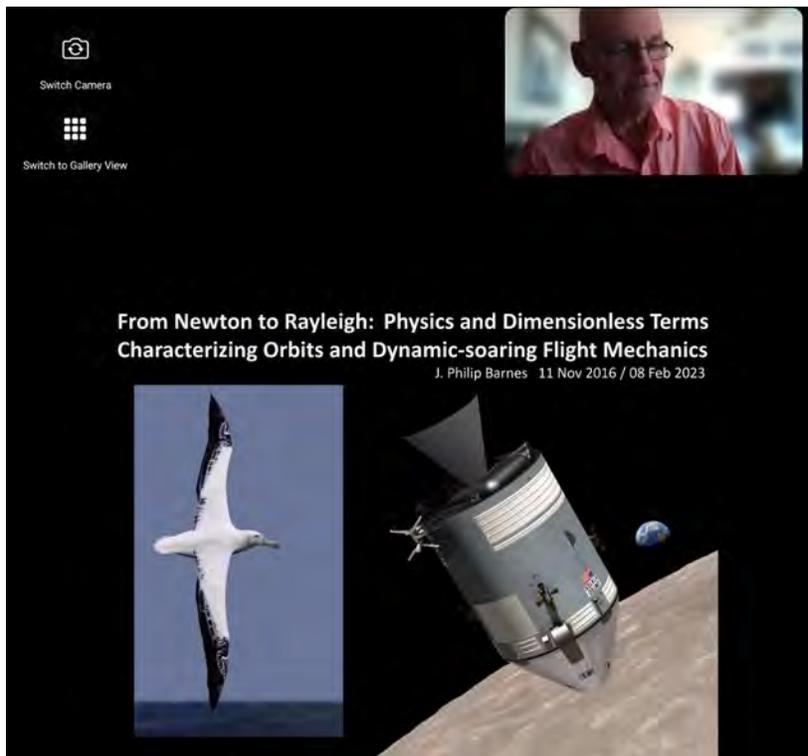
*(Left) Attendees were very interested in the presentation, demo, and discussions, asking questions enthusiastically in person and from on-line.
(Right) People stayed after the talk/Q&A to network, exchange information, and continue the discussions.*

AIAA LA-LV Aero Alumni Meeting (February 8)

(screenshots only) <https://www.aiaa-lalv.org/blogs/2023-blogs/february/2023-february-8>



Aero Alumni and attendees gathered together on February 8 and listened to the presentation by Mr. Phil Barnes, "Physics and Dimensionless Terms Characterizing Orbits and Dynamic-soaring Flight Mechanics". Before the presentation, there were brief discussions on the Chinese Balloon and the situation in Ukraine.



Mr. Phil Barnes presenting the talk, which was related to his other talk and efforts on the flight analysis of Albatross.

AIAA LA-LV Aero Alumni Meeting (February 8)

(screenshots only)

Conic-section orbits: Isaac Newton Chronology

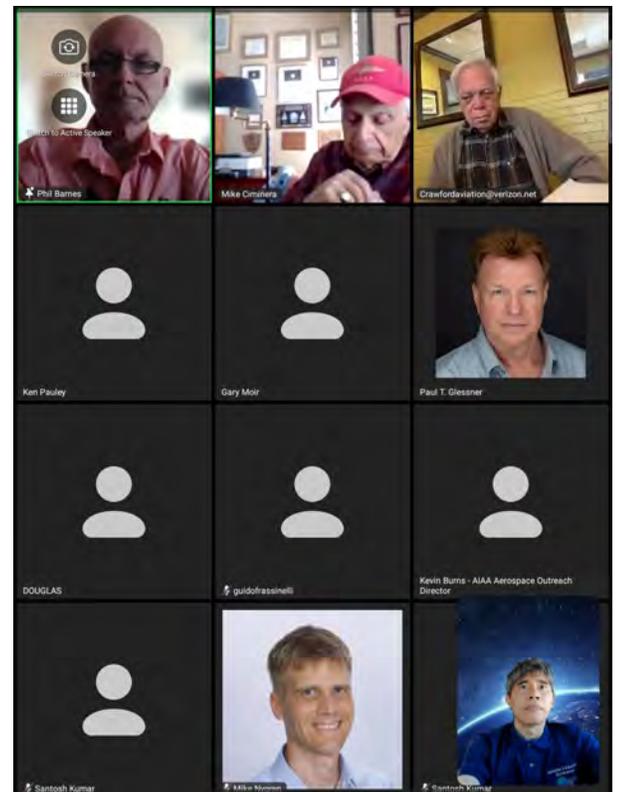
Year	Age	Development or Event
1665	23	Trinity math degree, avoids plague
1665	23	Invents differential calculus ⁶
1666	24	Integral calculus & gravitation
1668	26	Cambridge faculty appointment
1672	30	Elected Royal Society Fellow
1684~		Leibniz publishes his own calculus ⁷
1685	43	Sphere point-mass equivalent ⁸
1686	44	<i>Principia</i> (all proofs geometric)
1702	60	<i>Optix</i> (1 st pub. Newton's calculus)
1708	66	Knighted
1727	85	Quoted, shortly before death:



"I do not know what I may appear to the world, but to myself I seem to have been only like a boy playing on the seashore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, while the great ocean of truth lay all undiscovered before me."

Non-dimensional Parameters in Our Physical World: J. Philip Barnes - Nov 2011

Isaac Newton was not just about apple falling from a tree and the Earth's gravity.



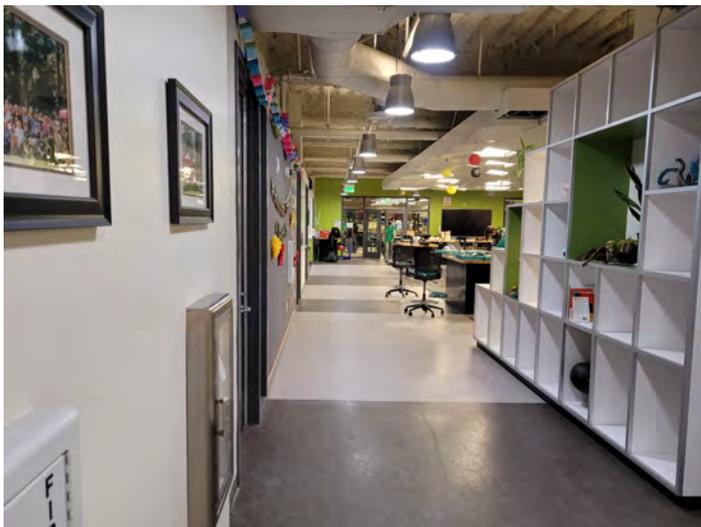
(Left) Mr. Phil Barnes first presented the concept and analysis in an AIAA Astrodynamics Conference in 1987. He has been a member of AIAA for many years. (Right) People listening to his presentation with enthusiasms and great interests.

AIAA LA-LV Educators (K-12 STEAM) Meeting 2/18 at the Da Vinci Schools

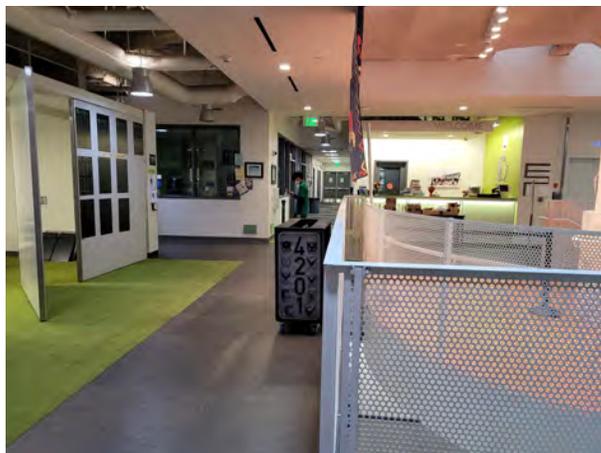
(Screenshots, photos only) <https://www.aiaa-lalv.org/blogs/2023-blogs/february/2023-february-18>



Thanks to Dr. Steve Wallis and the Da Vinci Schools, the AIAA LA-LV Section was back for the Educators Meeting (K-12 STEAM).



The Student Robotics Team had a meeting and showed us their activities and facilities. They are preparing for a contest in robotics.



(Left) The area is very suitable for student activities; (right) Joy, the mentor of the Robotics Team, gave us a tour and showed what the students were doing

AIAA LA-LV Educators (K-12 STEAM) Meeting 1/28 at the Da Vinci Schools (Screenshots, photos only)



Students were very active and enthusiastic, and kindly showing us what they were working on.



(Left) Joy, the mentor, showed us around for several areas in the Student Robotics Team's gathering place and the facility.

(Right) Mr. Dennis Leung was very impressed, and gave some very insightful suggestions and offered possible assistance.



Generalized Eclipse Computations and Graphics

Daniel R. Adamo, AIAA Associate Fellow, AIAA Distinguished Speaker (adamod@earthlink.net)

Consider three bodies in space, none of which are about to collide. The reasonably spherical "Occulter" body of linear radius R_C casts a shadow in the "light" of the "Source" body of linear radius R_S . From the classic astronomical eclipse scenario, this light would be radiation from the Sun, but the Source could be any other reasonably spherical body such as Earth emitting radio waves. The third "Observer" body effectively serves as a probe of the shadow and as origin of an inertial coordinate system in which Observer-centered positions of the Occulter r_C and Source r_S are known.

To quantify the degree to which the Source's apparent disc is eclipsed by the Occulter's apparent disc as witnessed by the Observer, the unobstructed areal Source fraction f is to be computed. At $f = 1$, the Source is completely unobstructed by the Occulter, and no eclipse exists. A partial eclipse is in progress if $0 < f < 1$, and a total eclipse is detected if $f = 0$.

For the sake of computation efficiency, f is obtained by evaluating a sequence of filters with successively greater complexity. If a filter's condition evaluates true, the associated value for f is determined and no further computation is required. A false evaluation triggers further computation, and the filter is said to be "passed".

Filter #1 is the most straightforward: $\text{if } r_S < r_C, f = 1$. This logic eliminates geometry in which a Source transit of the Occulter is in progress. Even if r_C were to be well-aligned with r_S , the Occulter's shadow would be cast away from the Observer by the Source and no eclipse is possible.

Conversely, if the Source is more distant from the Observer than the Occulter, an eclipse is possible. All geometries passing Filter #1 then require determining the Observer-centered angles θ_C and θ_S subtended by R_C and R_S respectively. Geometry for θ_C is illustrated in Figure 1.

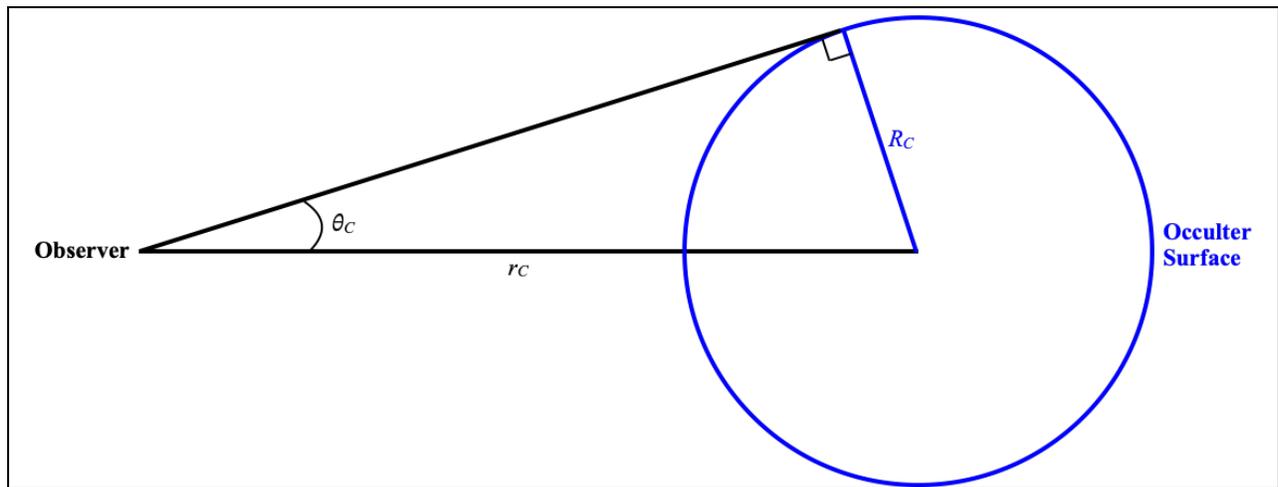


Figure 1. Geometry leading to Equation 1, and by analogy to the Source, Equation 2.

$$\theta_C = \text{asin}\left(\frac{R_C}{r_C}\right) \tag{1}$$

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$$\theta_S = \text{asin}\left(\frac{R_S}{r_S}\right) \quad (2)$$

Elongation of the apparent Source disc's center from the apparent Occulter disc's center, equivalent to the Source-Observer-Occulter angle ε , is then computed from the definition of a scalar product between two vectors.

$$\varepsilon = \text{acos}\left(\frac{\mathbf{r}_C \cdot \mathbf{r}_S}{r_C r_S}\right) \quad (3)$$

Filter #2 eliminates all remaining geometries not giving rise to an eclipse: $\boxed{\text{if } \varepsilon \geq \theta_C + \theta_S, f = 1}$. In a similar vein, Filter #3 eliminates total eclipse geometries: $\boxed{\text{if } \varepsilon < \theta_C - \theta_S, f = 0}$. In the case $\theta_C < \theta_S$, Filter #3 will be passed (ε cannot be negative), and an annular eclipse is possible with the Occulter failing to completely block the Source even if $\varepsilon = 0$.

To address annular and other partial eclipse geometries, circular apparent disc areas A_C and A_S (whose respective radii are θ_C and θ_S) must be computed. These computations are truly 2-dimensional areas with units such as square radians. They are distinct from 3-dimensional solid angles with units such as steradians.

$$A_C = \pi\theta_C^2 \quad (4)$$

$$A_S = \pi\theta_S^2 \quad (5)$$

Annular eclipse geometries are then eliminated by Filter #4:

$\boxed{\text{if } \varepsilon < \theta_S - \theta_C, f \text{ is computed by Equation 6.}}$

$$f = \frac{A_S - A_C}{A_S} \quad (6)$$

If Filter #4 is passed, the only remaining geometry has apparent discs of the Occulter and Source partially overlapping. A method for computing this geometry's overlapped area A_V is derived by Weisstein, Eric W. in "Circle-Circle Intersection" at the website *MathWorld--A Wolfram Web Resource*.¹ This method is adapted to compute f for the partial overlap geometry in Equations 7 and 8.

$$A_V = \theta_C^2 \text{acos}\left(\frac{\varepsilon^2 + \theta_C^2 - \theta_S^2}{2\varepsilon\theta_C}\right) + \theta_S^2 \text{acos}\left(\frac{\varepsilon^2 + \theta_S^2 - \theta_C^2}{2\varepsilon\theta_S}\right) - 0.5\sqrt{(\theta_C + \theta_S - \varepsilon)(\theta_C - \theta_S + \varepsilon)(-\theta_C + \theta_S + \varepsilon)(\theta_C + \theta_S + \varepsilon)} \quad (7)$$

$$f = \frac{A_S - A_V}{A_S} \quad (8)$$

¹ Reference <https://mathworld.wolfram.com/Circle-CircleIntersection.html> (accessed 6 February 2023).

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The foregoing operations are easily implemented as part of a solar power or communications simulation. They are also of use in computing solar radiation pressure.

As a test of Equations 7 and 8, consider the following data from ISS as Observer during its Orbit 137966 sunset on 25 January 2023 at 12:12:10 UTC.

Occulter (Earth) radius $R_C = 6378.137$ km

Source (Sun) radius $R_S = 696,000$ km

$$\mathbf{r}_C = \begin{bmatrix} -2927.910 \\ -3045.435 \\ -5315.925 \end{bmatrix} \text{ km} \qquad \mathbf{r}_S = \begin{bmatrix} +84316652.4 \\ -110792689.3 \\ -48033641.1 \end{bmatrix} \text{ km}$$

Relevant computations for this test proceed as follows.

$$\theta_C = 1.220641 \text{ rad}$$

$$\theta_S = 0.004725694 \text{ rad}$$

$$A_S = 7.015862\text{E-}05 \text{ rad}^2$$

$$\varepsilon = 1.217638 \text{ rad}$$

$$A_V = 6.140214\text{E-}05 \text{ rad}^2$$

$$f = 0.1248097$$

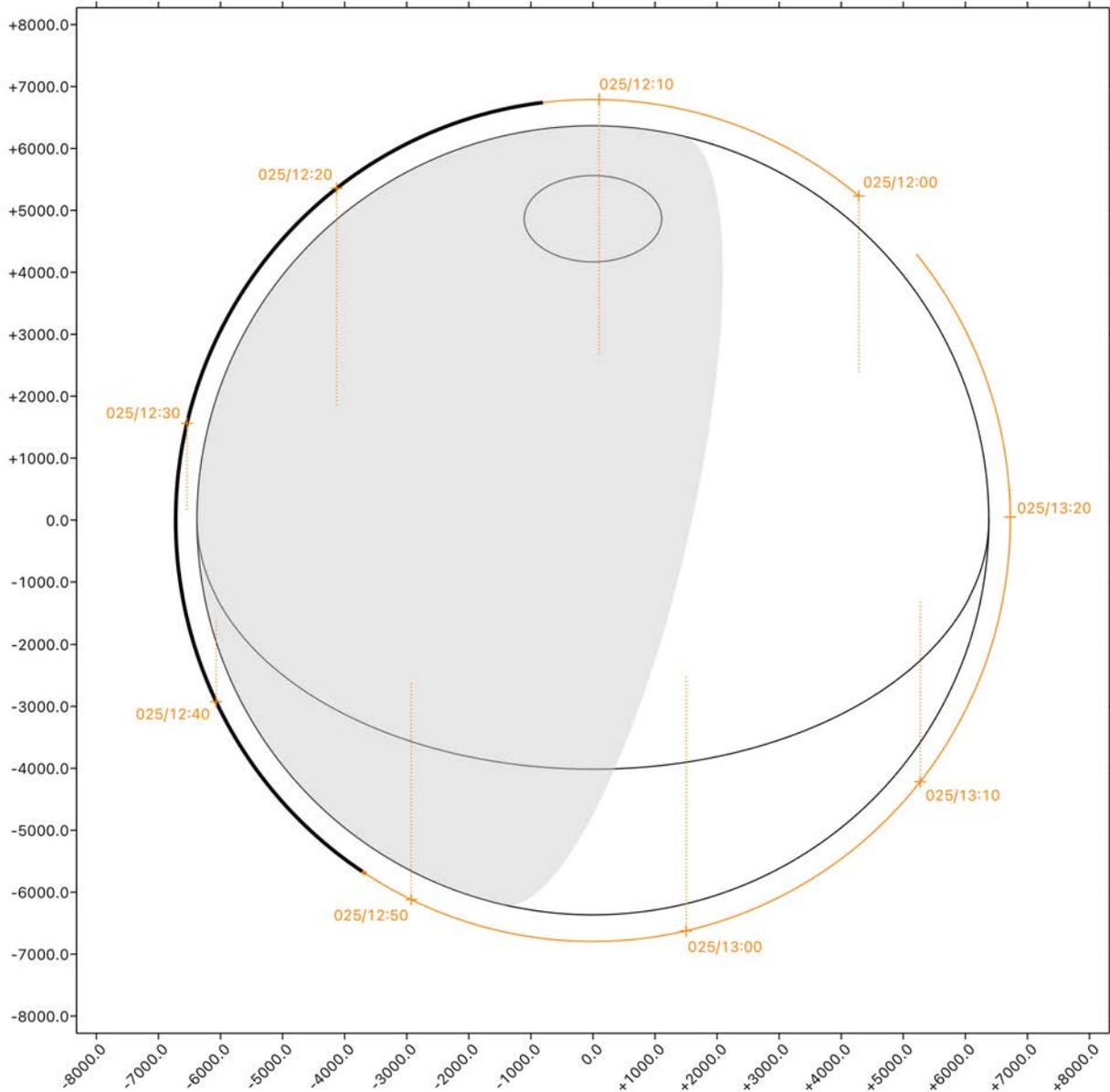
Values for f may also be used during trajectory plotting to locate rise/set events and eclipse arcs through appearance changes in the plot locus. Because f is a decimal quantity, it can indicate the degree to which the Source is obscured by the Occulter as viewed from the Observer. In practice, this is done by using f to scale the red, green, and blue channels in the color being used to plot a trajectory locus. With sufficient temporal and spatial resolution, this technique can produce a "fade to black" effect as a shadow is entered and the reverse upon shadow exit. Experimentation has shown eclipses are more clearly mapped onto a trajectory plot by broadening the locus width slightly whenever $f < 1$.

An example of eclipse mapping onto a trajectory is obtained in the context of the previous test by plotting the ISS geocentric orbit on 25 January 2023 from 12:00 to 13:30 UTC. The Sun as Source in this example has latitude $\beta = -5.9^\circ$ on the ISS orbit plane.² A relatively low β magnitude such as this indicates ISS makes nearly transverse passes through Earth's shadow with nearly maximum eclipse arcs. Another consequence of this geometry is relatively rapid sunrises and sunsets.

In the ISS sunset on Orbit 137966, $f = 0.99797$ at 12:12:03.2 UTC as Earth penumbral shadow entry begins (Sun partially eclipsed) and $f = 0.00049$ just before umbral shadow entry (Sun totally eclipsed) at 12:12:11.5 UTC. With plotting steps in Figure 2 set to 10 s at even-10 s UTCs, the fade to black from orange during this 12:12 UTC sunset appears instantaneous. During the subsequent sunrise, a locus point at 12:48:10 UTC has $f = 0.92459$, producing one broadened very orange 10 s segment before the penumbra is fully exited.

² The sign convention for β assigns positive values for solar latitudes north of the orbit plane and negative values otherwise.

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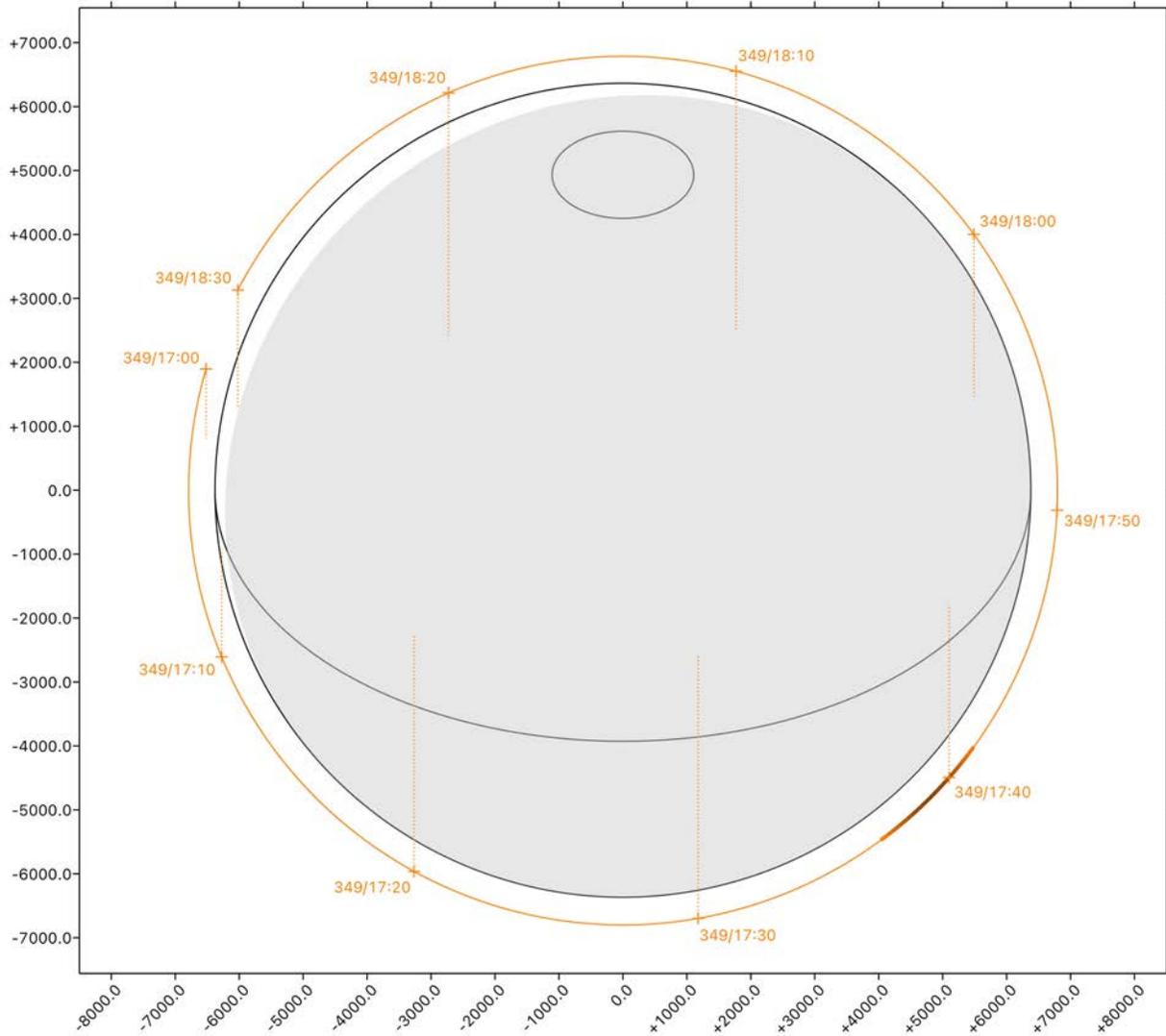
km Units Earth (399) EPM at 2023y 25d Wed (01-25) 12:00: 0.000 UTC Coordinate System Illumination from Sun (10)
 Origin: Earth (399) Orange Plot: SN 12 = ISS OEM Anchor on 25.5 January 2023 UT with 10s stepsize
 Plot-To-Screen Transformation: Yaw = +0.00° Pitch = +0.00° Roll = +51.00°

Figure 2. Inertial geocentric ISS motion on 25 January 2023 from 12:00 to 13:30 UTC is plotted in orange during the sunlit portion and in black when in Earth's shadow. Perspective is very nearly orthogonal to the ISS orbit plane. The Sun lies only 5.9° into the plot plane far in the distance at right, as indicated by gray shading on Earth's nightside. Dotted vertical lines are projections onto Earth's equatorial plane.

Solar latitude on the ISS orbit plane is dynamic. The Sun is shifting inertial position to the east by about one degree per day as Earth orbits it. Meanwhile, the geocentric ISS orbit plane is shifting west by about five degrees per day due to precession from Earth's excess equatorial mass. Thus, in mid-December 2022, ISS β is near the most negative values possible and Earth's shadow is evaded for multiple days. This "no sunsets" period comes to an end on 15 December 2022, when a series of short, grazing Earth shadow entries occurs with $\beta = -69.7^\circ$. On orbit

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137314, penumbral shadow entry begins at 17:36:52.7 UTC with $f = 0.99993$. It reaches maximum eclipse near 17:39:11 UTC with $f = 0.54177$, and penumbral exit is shortly after 17:41:29.1 UTC when $f = 0.99999$. This shadow graze is plotted in Figure 3. Although scale in this plot is the same as in Figure 2, note how increased temporal resolution during shadow entry and exit gives rise to multiple tonal variations in Figure 3's orange locus.



km Units Earth (399) EPM at 2022y 349d Thr (12-15) 16:59:59.999 UTC Coordinate System Illumination from Sun (10)
 Origin: Earth (399) Orange Plot: SN 12 = ISS OEM Anchor on 14.5 December 2022 UT with 10s stepsize
 Plot-To-Screen Transformation: Yaw = +180.00° Pitch = +0.00° Roll = +52.00°

Figure 3. Inertial geocentric ISS motion on 15 December 2023 from 17:00 to 18:30 UTC is plotted in orange except during a brief, grazing entry into Earth's shadow with no less than 54% of the Sun visible from ISS throughout. Perspective is very nearly orthogonal to the ISS orbit plane. The Sun lies 69.7° into the plot plane far in the distance at upper left, as indicated by gray shading on Earth's nightside. Dotted vertical lines are projections onto Earth's equatorial plane.

Appendix: A Related ChatGPT Interaction

On 7 February 2023, the following query was posed to OpenAI's ChatGPT application (Jan 30 Version) at <https://chat.openai.com/chat>.

"Create a white paper less than 5 pages in length and detailing how to compute the unobscured fraction of the Sun's apparent disc as blocked by the Earth when observed from any specified location in the Earth-Moon system."

The response as reproduced below (underlined text added for clarity) is grammatically succinct and generally comprehensive, but its computational method is questionable and likely erroneous in multiple respects. These shortcomings are discussed subsequently.

"Computing the Unobscured Fraction of the Sun's Apparent Disc

Introduction:

The Sun is a vital source of energy for the Earth and its presence is crucial for life to exist on the planet. It's often necessary to determine the fraction of the Sun's apparent disc that is unobscured by the Earth for a variety of applications, such as solar power generation and space weather forecasting. In this paper, we will discuss a method for computing the unobscured fraction of the Sun's apparent disc as blocked by the Earth when observed from any specified location in the Earth-Moon system.

Methodology:

To determine the unobscured fraction of the Sun's apparent disc, we need to consider the relative positions of the Sun, Earth, and the observer. We can use the spherical coordinates of the observer and the Earth-Sun vector to compute the apparent position of the Sun in the sky. The spherical coordinates of the observer can be calculated using the latitude, longitude, and altitude of the observer's location.

Once the apparent position of the Sun is known, we can calculate the angular radius of the Sun and Earth to determine the extent to which the Earth blocks the Sun. The angular radius of the Sun and Earth can be calculated using the following formulas:

Angular radius of the Sun = $\arctan(\text{Sun's radius}/\text{Sun-Earth distance})$

Angular radius of the Earth = $\arctan(\text{Earth's radius}/\text{Observer-Earth distance})$

Finally, we can calculate the unobscured fraction of the Sun's apparent disc by subtracting the obscured area from the total area of the Sun's apparent disc. This can be done using the following formula:

Unobscured fraction = $1 - (\text{obscured area}/\text{total area of the Sun's apparent disc})$

Where the obscured area can be calculated using the following formula:

Obscured area = $2 * \arccos(\cos(\text{Angular radius of the Sun} + \text{Angular radius of the Earth})/\cos(\text{Angular radius of the Sun} - \text{Angular radius of the Earth}))$

Appendix: A Related ChatGPT Interaction

Results:

The results of this method will give us the unobscured fraction of the Sun's apparent disc as seen from any specified location in the Earth-Moon system. This information can then be used to determine the amount of solar energy that can be captured at a particular location and the potential impact of Earth's shadow on space weather.

Conclusion:

In conclusion, the method presented in this paper provides a simple and accurate way to determine the unobscured fraction of the Sun's apparent disc as blocked by the Earth when observed from any specified location in the Earth-Moon system. The calculations can be performed using basic trigonometry and can be easily implemented in software. This information can be used for a variety of applications, such as optimizing the placement of solar panels and predicting the effects of Earth's shadow on space weather."

Per Figure 1, the ChatGPT formulae for Earth and Sun angular radii are incorrect. Applying the ISS Orbit 137966 sunset test case to the ChatGPT method, reasonable results are obtained for the Sun's angular radius θ_S because this angle is small and $\sin \theta_S \cong \tan \theta_S$ under that condition. Such is not the case for the angle subtended by Earth's radius θ_C as observed from ISS near an altitude of only 400 km. Another error in the Sun angular radius θ_S computation suggested by ChatGPT is solar distance reckoned with respect to Earth, not the Observer. This error is not consequential in the test's context but could be in other scenarios where distances from the Observer and Occulter to the Source are more distinctly different.

The ChatGPT computation completely falls apart in its computation of obscured area A_V in units of radians conferred by the arccosine function's result. This non-area further distorts the value for unobscured fraction f . Test results previously reported can easily be compared with those obtained from ChatGPT's suggested method in Table 1.

Table 1. Orbit 137966 ISS sunset test results reported previously (Adamo) are juxtaposed with those as suggested by ChatGPT. Values in red are not consistent with expected units.

Parameter (units)	Adamo	ChatGPT
θ_C (radians)	1.220641	0.7541188
θ_S (radians)	0.004725694	0.004725719
A_V (radians ²)	6.140214E-05	0.2661098
f (none)	0.1248097	-3791.933

AIAA LA-LV Exhibition in the Engineers Week Event at CMSC (February 25)

(Photos only) <https://www.aiaa-lalv.org/blogs/2023-blogs/february/2023-february-25>



The AIAA LA-LV Section had an exhibition table / booth in CMSC in the Engineers Week to inspire the young generations and families.



The AIAA LA-LV Section exhibition table is right next to the space shuttle and Downey aerospace historical displays (Apollo and Shuttles).

AIAA LA-LV Exhibition in the Engineers Week Event at CMSC (February 25)

(Photos only)



The Aerospace Corporation also had an exhibition table nearby.



The AIAA LA-LV Section has been doing the best to attract and inspire the next generation engineers!

(2023 January 28 PM) AIAA LA-LV Exhibition in the Service Academy Day Event
(Photos only)



The trailer for the IMAX film "Asteroid Hunter" was being shown with film producer, Mr. Phil Groves, explaining on the side.



(Left) Dr. Nahum Melamed (Project Lead, Guidance and Navigation, Aerospace Corp.) shared his experiences in his career and Planetary Defense Projects, very inspiring. (Right) Mr. Barbee Brent (DART Mission, NASA) shared his experiences remotely from the East Coast.

(2023 January 28 PM) AIAA LA-LV Exhibition in the Service Academy Day Event
(Photos only)



In memories of the heroes in the Columbia Tragedy.



Displays about the legacy of the Space Shuttle Columbia.

(2023 January 28 PM) AIAA LA-LV Exhibition in the Service Academy Day Event (Photos only)



Ms. Laura Brim welcoming the panelists and the visitors.



(Left) Displays about the aerospace heritages of the Downey facilities, next to the Aerospace Corporation's table. (Right) Columbia Memorial Space Center (CMSC) came from the great heritages of the Los Angeles aerospace development, also remembering the fallen astronauts / heroes of Apollo 1.

Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

(Ms. Michelle Evans: AIAA Distinguished Speaker, also Book Author on a best-seller on X-15)

— Days 1 & 2: Los Angeles to Buenos Aires – Wednesday & Thursday, 4 & 5 January 2023 —

<http://www.mach25media.com/antarctica1.html>



(Left) Cutting my Antarctic cake. (Middle) In my private cubicle in seat 1A aboard the 787, heading from Los Angeles to Miami. Already a bit haggard from no sleep. (Right) The area of my voyage. South America to the Antarctic Peninsula, and back.



Atlas Ocean Voyages World Traveller. The location of my cabin is marked by the red arrow.



(Left) Passing across the Andes Mountains in Chile. We flew down the west coast of South America, then cut east across the Andes to head into Argentina. (Right) La Recoleta Cemetery is famous as the resting place of Eva Peron.

Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

— Day 3: Buenos Aires to Ushuaia – Friday 6 January 2023 —

<http://www.mach25media.com/antarctica1.html>



(Left) The publications I brought with me. My book "The X-15 Rocket Plane," "Mike Mars South Pole Spaceman," and the February 1963 issue of National Geographic. (Right) The February 1963 National Geographic with the Antarctic map. This is the magazine I read as a kid where I first got excited about visiting Antarctica.



(Left) First views of the World Traveller at the port in Ushuaia. (Right) Looking back down the gangway to the bus that brought our group to the ship.



(Left) We left port at 10:04 pm Argentina Time. (Right) The beautiful sky as we headed for Cape Horn and the dreaded Drake Passage. On to Antarctica!

Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

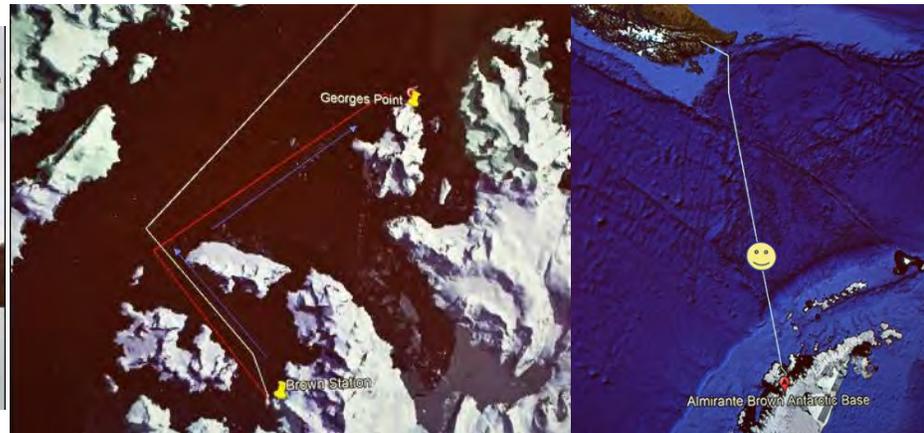
— Days 4 & 5: The Drake — Saturday & Sunday, 7 & 8 January 2023 —

<http://www.mach25media.com/antarctica2.html>



(Left) The view from the Aft Deck Zephyr Lounge as we crossed the Drake Passage. (Right) Jean-Roch tells us of the human exploration of the 7th continent.

"Never stop because you are afraid, you are never so likely to be wrong.
Never keep a line of retreat: it is a wretched invention.
The difficult is what takes a little time: the impossible is what takes a little longer"
Fridtjof Nansen



(Left) Three Antarctic explorers with one perfect quote by Fridtjof Nansen. (Middle) Projection of our journey to Brown Station, then back north to Georges Point. (Right) Our position in the Drake, around mid-day on 8 January. Gotta love the happy face icon they added, when so many people were in their cabins fighting the effects of the Drake.



(Left) Captain Vitaliy Tsylye speaks to us at the beginning of the voyage. His Chief Engineer is the one with the gray beard behind him. He later gave me a tour of the engine room. (Right) Most of those standing are the Expedition crew members who would take us on landings and zodiac tours.

Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

— Day 6: Arrival and First Views of Antarctica – Monday, 9 January 2023 —

<http://www.mach25media.com/antarctica2.html>



Woke up around 3:35 am, and I checked the view out the window. It was dark, but not totally devoid of light this far south. I was greeted by my first glimpses of Antarctica! This was an ice-covered island, probably in the South Shetlands. I processed the colors slightly differently in each of these three images to see how they might look. In the upper left is most closely what it looked like to my eyes in that near darkness. The bright smeared dots were actually my flash capturing snowflakes in the automatic setting since I didn't want to fumble with manual settings while I was half asleep. The image on the right was processed to more properly show what the colors of the ice should look like with the white and blue tones. Both of these images only show a segment of the island since I used a telephoto lens.



I used the wide-angle lens to capture the entire island in one image above. I was playing with the settings, and found this sort of sepia-tone captured the idea of what it might have looked like for a photographer first setting eyes on Antarctica more than 100 years ago.



(Left) One of the icebergs of various sizes and shapes. Every berg is a unique work of art. They were endlessly fascinating to watch as they slipped by the ship. (Right) All that's left of a once mighty iceberg. This was only a few feet across, and most of it was nearly clear.

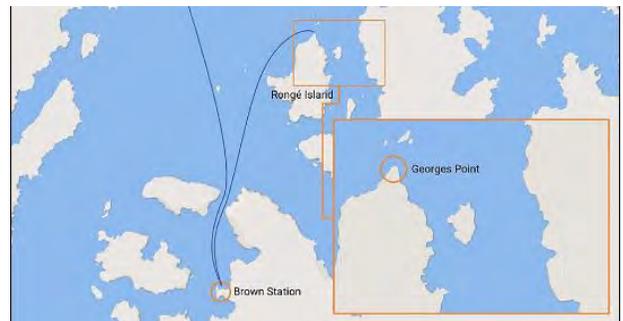
Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

— Day 6: First Landings at Brown Station & Georges Point – Monday, 9 January 2023 —

<http://www.mach25media.com/antarctica2.html>



(Left) This image of the west side of Brown Station, shows where we first touched the continent. The zodiac landed on the rocks between the sign on the left and the small shack just left of center, below the larger building. We scooted off the zodiac and climbed the snow path toward the blue-and-white roofed annex building. (Middle, Right) The Atlas Ocean Voyages World Traveller, stationkeeping off Brown Station while we did our first continental landing. The weather gives the ship a ghostly quality, and rather matched my feelings of not really believing I was actually in Antarctica after 60 years! The zodiac that just brought me to shore is now heading back to the ship for the next batch to land.



(Left) A newly married couple take portraits with Brown Station in the background. Note the extremely wet deck because of the rain. At least the groom had a coat! (Middle) A mass of penguins at Brown Station. (Right) The map and description of the features at Georges Point. This was the only landing I did not participate in during the voyage.



(Upper Left) A humpback whale spouts (left) and a second shows its fins (right) (Lower Left) An image of the quickly changing cloudscape as the Sun starts to peek through the Antarctic landscape. (Right) The upside-down, waning gibbous Moon over Antarctica at 4:33 am AT on 10 January 2023.

Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

— Day 7: **Sitting Out A Gale** – Tuesday, 10 January 2023 —

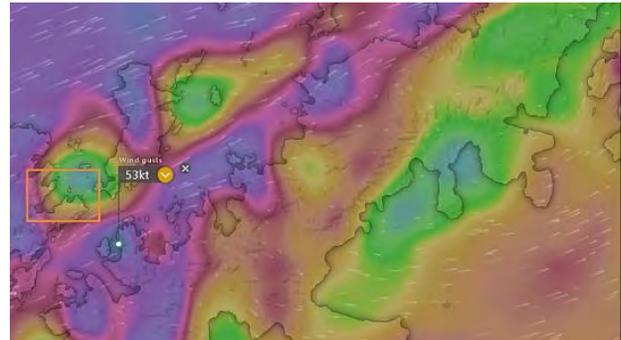
<http://www.mach25media.com/antarctica3.html>



Various views of the landscape, or should I say, icescape, of Patagonia Bay, nestled on the northeast sector of Brabant Island.



Icebergs.



We headed northwest from our previous days landings in order to wait out the gale. At right shows the green (calm) area of Patagonia Bay, while high winds surrounded us.



(Left) Another humpback whale sails by, then takes a deep dive. (Right) Michelle keeping an eye on Infy and Opus as they try to take over the gift shop.

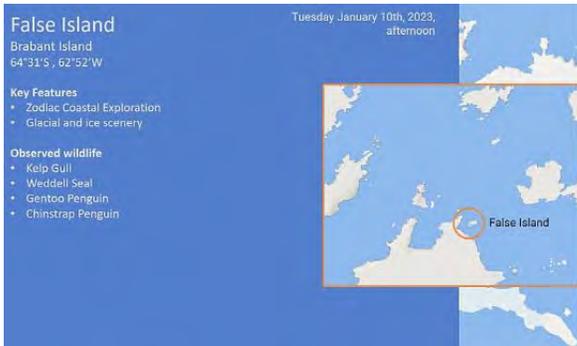
Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

— Day 7: Checking Out A False Island – Tuesday, 10 January 2023 —

<http://www.mach25media.com/antarctica3.html>



More Antarctic landscapes.



(Left) Heading to False Island for our next zodiac exploration. (Middle) A partner zodiac was close by as we traversed the area. Helps to give some scale to the scenery as well. (Right) Ice cubes made from the ice we retrieved from the ocean on our zodiac trip. Tiny bubbles trapped the air from hundreds, or even thousands, of years ago, then dissolved in the drink. An interesting thing to think that we were absorbing air as we sipped, from so long ago. My drink of choice was a simple glass of water, while most of the rest of our zodiac members preferred alcohol.



(Left) A whale shows off their fluke as they dive for more krill. (Middle) Our zodiac approaches an iceberg. (Right) Close-up of the snow petrel in flight.

Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

— Day 8: Antarctic Wildlife, and a Shipwreck – Wednesday, 11 January 2023 —

<http://www.mach25media.com/antarctica4.html>



(Left) Our map showing Enterprise Island and Foyn Bay. (Right) A fractured and fissured iceface, ready to crack and fall into the ocean.



(Left) An ice cave. A very unstable place where you definitely do not want to seek shelter. (Right) A view of the wreck as we sailed around to check it out. The ship now serves as a home to Antarctic wildlife, such as birds that love the hulk for its nesting qualities.



An icescape / landscape as we approached Enterprise Island and Foyn Bay.



(Left) The seals lounge around, and check out the visitors gawking from the zodiac. (Right) The happy couple kiss while everyone else pretends not to look.

Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

— Day 8: Portal Point & "There Be Whales" – Wednesday, 11 January 2023 —

<http://www.mach25media.com/antarctica4.html>



(Left) Our next landing is at Portal Point. The preview of possible wildlife in the area was spot on. (Right) Our zodiac hits the rocks at Portal Point. The cones show us a safe path to follow.



Another Gentoo penguin in sole command of an iceberg. As our ship passed by in review, he turned to follow us.



(Left) The humpback whales started to appear. (Right) Each fluke is unique. You can take an image like this, and upload it to Happy Whale. From there, they will examine other fluke images to determine which whale this is. If it has never been seen before, you get to name it yourself. That's what I did with this photo, and I'm waiting to hear back if this whale has been spotted previously or not.

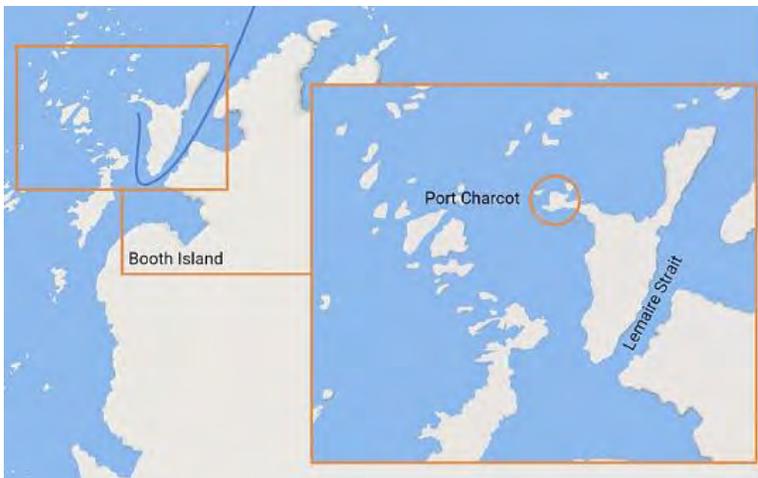
Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

— Day 9: The Weather Closes In – Thursday, 12 January 2023 —

<http://www.mach25media.com/antarctica5.html>



(Left) A great presentation by Vivel about Roald Amundsen. (Right) Vivel's slide shows Scott's dejected party at the South Pole, finding Amundsen's tent



(Left) Our map shows the planned path for the day. Unfortunately, it won't work as intended. (Right) At the bow of the World Traveller in the Lemaire Channel, holding a copy of my book, "The X-15 Rocket Plane, Flying the First Wings into Space."

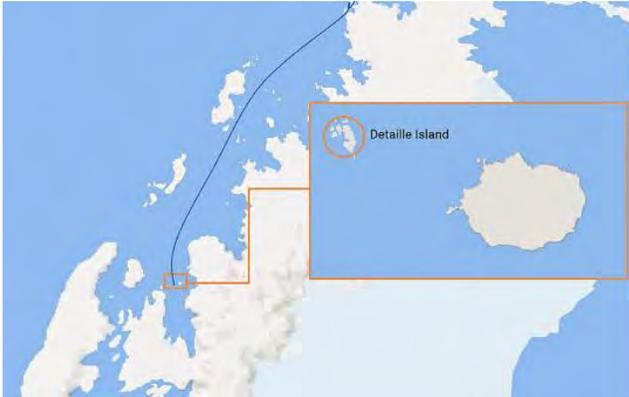


An amazing iceberg with one complete arch, with the possibility of two more arches in the making.

Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

— Day 10: Furthest South – Friday, 13 January 2023 —

<http://www.mach25media.com/antarctica6.html>



(Left) Our map shows the location of our landing on Detaille Island, specifically at the abandoned British Antarctic Survey's Base "W." (Right) The weather was very similar to the previous day as we continued south.

— Day 10: Assault on "Base W" – Friday, 13 January 2023 —

<http://www.mach25media.com/antarctica6.html>



(Left) Our objective: Take British Base W! Note the snow and rocks we'll have to climb. (Right) An assortment of wet weather gear left on the racks is inspected by Michelle.



(Left) The toilet facilities were crude and could give you splinters. (Right) Our assault forces return triumphant to our ship.

Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

— Day 10: The Polar Plunge & More Visitors – Friday, 13 January 2023 —

<http://www.mach25media.com/antarctica6.html>



(Left) Awaiting their turn to get really cold. (Right) A quick reminder that these are the waters that people are intending to plunge into!



(Left) Steve has committed to the jump, but hasn't quite hit the water. He's in for a shock! (Right) On overhead shot from Deck 8, looking down on the hapless jumper.

— Day 10: Stuck in the Ice, an Antarctic Rescue – Friday, 13 January 2023 —

<http://www.mach25media.com/antarctica6.html>

Andresen Island
66°53'00" S, 66°47'00" W

Friday 13th January, 2023, Afternoon

Key Features

- Zodiac Coastal exploration
- Beneath Antarctic Polar Circle

Observed wildlife

- Adélie Penguin



(Left) Leaving Detaille Island, we sailed to Andresen Island, also known as Isla Curanilahue. (Right) A magnificent iceberg, with a doughnut hole!

Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

— Day 10: Stuck in the Ice, an Antarctic Rescue – Friday, 13 January 2023 —

<http://www.mach25media.com/antarctica6.html>



Our ride home has finally arrived. This was one of the longest hours of my life, as we had no idea how long we might be trapped by the ice.

— Day 10: The End of a Very Long Day – Friday, 13 January 2023 —

<http://www.mach25media.com/antarctica6.html>



Late evening icescapes, after retrieval from our harrowing experience.



The end of a very long, but rewarding, if a bit scary, day.

Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

— Day 11: Heading North to Winter Island – Saturday, 14 January 2023 —

<http://www.mach25media.com/antarctica7.html>



The beauty in Antarctica is unparalleled. The rest of the world seems mundane in comparison.



The World Navigator sails by in the Penola Strait, as an expedition crew member, in the foreground at left, sets up a kayaking group for the World Traveller guests.



Looks like the clouds have moved in to give these mountains protective hats.

— Day 11: Wordie House, Our Final Antarctic Landing – Saturday, 14 January 2023 —

<http://www.mach25media.com/antarctica7.html>

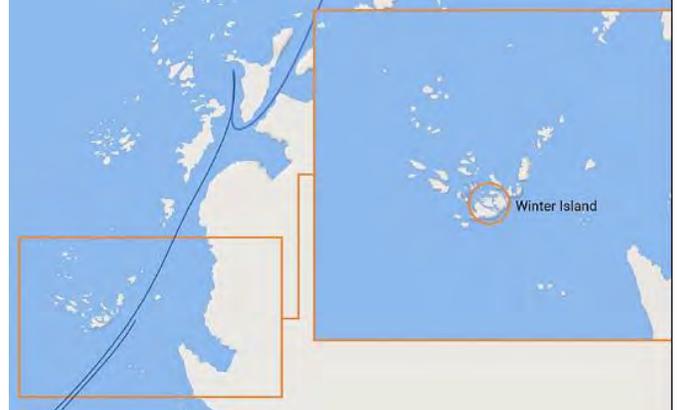


(Left) The entrance into Wordie House. How many scientists, researchers, and tourists have passed through this door in the decades since it was first constructed? (Right) As an author, I love old typewriters. Here is one of several I saw at the base.

Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

— Day 11: Wordie House, Our Final Antarctic Landing – Saturday, 14 January 2023 —

<http://www.mach25media.com/antarctica7.html>



(Left) The Gentoos inhabit most of the available rocky land near the base. (Right) Our map shows the final landing location at Winter Island.



The lone Elephant seal that we saw on this trip. It was in the shallows across a small inlet from Winter Island and Wordie House. A large, yet beautiful creature, that, like pretty much all Antarctic life we encountered, was indifferent to our human presence.

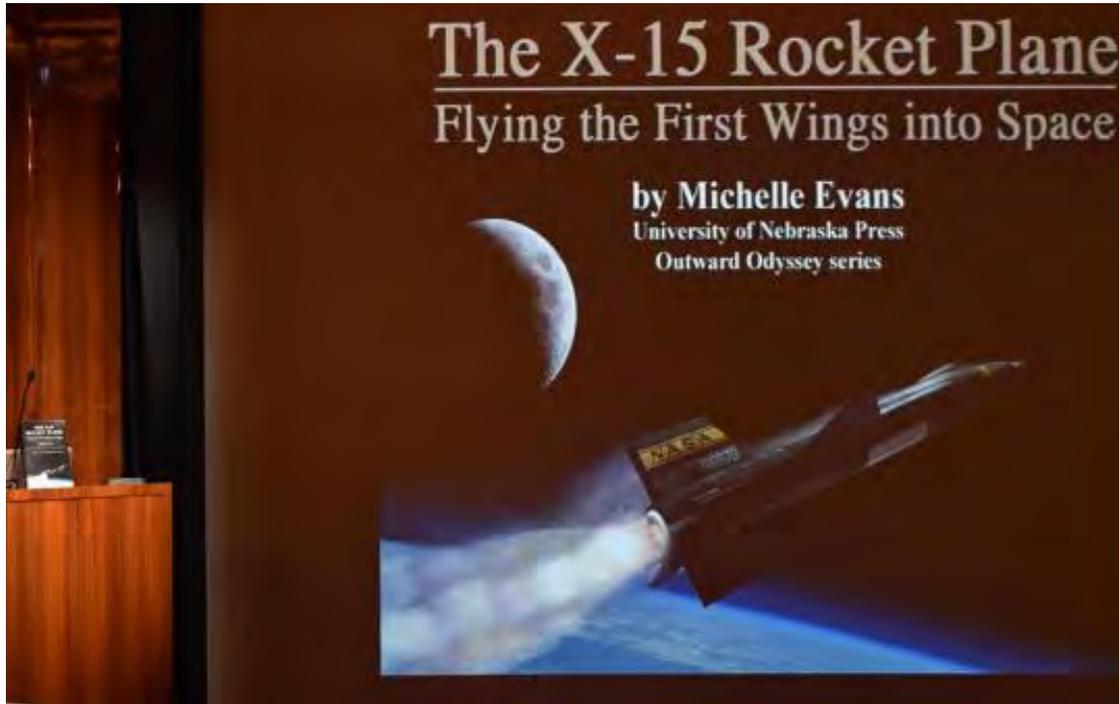


(Left) Approaching our ship after our last excursion. (Right) My film can filled with Antarctic snow that I collected outside Wordie House. Even melted, it will always be my ultimate souvenir from this continent.

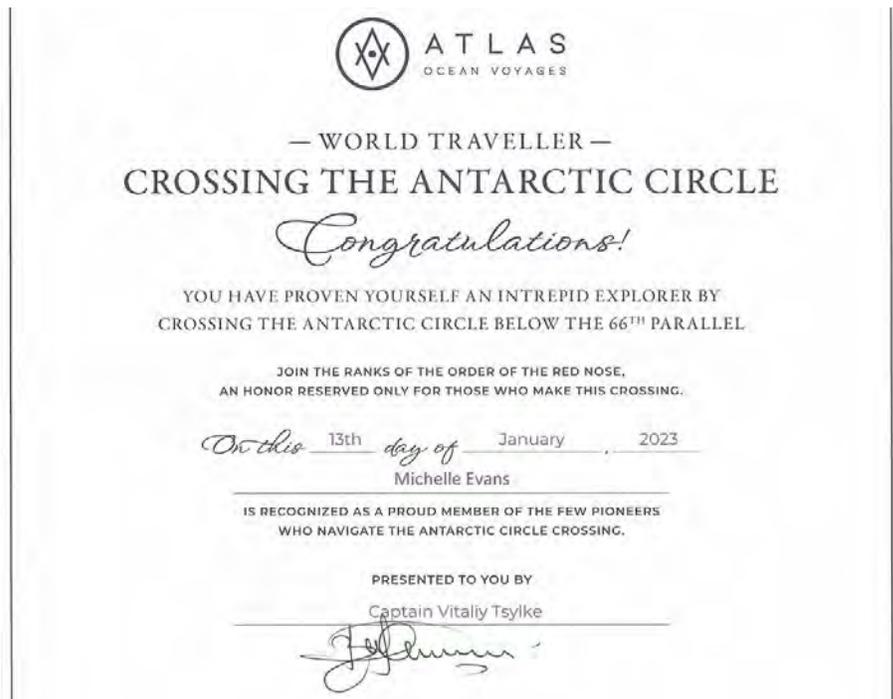
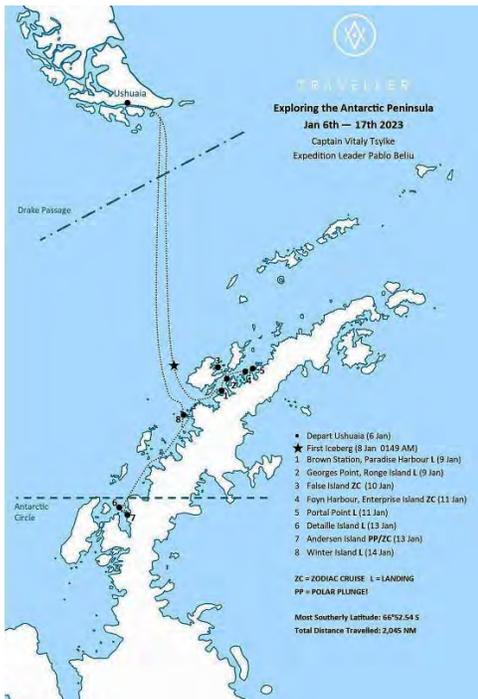
Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

— Day 11: The X-15 Rocket Plane – Saturday, 14 January 2023 —

<http://www.mach25media.com/antarctica7.html>



My presentation of "The X-15 Rocket Plane, Flying the First Wings into Space" was given at 2:00 pm on Saturday, 14 January 2023, in the Vasco da Gama Theater aboard the cruise ship, World Traveller, at a latitude of approximately 65°S. This was my first time doing this presentation in the Antarctic, but was the 120th time I have spoken about my book before an audience. A copy of my book is at the podium.



(Left) A map that shows our entire voyage, including crossing the Drake Passage, all of our stops along the Antarctic Peninsula, and crossing the Antarctic Circle. (Right) My official certificate from Atlas Ocean Voyages, acknowledging my inclusion in the "Order of the Red Nose." This signifies that I have crossed below the latitude of 66° South. It is signed by Vitaliy Tsylike, Captain of the World Traveller.

Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

— Day 12: Back in the Drake, Heading North – Sunday, 15 January 2023 —

<http://www.mach25media.com/antarctica8.html>



Passengers start to gather in the Atlas Lounge for the Captain's Farewell.

— Day 13: Antarctic Origami & the Engine Room Tour – Monday, 16 January 2023 —

<http://www.mach25media.com/antarctica8.html>



(Left) Three friends teamed up to find an origami penguin rookery. (Right) The very noisy, but extremely clean engine room. Not like you'd expect from old time cruise ships with dark and dank, dirty and greasy, areas.

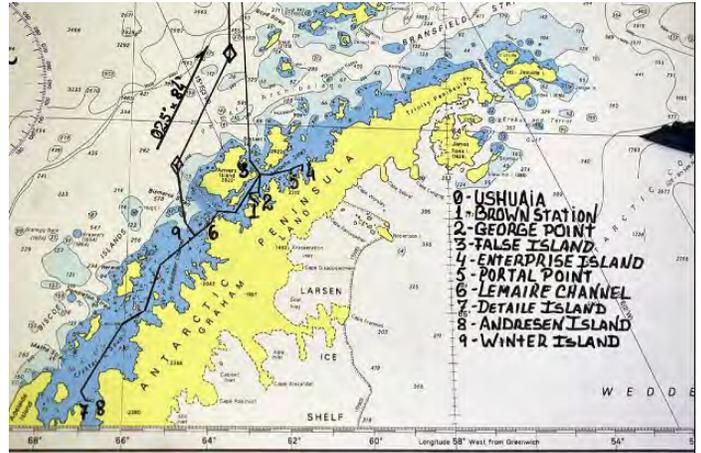
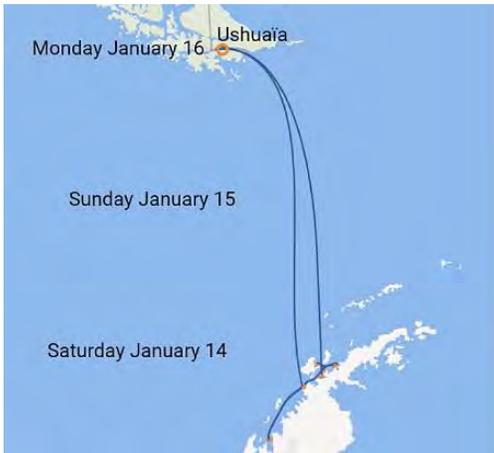


(Left) Another excellent presentation on Antarctic photography. This shows Frank Hurley's image of the Endurance stuck in the ice during the Imperial Trans-Antarctic Expedition. (Right) (Middle) Captain Robert Falcon Scott's hut at Cape Evans on Ross Island at McMurdo Sound in 1910, during the British Antarctic Expedition, and 100 years later (Right). In both images the volcano, Mt Erebus, is the background. "Near enough is not good enough." — Frank Hurley

Journey to Antarctica! (2023 January 4-18) (Photo Gallery by Ms. Michelle Evans)

— Day 14: Leaving and Returning – Tuesday, 17 January 2023 —

<http://www.mach25media.com/antarctica8.html>



(Left) Our full trip map, including the last days at sea. (Right) A close-up on our Antarctic Peninsula navigation chart with the various locations we visited marked.



(Left) Arriving at Buenos Aires aboard Flybondi. I was again in seat 9C. (Right) The final leg of my flight home, not far from landing at LAX. Seat 3A on my 787 flight. An amazing trip that covered 25,660 miles, and changed my life.

— Day 15: Home At Last – Wednesday, 18 January 2023 —

<http://www.mach25media.com/antarctica8.html>



(Left) Four different patches were available. My favorite is the Antarctic continent. (Right) The oversized postcards from Port Lockroy, sold in the World Traveller gift shop, along with the British Antarctic stamps. On 23 February, my postcard that was mailed through Port Lockroy showed up at home! I was very surprised, but also very elated that this happened. The World Traveller called at Port Lockroy on its very next cruise, as the postmark is 21 January.

Nearly Full Moon one cycle (2023 January 5 - February 3) (Photo Gallery by Ms. Michelle Evans) *(Ms. Michelle Evans: AIAA Distinguished Speaker, also Book Author on a best-seller on X-15)*



A double image of the nearly full Moon. The image on the left was taken on 5 January 2023 in Buenos Aires, Argentina, while the one on the right was taken exactly one lunar cycle later on 3 February 2023 in Lake Forest, California. Each was taken at 300mm at 1/400th/sec, but shows how the aspect of the Moon changes when viewed from the Southern Hemisphere (left) versus the Northern Hemisphere (right).

**Crescent Moon, along with Venus and Jupiter (2023 Jan. - Feb.) (Photo Gallery
by Ms. Michelle Evans)** *(Ms. Michelle Evans: AIAA Distinguished Speaker, also Book Author on a best-seller on X-15)*



An image of the crescent Moon with Venus, when they made their closest approach to each other on 25 January 2023. This was taken at 300mm at 1/500th/sec.

Crescent Moon, along with Venus and Jupiter (2023 January - February)
(Photo Gallery by Ms. Michelle Evans)



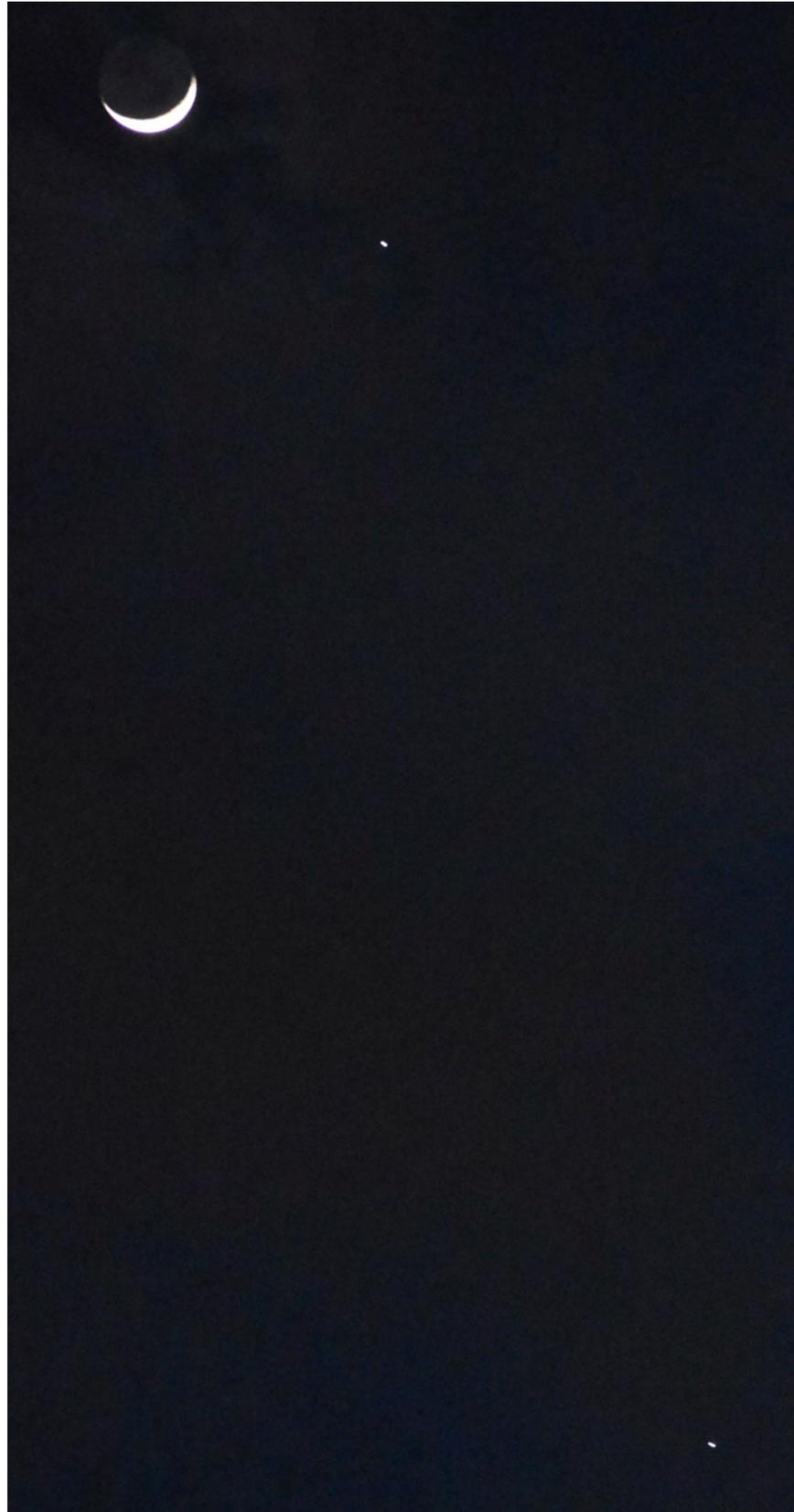
Moon and Venus at 6:07 pm. 300mm, 1/1000th/sec, f6.5. (22 February 2023)

Crescent Moon, along with Venus and Jupiter (2023 January - February) (Photo Gallery by Ms. Michelle Evans)



A crescent Moon, Venus, and Jupiter at 6:10 pm. 110mm, 1/60th/sec, f4.8. (22 February 2023) (Left) Unprocessed; (Right) Processed to see the sky conditions.

Crescent Moon, along with Venus and Jupiter (2023 January - February)
(Photo Gallery by Ms. Michelle Evans)



A crescent Moon, Venus, and Jupiter at 6:19 pm. 110mm, 1/60th/sec, f4.8. (22 February 2023)

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



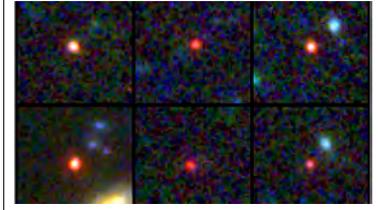
(Feb. 17) Military finishes recovering Chinese balloon debris from off Carolina coast



(Feb. 22) SpaceX proceeding with Starship orbital launch attempt after static fire



(Feb. 23) Russia launches rescue ship to space station after leaks



(Feb. 22) The Webb telescope finds surprisingly massive galaxies from the universe's youth



(Feb. 16) The F-22 Raptor Stealth Fighter Was Expensive, But It's Worth It



(Feb. 16) NASA advisers raise concerns about Artemis safety and workforce



(Feb. 18) Russia to propose Gulf States partnership to produce Su-75 Checkmate fighter aircraft



(Feb. 15) Virgin Orbit launch failure inquiry indicates engine overheat after fuel-filter dislodged



(Feb. 24) 'Great Shock' For Taiwan's Air Force; Its Indigenous MALE UAV Capable Of Firing AGM-114 Missiles Damaged During Trials



(Feb. 19) Meet China's 'Futuristic & Covert' Unit Believed To Be Behind Balloon Campaigns Over US, India & Japan



(Feb. 17) China set to eclipse US air superiority in Pacific



(Feb. 16) US F-35 jets intercept 4 Russian fighter aircraft near Alaska, second action in 2 days



(Feb. 15) Unlike MiG-31, US Air Force Lacks 'Service Ceiling' To Shoot Down High Altitude Balloons: Russian Experts



(Feb. 17) Hobby Airport flight cancellations mount after small plane wrecks on runway



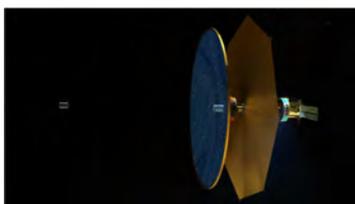
(Feb. 10) US military shoots down small object over Alaska



(Feb. 10) SPACEX PRESIDENT WARNS THAT STARSHIP'S ORBITAL LAUNCH MAY EXPLODE



(Feb. 16) Timelapse of the Green Comet that Passed Through our Solar System



(Jan. 20) It's Not Sci-Fi—NASA Is Funding These Mind-Blowing Projects



(Feb. 17) China sanctions Lockheed, Raytheon after vowing to retaliate against US restrictions



(Feb. 20) Germany's Rheinmetall Set to Produce Parts for F-35 Jets

RSVP and Information: (<https://conta.cc/3Y2IBbZ>)

AIAA LA-LV 3/4 @10:30 AM PST Section (Hybrid) Meeting

Saturday, 2023 March 4, 10:30 AM PST (US and Canada) (GMT -0800)

Aerospace Clean & Sustainability Energy - Power-Star

by

Mr. Shawn P. Boike

CEO & President of AIC & Insta-Grid
United States Space Force via AIC & Insta-Grid
Los Angeles, CA
(This speaker will present in person.)



Professor David C. Hyland, Sc.D.

Professor Emeritus, Aerospace Engineering
Adjunct Professor of Physics, College of Science
Wisnbaker Chair of Engineering
Director, Space Science and Space Engineering Research
Texas A&M University (Emeritus), College Station, TX
President, Augusta Quantum Electrodynamics Inc
(This speaker will present online remotely.)

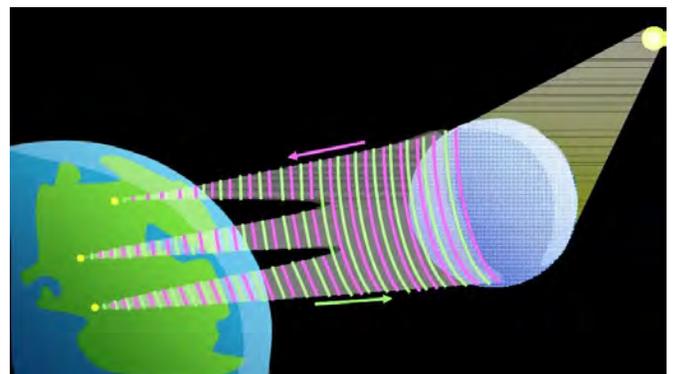


Physical Location

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, and close to Northrop Grumman Space Park)(also
online for a hybrid event)
(This event is not sponsored by the Lawndale Library)

Online on Zoom

(Please register /RSVP and you will receive the ticket with the Zoom link.
Please check Spam or Junk folder shortly after registration to make sure.
If not, please try using an alternative email address.)



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

Contact: General Contact: contact@aiaa-lalv.org, Events/Program events.aiaalalv@gmail.com

AIAA LA-LV 1/11 Section Aero Alumni (hybrid) Meeting

Wednesday, March 8, 11:15 AM - 1 PM PST (GMT -0800) (US and Canada)

Aero Alumni Meeting

Hybrid in-person luncheon and Zoom on-line meeting

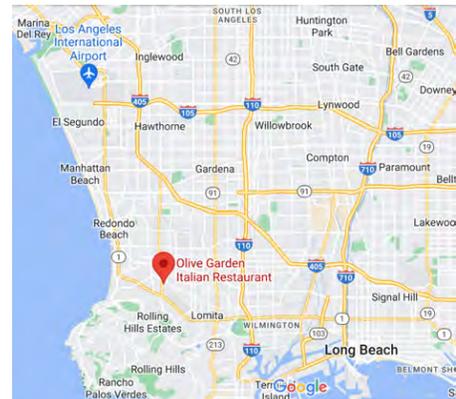
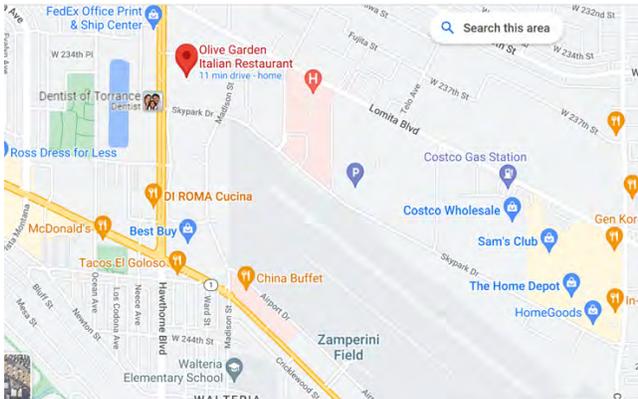
Our monthly Aero Alumni Zoom meeting is at 11 am PST (on-line) / 11:15 am PST (in-person) on March 8. (The 2nd Wednesday of March) It will be a hybrid meeting (both in-person there and on-line) at the Olive Garden in Torrance, 23442 Hawthorne Blvd., Torrance, CA 90505. COVID is again allowing a hybrid 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/88310346375?pwd=K28rQmVJOW1uTlpab0VyVzIjCeFURzZ09>

Meeting ID: 883 1034 6375

Passcode: 062931

One tap mobile +16694449171,,88310346375# US, +12532050468,,88310346375# US
Dial by your location +1 669 444 9171 US, +1 669 444 9171 US, +1 253 205 0468 US, +1 253 215 8782 US (Tacoma)

+1 346 248 7799 US (Houston)

+1 719 359 4580 US

+1 720 707 2699 US (Denver)

+1 253 215 8782 US (Tacoma)

+1 646 558 8656 US (New York)

+1 646 931 3860 US

877 853 5257 US Toll-free

Meeting ID: 899 4544 9353

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

+1 689 278 1000 US

+1 301 715 8592 US (Washington DC)

+1 309 205 3325 US

+1 312 626 6799 US (Chicago)

+1 360 209 5623 US

+1 386 347 5053 US

+1 507 473 4847 US

+1 564 217 2000 US

888 475 4499 US Toll-free

Please contact Mr. Gary Moir (gary.moir@ingenuir.com)



RSVP and Information: (<https://conta.cc/3CJnin6>)

AIAA LA-LV 3/11 Section mini-Conference

Saturday, 2023 March 11, 10:30 AM PST (US and Canada) (GMT -0800)

AIAA LA-LV University Student Branches mini-Conference

Dr. Paul Bevilaqua (Keynote Address),

Dr. Nahum Melamed,

Mr. Dennis Leung,

Mr. Luis Cuevas,

AIAA California State University, Long Beach (CSULB) Branch,

AIAA University of California, Los Angeles (UCLA) Branch,

AIAA University of Nevada, Las Vegas (UNLV) Branch,

AIAA University of Southern California (USC) Branch,

Empirical Systems Aerospace Inc. (ESAero)



Dr. Paul Bevilaqua and (Inventing the Joint Strike Fighter / Skunk Works)



Mr. Dennis Leung



Mr. Luis Cuevas



Dr. Nahum Melamed

Contact:

Luis Cuevas

Education/Collegiate Chair

AIAA LA-LV Section

education-collegiate-chair@aiaa-lalv.org

Events/Program Chair

events.aiaalalv@gmail.com



Empirical Systems Aerospace Inc. (ESAero)

Physical Location

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, and close to Northrop Grumman

Space Park)(also online for a hybrid event)

(This event is not sponsored by the Lawndale Library)

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



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engage.aiaa.org/losangeles-lasvegas

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

AIAA LA-LV 3/18 @10:30 AM PDT Section (Hybrid) Meeting

Saturday, 2023 March 18, 10:30 AM PDT (US and Canada) (GMT -0700)

**Supply Chain and Traceability in Space
Production Applications**

Speaker / Panelist:

Dennis Leung

Founder of DIBASHI Consulting, LLC
(Formerly with Northrop Grumman Corporation and NASA)
(This speaker/panelist will present in person.)



Panelists:

Dr. Bradley Bobbs

PhD, Physics, UCLA; BS, Physics, Harvey Mudd College
Senior Scientist and Lead, Laser Ultrasonic Products Group
Intelligent Optical Systems, Torrance, CA
(This panelist will participate in person.)



Ms. Deborah Shepard

Special Projects Career Pathways Coordinator
South Bay Workforce Investment Board-SBWIB
(This panelist will participate in person.)
(Possible additional panelists : TBD)



Physical Location

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, and close to Northrop Grumman Space Park)(also
online for a hybrid event)
(This event is not sponsored by the Lawndale Library)

Online on Zoom

(Please register /RSVP and you will receive the ticket with the Zoom link.
Please check Spam or Junk folder shortly after registration to make sure.
If not, please try using an alternative email address.)



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RSVP and Information: (<https://conta.cc/3Ylr52t>)

AIAA LA-LV 4/29 @10:30 AM PDT Section (Hybrid) Meeting

Saturday, 2023 April 29, 10:30 AM PDT (US and Canada) (GMT -0700)

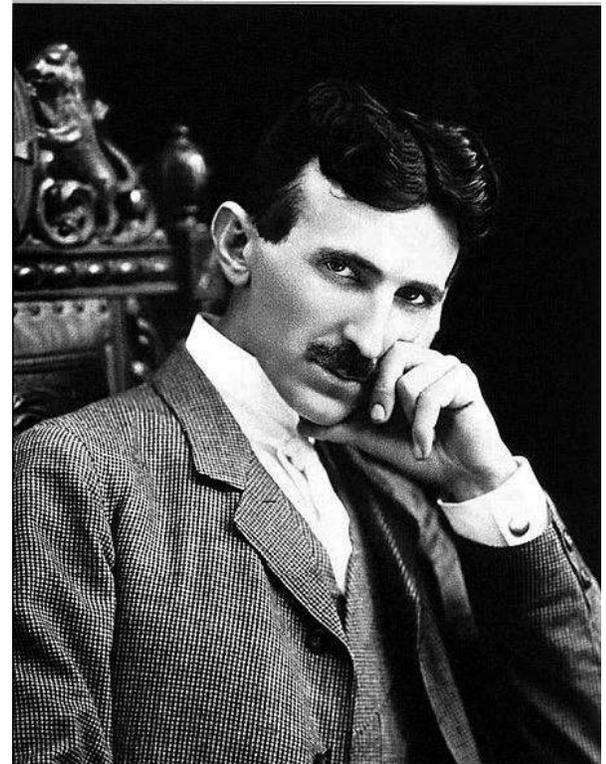
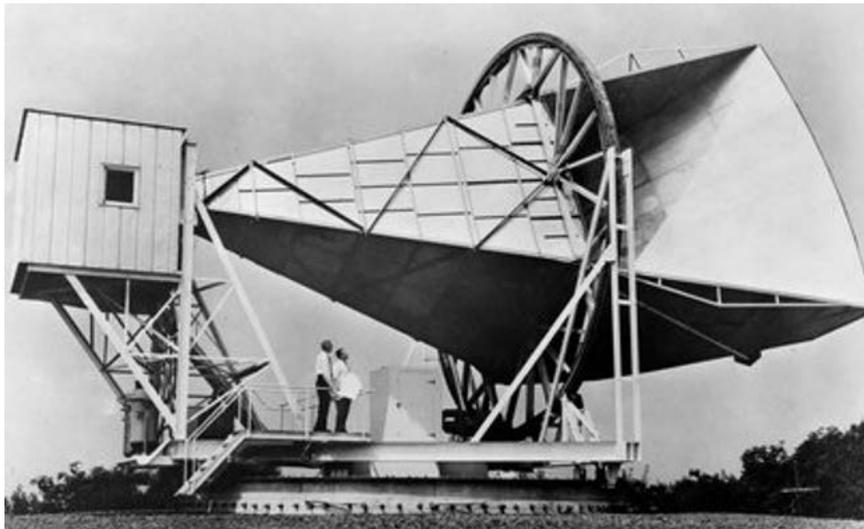
**Serendipity and contrarianism in scientific research:
Hit 'em where they ain't**



by

Prof. Paul D. Ronney

Department of Aerospace and Mechanical Engineering
University of Southern California, Los Angeles, CA
(The speaker will present in person.)



Physical Location

Olin Hall of Engineering (OHE), room 406 (Conference Room)
University of Southern California (USC)
3650 Mcclintock Ave.,
Los Angeles, CA 90089

<https://www.campus-maps.com/usc/olin-hall-ohe/>

(South of 10 Hwy, West of 101 Hwy, East of 405 Hwy, North of 105 Hwy)

Online on Zoom

(Please register /RSVP and you will receive the ticket with the Zoom link.
Please check Spam or Junk folder shortly after registration to make sure.
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RSVP and Information: [\(TBA\)](#)

AIAA LA-LV 5/11 Annual Awards Dinner

Thursday, 2023 May 11, 6:00 PM PDT (US and Canada) (GMT -0700)

AIAA LA-LV Annual Awards Dinner

Keynote Address:

Artemis-1 and Aerojet-Rocketdyne

Recognitions:

Council Members, Membership Honors and Advancement, Volunteers

AIAA LA-LV Section Excellence Award

AIAA LA-LV Section K-12 Student Awards

AIAA LA-LV Section James Wertz Scholarship

AIAA SSTC Middle School Essay Contest local entry Recognition

Physical Location

Cambria Hotel LAX, Meeting Room/Patio
199 Continental Blvd, El Segundo, CA 90245

(South of LAX/105 Hwy, West of 405 Hwy, and East of PCH 1. Adjacent to LAX, Raytheon, Aerospace Corp. Northrop Grumman, Boeing, LA AFB / Space Force, Millennium Space Systems, LA Kings/Toyota Sports Performance Center etc.)

Online on Zoom

(Please register /RSVP and you will receive the ticket with the Zoom link. Please check Spam or Junk folder shortly after registration to make sure. If not, please try using an alternative email address.)

Tentative Agenda (All time PDT (GMT -0700)

5:00 PM: Check-in / Cash Bar (Lobby) / Student Posters

6:00 PM: Dinner

7:15PM: Recognitions

7:30PM: Keynote Address / Excellent Award

8:15: Student Awards, James Wertz Scholarship, SSTC Essay Contest

9:00 PM: Concluding Remarks



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

Section. Contact: General Contact: contact@aiaa-lalv.org, Events/Program events.aiaalalv@gmail.com

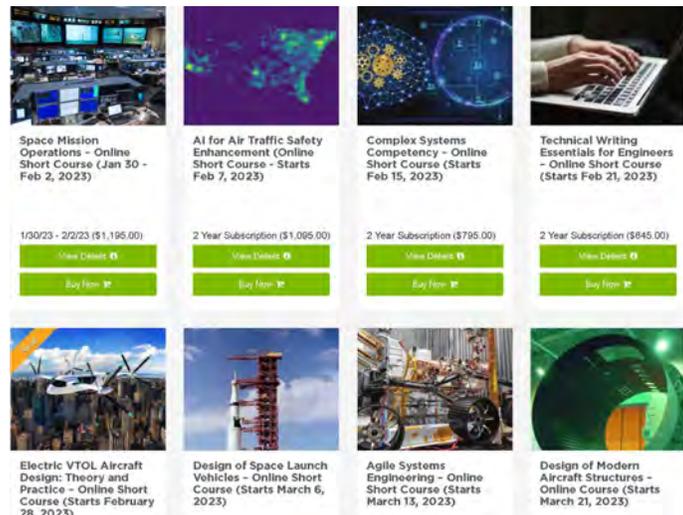
AIAA On-line short courses in the first half of 2023

<http://learning.aiaa.org/>

AIAA is offering over 25 online short courses in the first half of 2023 and will provide Member Discounts and group discounts for organizations registering 5+ people for a given course. All Details at <http://learning.aiaa.org/>

Any question please contact:

Jason Cole, Director, Continuing Education, 800-639-AIAA (2422), jasonc@aiaa.org 703.264.7596 (direct)



Jan 30 - Feb 2	Space Mission Operations
Feb 7 - Mar 2	AI for Air Traffic Safety Enhancement – NEW!
Feb 15 - Feb 24	Complex Systems Competency – NEW!
Feb 21 - Mar 2	Technical Writing Essentials for Engineers
Feb 28 - Mar 30	Electric VTOL Aircraft Design: Theory and Practice – NEW! (Joint with Vertical Flight Society)
March 6 – April 12	Design of Space Launch Vehicles
March 13 – April 5	Agile Systems Engineering – NEW!
March 21 - April 20	Design of Modern Aircraft Structures
March 28 – April 6	Introduction to Propellant Gauging – NEW!
April 5 - April 26	Optimal Control for Unpiloted Aerial Vehicles (UAVs) – Online Guided Short Course
April 11 - April 27	Overview of Python for Engineering Programming
April 19 - May 12	Electrochemical Energy Systems for Electrified Aircraft Propulsion: Batteries and Fuel Cell Systems
April 19 - June 9	Design of Gas Turbine Engines: From Concept to Details – NEW!
April 17 - May 17	Hypersonic Flight Vehicle Design and Performance Analysis
April 25 - May 11	Understanding Aircraft Noise: From Fundamentals to Design Impacts and Simulations – NEW!
April 25 - April 26	OpenFOAM® CFD Foundations
May 2 - May 11	Digital Engineering Fundamentals
May 8, May 15	Essential Model-Based Systems Engineering – NEW!
May 9 - May 11	Launch Vehicle Coupled Loads Analysis: Theory and Approaches – NEW!
May 16 - June 8	Introduction to Aeroelasticity: From Basics to Application – NEW!
May 16 - May 17	OpenFOAM® External Aerodynamics
May 16 - May 25	Aircraft Reliability & Reliability Centered Maintenance
May 22- May 25	Understanding Space: An Introduction to Astronautics and Space Systems Engineering Sustainable
May 23 – June 6	Aviation: Challenges, Design Implications, Recent Advancements, Noise, Emissions, Alternative Fuels, Electric Aircraft, and Emerging Technologies – NEW!
June 6	OpenFOAM® Aeroacoustics Modeling
June 7	OpenFOAM® Dynamic Mesh Modeling
June 20 - June 23	Safety Management System (SMS) in Aviation – NEW!
July 19 - July 28	Aircraft Maintenance Management – NEW!