NASA Langley Alumni Association

LANGLEY ALUMNI ASSOCIATION

September 2026

A Summary of Accomplishment and Fellowship

By Kathy Ferrare, President

The summer has flown by! Thinking of flying by, the NASA Boeing 777 looked spectacular circling NASA Langley before landing at Langley Air Force Base on August 11th. This aircraft has been transformed from a passenger plane into NASA's next-generation airborne lab. Ms. Kirsten Boogaard, the NASA 777 NASA Langley's program manager, said "I'm excited for what the 777 will bring. It gives us the ability to bring together more partners, more educational opportunities, and more instruments. That will make a real difference in the data we collect moving forward."

Its first science mission is scheduled for January 2027 to investigate winter events spanning from North America, Europe, Greenland, and the Arctic and North Atlantic Oceans.

To learn more about 777 and other airborne science missions, please visit: https://www.nasa.gov/centers-and-facilities/langley/nasas-777-aircraft-returns-home-with-science-flights-on-the-horizon.

Our July annual picnic hit a record crowd of 64 people! It was wonderful seeing our "regular" LAA attendees there, along with so many new faces. Our bingo game was very interesting and we learned, once again, how even though we are re-

continued on page 2

In This Issue

2026 LAA Officers

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Wes Goodman Ray Whipple
Jill Marlowe Dave Young
Neil O'Connor

A Summer of Accomplishment and Fellowship

continued from page 1

tired, our competitive nature has not slowed down...especially when prizes are involved 🙂. Thank you Susan McClain for organizing this fun-filled event! Our Spirit Wear collection rack was hopping with customers as Jill Marlowe and Amy Radford guided attendees through the purchasing process. Thank you Jill and Amy for all your hard work! It was nice to see people wearing the merch at the August meetings. I love seeing all those smiling faces in our group picture!

The Class of 2027 Hall of Honor committee remains committed to honoring those whose achievements have fundamentally advanced aerospace science, engineering, and mission support—ensuring their legacy continues to inspire future generations.

We are so excited to announce that our electronic Class of 2027 Hall of Honor nomination form went live as of September 1st on the LAA website. This marks our official start of the nomination period *from September 1, 2026 to January 7, 2027*. Please see more details, along with the nomination form, at https://larcalumni.org/the-langley-research-center-naca-and-nasa-hall-of-honor.

THANK YOU so much to all the newsletter contributors. We appreciate the time and effort you put into helping make our newsletter a wealth of knowledge!

One final note: with all these special events, it takes many people to make them take shape and happen. It is with helping hands of our LAA members that allow us to provide these wonderful activities. As opportunities arise, please consider volunteering...we would enjoy seeing you! ◆

If you want to go fast, go alone.
If you want to go far, go together.
— African Proverb

Supporting the VASSM *Museum for All* Program

By Ray Rhew, Treasurer

The financial status of the organization is strong and ahead of the 2026 spending plan. Based on this and the donations ad hoc committee planning, the LAA was able to provide an impactful donation to the Virginia Air and Space Science Museum (VASSM) to support the *Museum for All* program. Specifically, we helped support increased participation of youth in the Mars Viking 50th anniversary event hosted by the VASSM.

The next step in the donations ad hoc committee is to provide a plan going forward to enable donations to the community in the coming years similar to or exceeding what was provided to the VASSM. A big thank you to the ad hoc committee and the LAA for their continued financial support to fulfill our commitment to help students thrive! ◆

Vice President's Report

By Susan McClain, Vice-President and Programs Chair

It has been a busy summer—and thanks to everyone who came out to our LAA meetings in person and virtually. It is great to see so many people enjoying our events and speakers.

We are working to bring you diverse speakers—and as always, please let us know if there is a topic in which you are interested. Several of our recent and upcoming speakers were suggested by LAA members.

In June, the LAA welcomed Dr. Kevin Marlowe who presented on "AI in Your Corner." Several members mentioned that they were able to immediately use several of the tools Dr. Marlowe recommended (see *AI Musings*, p. 9).

In August, we welcomed Stephanie Letourneau from the Wetland Watch who presented "Rising Tides and Real Data: Community Science and Nature Based Climate Resilience." In addition to being a great and informative presentation, there are a number of opportunities for LAA members—I know that several LAA members (and their family members) have participated in Catch the King in past years.

If you could not make the presentations, the videos are available through the larcalumni.org website.

We have a great slate of presenters and presentations coming up:

- September 8 – Steve Gayle, the Acting Associate Center Director, will be providing an update on the State of the Center.
- October 13 – Bryan Barmore, a LAA member, will present on the Master Naturalist Program
- November 10 – Neil O'Connor, a LAA member, will present on NASA Langley's Air Traffic Operations Lab (ATOL). We are also working on a tour of the ATOL.

We have planned speakers through March of 2027.

Thanks so much to everyone who came out for our annual picnic. The food and the company were wonderful. I have a few lessons learned: (1) do not give out the bingo cards at the beginning of the event, and (2) have more than one version of the bingo card!

We are beginning to plan for our holiday luncheon. Please let me know if you have any ideas on restaurants. ◆

LAA Membership is Growing!

By Amy Radford, Membership Chair

The LAA continues to grow and thrive, with 310 active members as of early August. We are pleased to welcome 41 new members and two returning members this year.

Membership Process Improvements

- Launch of the new online LAA application on May 29, with 15 applicants using the system to date.
- Creation of a test environment with active member records and new applicant data to support system testing.

Testing is progressing well. Current efforts are focused on completing the remaining data uploads and finalizing screen layouts and reports. We greatly appreciate Cody Flowers for sharing his expertise and supporting the development of modules and workflows that will further improve our processes.

Badging Reminders

For badge-related questions or requests, please email membership@larcalumni.org. If you do not have a badge and wish to attend an LAA monthly meeting or event in person, we can request a visitor badge on your behalf. Requests must be submitted at least five business days before the event. For Activity Badge requests, we ask for ten business days' advance notice. Special thanks to Eileen Nelson and Mariya Georgieva for their prompt responses in approving our badge requests and answering questions. For additional badging information, please see the LAA_Badge_Policy.pdf.

Activity Badge holders are expected to:

- Attend at least two LAA monthly meetings during a 12-month badge period, or one meeting every six months for holders of six-month Activity Badges. Only in-person attendance counts toward this requirement.
- Remain in good standing with dues paid.
- Understand that badges will not be renewed if dues are unpaid or if ongoing participation requirements are not met, as documented by meeting sign-in sheets.

We welcome your suggestions for improving the membership application, badging, and recruiting efforts. Thank you for your feedback and continued engagement! ◆

Viking at 50—Honoring the Legacy and Looking Ahead

By Walt Engelund

As we celebrate the nation's 250th anniversary, it seems only fitting to honor another remarkable legacy—that of the Vikings. The Mars Vikings, that is. 50 years ago, a team led from Langley successfully executed the nation's first two soft landings on the surface of Mars. Yet it was during the preceding decade that the Viking team was assembled and the technologies that enabled the mission were conceived and developed. The innovations pioneered by the Viking Project, together with the mission's extraordinary scientific return, have informed every subsequent Mars mission since 1976.

Langley Photo LRC-2026-OCIO_P-02415

On July 23, Langley celebrated the legacy of Viking while looking ahead to future human missions to Mars through a series of presentations. The seminar began with a historical review of the Viking missions, followed by talks from Langley's Chief Scientist and researchers who continue to build upon Viking's scientific and engineering legacy.

The Viking project was an enormous undertaking that followed closely on the heels of Apollo. In the early 1960s, Langley led the highly successful Lunar Orbiter Project. Over the course of just 13 months in 1966–67, five spacecraft were launched to orbit the Moon and map more than 99% of its surface, helping determine where Apollo astronauts would ultimately land. Through the success of Lunar Orbiter and the world-class research capabilities and expertise in planetary entry technologies that existed at Langley, NASA Headquarters recognized the Center's exceptional technical workforce and project management capabilities and selected Langley to lead the Viking Project, which was established in December 1968. Just eight years later, Viking 1 and Viking 2 arrived in orbit around Mars and successfully delivered their twin landers safely to the Martian surface.

The scientific legacy of Viking is profound. The missions made the first vertical profile measurements of the Martian atmosphere, including its density, temperature, and chemical and isotopic composition. These measurements ultimately helped reveal that Mars once possessed a much thicker atmosphere and abundant surface water that have since been stripped away and lost to space. Viking also conducted three pioneering biology experiments in search of life. Although no definitive evidence of surface organics was found, the missions discovered the highly chemically reactive nature of the Martian soil—important findings that continue to influence our understanding of the planet today.

The engineering legacy of Viking is equally significant. Numerous first-of-their-kind technologies had to be invented to fly through a largely unknown atmosphere and land safely on a planet whose surface elevation, soil bearing strength, slopes, and rock distributions were poorly understood. The development and qualification of the 70-degree spherically blunted aeroshell, the supersonic disk-gap-band parachute, and the Viking lander engines with their innovative showerhead nozzle design to minimize plume-surface interactions established capabilities that have been incorporated into every subsequent successful Mars lander mission.

Yet Langley has never rested on its laurels, as demonstrated by the presentations that followed during the seminar. Langley scientists and engineers continue to build upon Viking's legacy, conducting research and developing technologies that will unlock the remaining mysteries of Mars and ultimately enable human exploration of the red planet.

Langley Photo LRC-2026-OCIO_P-02415

Advanced propulsion will be essential for reducing travel times to and from Mars, and Langley is supporting the development of next-generation nuclear propulsion technologies, including both nuclear electric and nuclear thermal variants. While the Center is not leading development of the nuclear portion of the propulsion systems themselves, it is providing critical expertise in advanced high-temperature materials, in-space structural assembly, and large-scale composite thermal radiators that will almost certainly be required for these future systems.

Langley scientists also continue to investigate the mysteries of the thin Martian atmosphere, developing advanced LiDAR technologies capable of providing long-range remote sensing and persistent atmospheric profile measurements from both orbit and the Martian surface.

The Center also continues its long heritage of leadership in planetary Entry, Descent, and Landing (EDL)

Viking at 50—Honoring the Legacy

technologies by building upon Viking's accomplishments while advancing entirely new capabilities needed for human-scale missions. Current research spans deployable inflatable aeroshells, advanced thermal protection systems and materials, and LiDAR-based sensors that will enable precision landing and hazard avoidance. Langley researchers are also leading extensive studies of engine plume-surface interactions for the much larger robotic and human-class landers envisioned for future lunar and Martian missions.

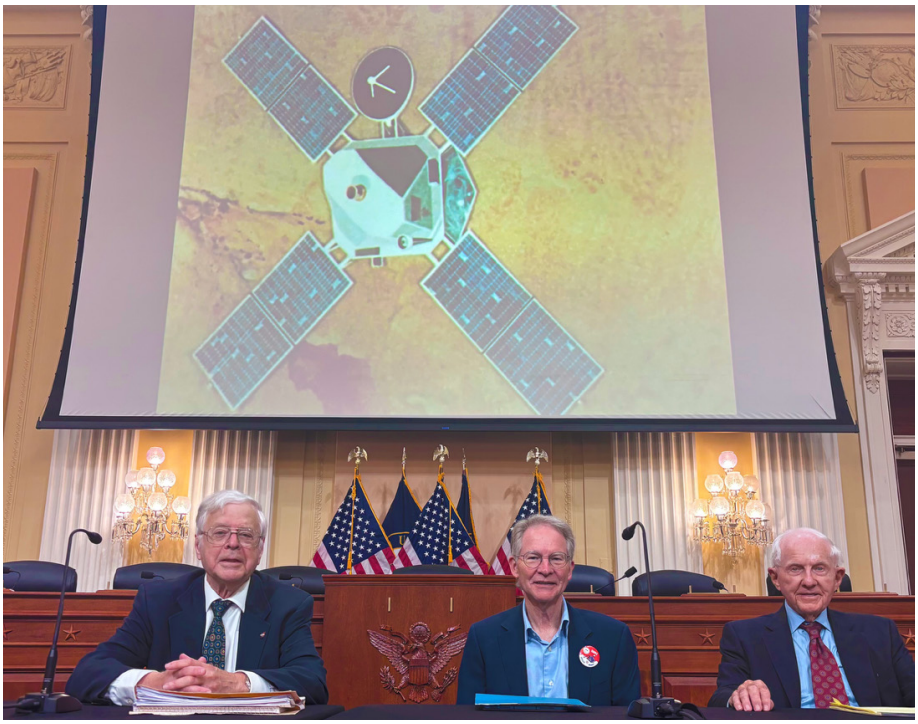
Langley Photo LRC-2026-OCIO_P-02415

Finally, personnel from Langley's Systems Analysis and Concepts Directorate continue to play a critical role in the Agency's Human Mars Architecture studies, evaluating emerging technologies, mission concepts, and architectural approaches from both NASA and industry partners that will one day make sustained human exploration of Mars possible.

None of this would have been possible without the extraordinary efforts and accomplishments of the Viking team and those who came before them. We truly stand on the shoulders of giants. Their engineering innovations and scientific discoveries have informed every successful robotic mission to Mars since Viking and will undoubtedly continue to shape humanity's journey toward the first human footsteps on the Red Planet. ◆

Viking 50th Anniversary Celebration in DC

Article and photos by Doug Morris



(L to R) Dr. Joel Levine, David Thompson, and Tom Young.

The week of July 20th saw three different recognition events for Viking in three different locations.

On Monday, July 20th, Dr. Bobby Braun arranged the second of these, a recognition event through the Planetary Society at the Cannon House Office Building in DC. Among the eminent luminaries attending the event were former Viking Team members Tom Young, the Deputy lead of the project and later VP of Lockheed Martin; David Thompson, later the co-founder of Orbital Sciences Corp.; and LAA's own Dr. Joel Levine, lead scientist on Viking and now a professor at William and Mary. There is much more that could be said of their past Viking credentials, but the essence is that these are part of the team that accomplished this extraordinary feat. Each gave their own reflections on what it was like to be a part of the team and the team's accomplishments.

Perhaps it was fitting that Dr. Braun was able to pull this together. He played a major role in the first return landing on Mars after Viking with the Pathfinder mission and was the Director of Planetary Sciences at JPL for the last Mars lander, Perseverance. Since Viking, there has been a continuous legacy of support from Langley for Mars missions. ◆

Dr. Lance Bush, former head of the Challenger Center, and Dr. Bobby Braun, Head of the Johns Hopkins Applied Physics Laboratory's (APL) Space Exploration Sector.

From Echo to the Big Bang

By Chuck Byvik

It is interesting that a concept to measure the density of the upper atmosphere by a NACA engineer in 1956 would lead to measurements supporting the Big Bang theory eight years later. While on travel and around midnight in a hotel room, NACA engineer William J. O'Sullivan designed a light-weight two-foot diameter sphere to measure air density at near-space altitudes that would support the design of aerospace vehicles and satellites operating in this regime. The sphere would be made of Aluminized Mylar. This was almost two years before Sputnik. His "balloon" came to be called a "satelloon."

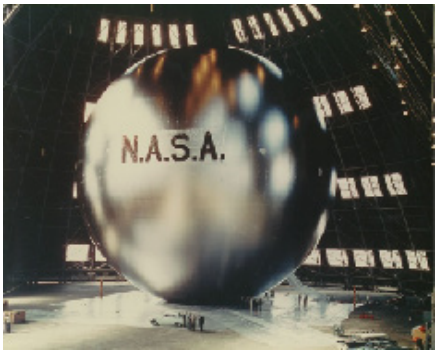
Then came Sputnik in October 1957 and NACA becomes NASA in July 1958.

O'Sullivan's concept became real with a launch-ready 20" diameter satelloon … until it was discovered that to be optically tracked required a 30" diameter sphere. After scrambling, the 30" was ready for the April '59 launch, but the Vanguard launch failed.

In the meantime, there was a desire to have a U.S. satellite large enough to be seen from the ground particularly by the Russians and O'Sullivan's satelloon fit the bill and the diameter grew to 12 feet. Again two orbiting attempts were thwarted by launch failures.

Interests in NASA characterizing the density of the upper atmosphere was replaced with orbiting "comsats."

Bell Labs indicated an interest in using satelloons as a passive communication relay system from a 100 foot diameter satelloon. Thus was Project Echo formed. This passive communication demonstration involved a number of organizations. A 60-foot antenna and related electronic communication equipment at Bell Labs in Holmdel, NJ, Naval Research Lab would use its 60-foot dish antenna at Stump Neck, MD, and JPL employ two 85-foot antennas at Goldstone, CA.



Inflated 100' diameter Echo satelloon

After multiple failed sub-orbital launch tests, the second Echo satelloon achieved a ~1000 mile high orbit on August 12, 1960. On that day, a prerecorded message from President Eisenhower was transmitted from the JPL Goldstone antenna, relayed by the orbiting Echo satelloon and received by the Bell Labs Holmdel facility. The first demonstration of passive communication transmission from an orbiting satellite and it was based on O'Sullivan's concept born late one evening in a hotel room.

What's next? Bell Labs moved on to Telstar—an active comsat launched and on orbit in 1962. The giant Holmdel antenna became available for two recently hired radio astronomers, Arno Penzias and Robert Wilson. They inherited a well characterized antenna system that included an ultra-sensitive cryogenically cooled Ruby Maser amplifier that enabled detection of low level signals at 4080 MHz—the frequency used for the Echo communication demonstration.

They began the characterization and calibration of this antenna system by determining the extraneous signals entering the antenna from the atmosphere, ground, and the antenna itself. Each of these signals have an associated black body temperature. Pointing the antenna to space indicated a temperature of 6.7 K. Subtracting the contributions from the Atmosphere, antenna losses and ground radiation left a 3.5 K excess unaccounted for—a radio "hiss." The "hiss" persisted where ever they pointed in the sky and even at NY City. Where did this come from? The seams and rivets in the antenna? They taped these. The fallout from the 1962 above ground nuclear test? Nope. How about the pigeons nesting in the antenna and their droppings? Removing the pigeons and droppings had no effect. They spent months working on this. The source of this 3.5 K "hiss" was solved by a fortuitous set of circumstances—somewhat analogous to the message relayed by Project Echo.

A group of cosmologists at nearby Princeton University were focusing on the theories of the origins and evolution of the universe—one being the big bang theory. Dr J. Peebles, a Post-Docs working with Professor Robert Dicke, had assumed that the temperature of the initial fireball exceeded 10 billion degrees. The corresponding blackbody temperature would cool to an estimated few tens of kelvins due to the expansion of the universe over the past 10+ billion years. This thermal history of the universe is a direct measure of the changes in the radiation density over time. He presented these findings at a colloquium at Johns Hopkins University. Later, one of the attendees mentioned this result in a phone conversation with Dr. Bernie Burke of the Carnegie Institute. In a following phone conversation between Dr. Burke and Dr. Arno Penzias regarding the mysterious "hiss," Burke suggested he contact this Princeton group.

From Echo to the Big Bang

Arno called Dicke at lunchtime when, coincidentally, the group was having a sack lunch. When Dicke hung up the phone, he said "boys, we've been scooped" since the group was in the process of making the measurements that Penzias and Wilson had already made. What a set of Echo-like telephone relays of information!

The 4080 MHz "hiss" was from the thermal remnant of the Big Bang with an estimated temperature of 3.5 K!

Many measurements of this background radiation have since been made that fits a 2.728 K blackbody spectrum.

Arno Penzias and Robert Wilson received the Nobel Prize in Physics in 1978 for the discovery of the cosmic microwave background validating the big bang theory.

It is interesting that the original objective of O'Sullivan's concept was to measure the density of air in the upper atmosphere but eventually led to measuring the radiation density of the cosmos!

1. NASA SP-4308; *Spaceflight Revolution, NASA Langley Research Center; From Sputnik to Apollo*; James Hansen, 1995.

2. YouTube presentation at Harvard University by Robert Wilson on March 27,2014: *Discovering the Cosmic Microwave Background with Robert Wilson* | CfA

3. Discussion of the parallel work of Dicke and Penzias-Wilson in *The Discoveries*, by Alan Lightman (Pantheon Books, 2005), pp. 408-434, along with the transcripts of their papers published in *The Astrophysical Journal* in 1965. ◆

Temples of the Wind: From Langley to China

By Steven A. E. Miller, Ph.D.

In the not too distant memory of our predecessors, the Langley Memorial Aeronautical Laboratory or NASA Langley was a "City Upon a Hill" (see John Winthrop, A Model of Christian Charity, 1630) in that it was the wind tunnel capital of the world. The world looked upon us with envy and watched what we did. No other place on Earth contained the number, kind, quality, or capability of NASA Langley. Wind tunnels of NASA are catalogued in many public books, including those published by NASA (see NASA SP-440 or NASA SP-2025-4320). Such a place was special for those who worshipped in the temples of the wind.

There were certainly close seconds, most notably the Central Aerohydrodynamic Institute (TsAGI), founded in 1918 (very close to the founding of NACA) under the initiative and leadership of N.E. Zhukovsky. One can see satellite photos of the complex at Ulitsa Zhukovskogo, 1, Zhukovskiy, Moscow Oblast, Russia, 140181. The CCCP wind tunnels were accompanied, and perhaps surpassed, by Soviet theoretical brilliance from household names such as Academician Andrey Nikolaevich Kolmogorov, but that is another story. I was very honored in my lifetime to visit facilities at TsAGI and NPO Energomash near Moscow, Russia, to view both historic wind tunnels and rocket engines.

Today, one might look around within our own city upon a hill and wonder—are we still the center of experimental excellence, not just in experimental fluid dynamics, but in other experimental fields?

One needs to look just outside our own "Ivory Tower to Iron Tower" to see a growing mountain of experimental, numerical, and theoretical brilliance that is now the new Wind Tunnel Capital of the World—The People's Republic of China (PRC). For example, consider China's Aerodynamics Research and Development Center (CARDC) in Mianyang, Sichuan, PRC. One can examine dated Google satellite photos of just one location: CMHM+73Q, Fucheng District, Mianyang, Sichuan, China, 621005. Some facilities remain unfinished, but are spectacular. Now, the world watches the PRC and its new experimental developments.

America put the first domino in motion in the 1950s when we deported (traded) Qian Xuesen (钱学森), Theodore von Kármán's student at Caltech/NASA JPL, back to the PRC. His legacy is alive today. After returning to China, he became a foundational figure in the development of PRC missile, rocket, space, and aerodynamic science.

It is interesting today to view academic and research positions in China. Last year I did my own numerical study and found a ten-to-one ratio of open aerospace faculty positions and research positions in the PRC relative to the US. The derivative is increasing. The visible scale of China's present investment in aerodynamic experimental infrastructure is difficult to match with an American counterpart today. A wind tunnel without scientists is just machinery. If America wants to remain a leading scientific nation, it should create two things at once—facilities and people.

As for my personal opinion, I can only feel proud of my former students who are now making their way through the craft of research, both at home and abroad. I wonder whether, in ten or twenty years, I will be welcome to visit them and their temples to the wind, much like I did long ago in the United States, Europe, and Russia. ◆

NASA Langley's Orchestra Concert Celebration

By Lil Richwine

On July 16th, I had the pleasure of attending NASA Langley's Orchestra Concert celebrating our nation's 250th anniversary and NASA Langley's 109th birthday. The NASA Langley community came together to celebrate with an amazing symphony that featured Langley employees from various organizations, retirees, family, and members of the Williamsburg Youth Orchestra under the direction of Rebecca Nixon, Strings Orchestra Director of the Williamsburg Youth Orchestra. Individual orchestra members practiced on their own and practiced together for the first time just two days before the concert. The orchestra played to a full room of guests and received a standing ovation.

The music was incredible and included: "The Star-Spangled Banner" composed by John Stafford Smith; "America the Beautiful" composed by Samuel Ward; "God Bless America"; "Jupiter—Bringer of Jollity," the famous fourth movement of the orchestra suite from "The Planets" written by Holst; "Moon River"; and the finale "The Empire Strikes Back Medley" by John Williams.

After the orchestra played, a number of smaller groups showed off their musical talents, including The Langley Legacy Choir singing "A Storied Legacy, A Soaring Future" written by Karl Werne, the Langley Jazz Quintet performed "Fly Me to the Moon" and other moon-themed songs, The Cornets performed "Rondeau" and other classical trumpet duets, Wild Honey performed "Pictures" and other songs, Dave Piatek performed "Born to Run" and others songs, and Atomic Rose performed "Crazy Train," "The Star Spangled Banner," and other songs. The music even got the crowd dancing!

What an amazing night. In addition to the wonderful orchestra and music, we got a chance to reflect on NASA's past, present, and future contributions to aviation, Earth's atmosphere, and space exploration. ◆

Shooting the Stars

By Chuck Byvik

Finding one's location these days takes only a few seconds with a GPS app on a smart phone. Locating oneself in the 1700s required about three days to shoot the stars with special telescopic equipment, an accurate grandfather-like clock, and a star chart. What changed?

In these early days, tracking stars documented in a Star Chart and getting the time when they passed through the meridian provided the basis to determine the distance from a well-established fixed point on a map. High accuracy required days to months of observations depending on weather conditions. For modest location accuracy, one person could perform this task in, say, three days.

Today, the 32 GPS satellites have replaced the stars. Each satellite continually transmits its location and synchronized time from on-board atomic clocks. The GPS receiver requires data and time-signals from at least four satellites to determine position on the ground. Location determined within a few meters in just a few seconds.

It is interesting to compare the efforts expended between these two periods of time. In the 1700s, one person spent three days for a total effort of three person-days.

What about GPS? The annual GPS budget for maintaining the GPS constellation is approximately $1.8 billion. This budget supports an estimated 9,000 people! Using this figure with three seconds to compute location results in 9,000 people × 3 seconds = 27,000 people-seconds. This is ~ 0.3 person-days.

Replacing the stars with GPS satellites along with its workforce of 9,000 and $1.9B reduces personal efforts to locate by a factor of ten while expanding the capability to everyone with a smart phone. ◆

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NASA Langley Alumni Association

YouTube

Remember!

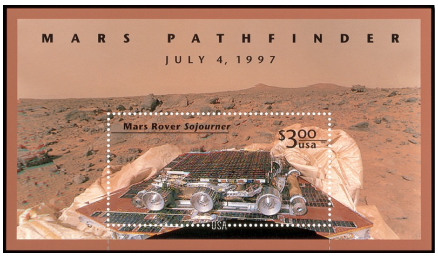
Oct 13: Bryan Barmore, the Master Naturalist Program

Nov 10: Neil O'Connor, NASA Langley's Air Traffic Operations Lab (ATOL)

Dec 8 (tentative): Holiday Lunch (details to follow)

Mars Pathfinder

By Geoff Tennille



Scott Number 3178
Mars Pathfinder Souvenir Sheet
1997 Commemorative Issue

Issued to celebrate the Pathfinder mission that reached Mars on July 4, 1996. It was issued as a commemorative stamp and was not intended to replace the 1995 Challenger definitive stamp that covered the Priority Mail rate. This was the largest US postage stamp at the time of its issue and the largest of any stamp since the newspaper and periodical stamps of 1865. It pictures the surface of Mars as viewed from the Pathfinder, with the Sojourner cover on one of the three pod doors that opened after Pathfinder landed on the surface. Part of a deflated air bag surrounds the pod leaf holding Sojourner. The rover appears in the collapsed position in which it traveled aboard the spacecraft. The background shows a view of the Ares Vallis region of Mars. Muted reds and browns are the main colors on the stamp, similar to the pictures sent back from Pathfinder of the Martian surface. ◆

Harriet Quimby

By Geoff Tennille

Scott Number C128 (Airmail)
Harriet Quimby—1991
First Licensed US Female Pilot

Harriet was a journalist and a drama coach. She was the first US woman (and second in the world) to earn a pilot's license in August 1911. In April 1912, she became the first woman to fly solo across the English Channel. Unfortunately, this was just after the sinking of the Titanic and she received little notice in the press of her accomplishment.

She designed her own purple flying uniform and became the spokesperson for Viz Grape Soda. In July 1912 she flew in the Third Annual Boston Aviation Meet. Flying with the event's organizer, William Willard her plane lurched forward and Willard was ejected, followed by Quimby. Both fell to their deaths. It is not clear what caused the plane to lurch, but the debate about whether airplanes needed seatbelts was over. She was a major influencer for generations of female pilots, including Amelia Earhart. ◆

AI Musings

By Kevin Marlowe

1. "I'm using AI to help with a home renovation—it helps us visualize our new kitchen cabinets." You can take multiple photos of a space from multiple angles, upload them, and it will even give you a floor plan if there's enough dimensioning info in the photos. You can even point it to a vendor's web page describing your new furnishings and it can "install" them in your pictures or download photos manually. Previewing alternatives and color choices is also really easy and fun.

2. "I'm interested in more info on how to use this for genealogy." LLMs can be used to propose websites with archives of old records you can review. These tools are also good at reading individual pages of old records that may be poorly photographed, and can usually translate as well. An LLM can also import a GEDCOM file (text-based genealogy format), tell you the relationships between people in it, and recommend gaps worth pursuing or possible date problems.

3. "I need a contact at [Government agency]." Have an LLM scan the official websites of the agency in question also the various online success and horror stories other people have posted. You can even describe the issue you need help with and have the LLM propose a checklist for solving it.

4. "I have a business idea that I would love discussing with an expert, but I don't want it getting out into the public." If you use any of the paid tools, that's not a concern. First, they promise not to train their models on your chats if you ask them not to. Second, training on user-provided data is a really bad idea; it creates the possibility of "poisoning" the data with incorrect "facts" and the LLM vendors are very wary of that. Finally, always anonymize as much as is feasible. ◆

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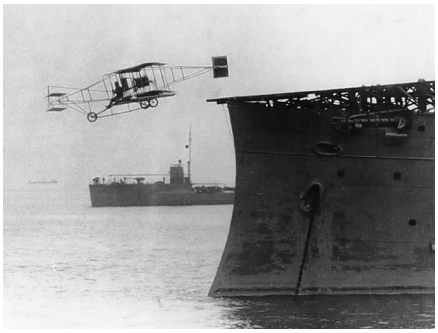
The LAA Newsletter is published quarterly. Please submit articles for publication to Rick Ross (info@larcalumni.org) no later than the 10th of February, May, August, or November for publication the following month. Please contact Dick Hueschen (info@larcalumni.org) to subscribe or unsubscribe.

Mystery Photo Answer Revealed

By Bobby Berrier



The mystery photograph from our last newsletter (also shown above) shows Eugene Ely, in a Curtiss pusher biplane, making the first aircraft takeoff from the deck of a modified light cruiser, the USS Birmingham. An 83-foot long wooden platform (inclined at 5° for gravity assist) was built on the bow of the two-year old light cruiser in the Norfolk Navy Yard. Since no funds were available from the Navy Budget, early flight booster John Barry Ryan donated $500 for construction and an additional $500 as a prize for a successful launch.

On November 14, 1910, the Birmingham steamed down the Elizabeth River toward Hampton Roads where the flight was to be made. However, the weather was dreadful with rain squalls rolling by and threatening to cancel the attempt. The Birmingham anchored in Hampton Roads to wait for improved conditions. In the afternoon, weather seemed to be improving and Ely boarded his airplane to warm up the engine as the Birmingham prepared to steam into the wind to gain greater wind over the deck (and lift). However, Ely noticed that visibility was again deteriorating and decided that the attempt had to be done immediately. Wearing a bicycle inner tube as a life preserver (Ely could not swim), he gunned his engine, gave the release signal, rolled down the ramp, and was airborne—almost. The Curtiss's wheels briefly touched the water and threw up enough spray to damage the propellers. This problem can be anticipated from the photograph because the anchor chain is clearly still deployed and the ship is stationary. With the airplane vibrating heavily, Ely realizing that a quick landing was essential, aborted his plan to fly back to the Norfolk Navy Yard, and touched down after some five minutes in the air on nearby Willoughby Spit.

A marker (shown in photo above) commemorating this historic aviation first is located in the Monitor/Merrimack Overlook Park at the end of 16th Street before it turns into Chesapeake Ave. Dedication of marker was held in 1993 and the speaker was former Newport News mayor—Jessie Rattley.

No answers to the mystery photo were received. ◆

A Little Research Humor

Contributed by Marilyn Ogburn

Cohn's Law: The more time you spend in reporting on what you are doing, the less time you have to do anything. Stability is achieved when you spend all of your time reporting on the nothing you are doing.

Stewart's Corollary: The more time you spend planning what you are going to do, the less time you have to do anything. Stability and recognition are achieved when you spend all of your time planning work you will never do.

Murri's Corollary: The more time you spend working, the less time you have to plan or report on what you are doing. Stability and oblivion are achieved when you spend all of your time doing work that was never planned and will never be reported.

Finagle's First Law: If an experiment works, something has gone wrong.

Finagle's Second Law: No matter what the anticipated result, there will always be someone eager to misinterpret it, fake it, or believe it happened to his own pet theory.

Finagle's Third Law: In any collection of data, the figure most obviously correct, beyond all need of checking, is the mistake. *Corollaries*: No one you ask for help will see it, and everyone who stops by with unsought advise will see it immediately.

Finagle's Fourth Law: Once a job is fouled up, anything done to improve it only makes it worse.

Finagle's Rules:

1. To study a subject best, understand it thoroughly before you start.
2. Always keep a record of data—it indicates you've been working.
3. Always draw your curves, then plot your reading.
4. In case of doubt, make it sound convincing.
5. Experiments should be reproducible—they should all fail the same.
6. Do not believe in miracles—rely on them.

Wingo's Axiom: All Finagle laws may be bypassed by learning the simple art of doing without thinking. ◆

SPECIAL REPORT

The NASA Flight Dynamics Research Facility

By Mike Fremaux

Introduction

As you have likely heard by now, the Flight Dynamics Research Facility, or FDRF, recently had it's ribbon cutting and is the first major wind tunnel built by the agency since the opening of the National Transonic Facility (NTF) in 1983. The FDRF project had a decades-long genesis with multiple internal studies and proposals preceding it. The project itself gained traction in the mid-2010s and as of the ribbon cutting ceremony on July 31st, it is fully operational. FDRF's predecessors, the Langley 20-Foot Vertical Spin Tunnel and 12-Foot Low-Speed Tunnel, operated continually for nearly eighty-five years, and are slated to be demolished soon. This article will review a brief history of the predecessor flight-dynamics testing facilities, development of the FDRF concept, tunnel performance, research capabilities, near-term planned tests.

Background and Legacy Facilities

Experimental testing of vehicle stability characteristics in specialized wind tunnels has a long and productive history at NASA Langley, dating to the early 1930s when the center was known as the National Advisory Committee for Aeronautics (NACA) Langley Memorial Aeronautical Laboratory (LMAL). Photos of the earliest flight-dynamics specialty tunnels are shown in Figs. 1-5. By the mid- to late 1940s, the capabilities of the earliest tunnels had been supplanted, and until 2025 LaRC flight dynamics testing was supported in the 12-Foot Low-Speed Tunnel (operational 1939, Fig. 4) and the 20-Foot Vertical Spin Tunnel (operational 1941, Fig. 5). These two tunnels were operated continually until 2025. A contemporary photo of the two tunnels in the Langley East

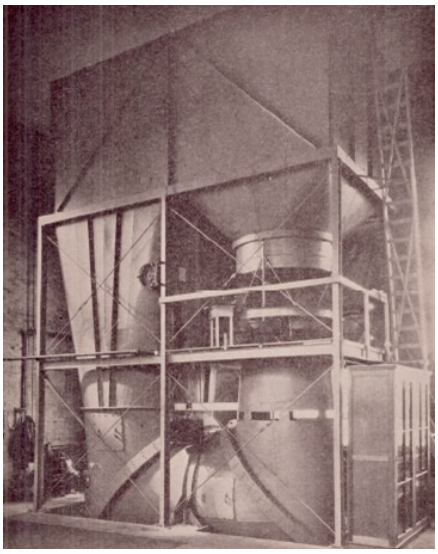


Fig. 1. 5-Foot Vertical Wind Tunnel, 1931

Area (Langley Air Force Base), along with their adjacent support buildings, is shown in Fig. 6. Notably, the "free flight" technique pioneered in the 5-Foot and 12-Foot free-flight tunnels was moved to the much larger Langley Full Scale Wind Tunnel (30-foot by 60-foot open jet test section) in the late 1940s, and moved yet again in the mid-1990s to the Langley 14- by 22-Foot Subsonic Wind Tunnel when Full Scale was closed by NASA and taken over by Old Dominion University (ODU). As a point of interest, the free-flight technique in the Full-Scale Tunnel under ODU was revived for a single, highly productive test of a large blended wing body (BWB) transport configuration in 2006.

The fact that the VST and 12-Foot were in demand and operating for the better part of 85 years after commissioning is a testament to the flexibility and adaptability that was designed into these facilities in the 1930s. Although the designers could likely not have conceived of some of the testing needs

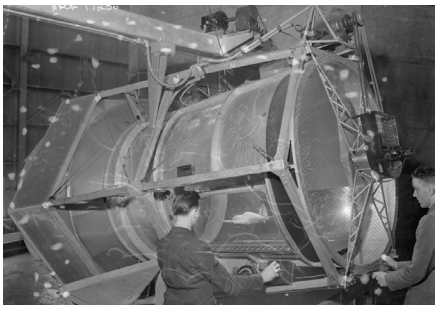


Fig. 2. 5-Foot Free-Flight Tunnel, 1937

driven by 21st-century aerospace vehicles, the simple yet robust layouts and construction have allowed continual evolution of their capabilities. With continually-upgraded test rigs, data systems, and other instrumentation, at the time of their closures, the VST and 12-Foot were still supporting their original missions (airplane spin testing and stability-and-control testing, respectively), along with tests of advanced next-generation transport concepts, crewed and uncrewed Earth-entry vehicles, atmospheric entry vehicles for exploring Venus and moons of Saturn, stabilizing parachute characterization, and electric Vertical Takeoff and Landing (eVTOL) aircraft for urban air mobility. The emergence of this last category is bringing about a diversity of vehicles and other concepts that continues to expand beyond the confines of traditional flight vehicles undergoing aerodynamic testing.

Flight Dynamics Research Facility

The Flight Dynamics Research Facility, or FDRF, was conceived to replace both the 12-Foot Low-Speed Tunnel and the 20-Foot Vertical Spin Tunnel. The FDRF has the combined capabilities of the two existing tunnels while also having significantly higher performance, improved flow quality, wipes out a significant backlog of

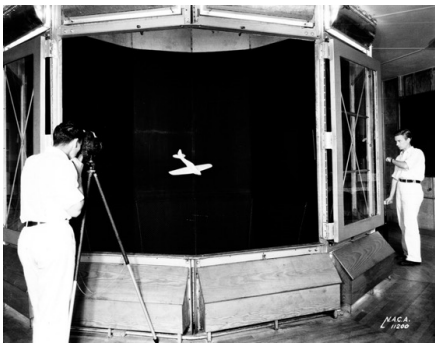


Fig. 3. 15-Foot Free Spinning Tunnel, 1935

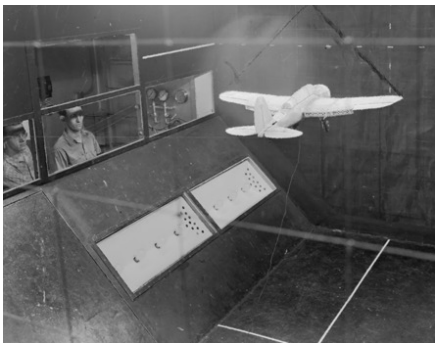


Fig. 4. 12-Foot Free-Flight Tunnel, 1939

Fig. 5. 20-Foot Vertical Spin Tunnel, 1941

deferred maintenance, and vacates an area that has repeatedly flooded over the decades. FDRF was proposed to be part of the NASA Langley Revitalization Plan in the early 2010s. Multiple years of design studies and vetting by various stakeholders had been conducted by the time the Agency-wide Flight Mechanics Capabilities Leadership Team of the NASA Engineering and Safety Center (NESC) accepted a proposal to upgrade the Agency's flight mechanics test facilities and subsequently brought the FDRF concept forward to NASA headquarters for additional vetting. FDRF was included in the President's FY20 budget proposal, and in September 2021 the General Services Administration (GSA) awarded the $43.2M design-build contract to the team of B.L. Harbert International as the prime contractor, Calspan ASE (now North Wind USA) as the wind tunnel designer and systems integrator, and Mason & Hanger Group for architecture and engineering. Construction of the foundation commenced in November 2022, and the tunnel was operational for contractor site acceptance testing beginning in January, 2026.

FDRF Requirements Definition

NASA teamed with GSA to execute a "design-build" contract for the procurement of FDRF. In a design-build project, the prime contractor is responsible for both the design and the ultimate construction of the facility. This differs from the more traditional "design-bid-build" delivery method in which a design package is completed by either an in-house team or under contract. Contractor teams then submit construction proposals based upon that design. By obtaining the design and construction through a single contract, design-build engages the construction team early in the design process.

The project team that was formed consisted of personnel from NASA, GSA, and Jacobs Technology. The primary task that needed to complete prior to a contract being awarded was to develop the official Program of Requirements (POR). The POR consisted of five volumes totaling 445 pages, with sections covering the overall statement of work, building requirements, safety, critical tunnel performance parameters, information regarding integration of government-furnished equipment (GFE) that was to be re-purposed from the existing facilities and a host of other details. For the wind tunnel itself, some of the important tunnel performance requirements included:

- A round or 12-sided test section with a nominal diameter of 20 ft to 22 ft
- A controllable dynamic pressure range of 0.5 lb/ft2 to 35 lb/ft2
- A flat velocity profile across the core flow at the test rig elevation
- Maximum flow angularity of 0.5 deg
- Maximum longitudinal turbulence intensity of 0.5%
- Means of controlling tunnel state by open-loop (joystick) and closed-loop (dynamic pressure, airspeed, or fan RPM) methods
- Test section flow acceleration under open-loop control of at least 20 ft/s^2
- Test section flow deceleration under open-loop control of at least –10 ft/s2
- Active cooling of the tunnel circuit

Fig. 6. Contemporary photo of the VST/12-Foot complex, including two support buildings. TDT is to the right, and the vacant lot behind the complex is the former site of the Langley Full-Scale Tunnel.

The concept of NASA providing specialized existing test equipment as GFE was one of the significant cost-saving approaches used when developing the FDRF concept. In the POR, it was specified that major systems that had been kept up-to-date and were in good working order would be re-purposed from the legacy tunnels rather than designing and building custom systems from scratch. A partial list of equipment to be removed from the legacy facilities and integrated into the FDRF in-

cludes the rotary balance system from the VST, the C-strut static/dynamic test rig from 12-Foot, laser light sheet and smoke systems (some components replaced), optical motion capture (Vicon) data system, model mass properties measurement rig, and several other important support systems. With the combined capabilities of the two tunnels now combined, FDRF has the following test techniques available under one roof:

- Static force and moment measurements
- 1 degree-of-freedom (DOF) forced oscillation (sinusoidal and arbitrary motion shapes)
- 3-DOF free-to-rotate motion
- Steady (wind axis) coning
- Combined motion (forced oscillation superimposed on steady coning)
- Dynamically-scaled free flight
- Laser light sheet flow visualization
- Smoke flow
- Surface pressure measurements

In addition to the above "traditional" techniques that were migrated from the VST and 12-Foot, research and development of state-of-the-art test methods is an ongoing activity at FDRF. These include advanced design of experiments; use of programmed test inputs to a model's control surfaces for real-time identification of aerodynamic parameters and control authority; and 3-DOF dynamic derivative identification. These and other approaches promise to greatly reduce the time required to obtain a complete data set or in some cases, acquire data that is not possible obtain using traditional approaches.

A requirement provides a significant improvement in tunnel efficiency, as well as the flow quality, is that the two primary test rigs (RBS and C-strut) must be fully retractable from the test section when not in use. This provides the capability of working on model buildup on one rig while the other is inserted for testing. Alternatively, both rigs can be retracted during free-flight testing. This is an improvement over the VST, where the RBS was stored against the test section wall protrudes into the airstream and causes some flow quality degradation. Furthermore, during free-flight tests in the VST, models were frequently damaged due to impact with the stowed RBS.

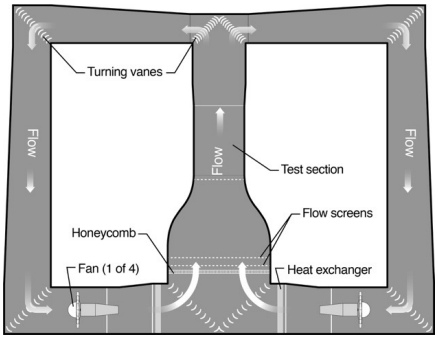


Fig. 7. FDRF flow path major features

Design and Layout of FDRF

The FDRF wind tunnel uses a vertical, closed double return, closed throat configuration. The 12-sided test section measures 20 feet across the flats and is 24 feet tall. The building is approximately 131 feet tall, 179 feet wide, and 95 feet deep. A schematic of the tunnel circuit is shown in Fig. 7. Some of the primary features of the tunnel circuit visible in Fig. 7 include double return legs with turning vanes in each corner; four 750 horsepower motors, each with an integrated, 14-foot diameter, eight-bladed fan equipped with carbon fiber blades (two fan-motor units per return leg); active cooling of the tunnel circuit via heat exchangers immediately downstream of the fans in each return leg; a honeycomb flow straightener; two flow-conditioning screens; a 5:1 contraction cone leading into the test section; and a high-speed diffuser immediately downstream of the test section. North Wind used proprietary wind tunnel design tools and high-fidelity computational fluid dynamics (CFD) simulations to optimize the tunnel circuit, while NASA and Jacobs Engineering CFD specialists focused on analysis of design features in portions of the circuit to help ensure that unsteady flow was not of concern. The tunnel is contained in a building that encapsulates the flow path and provides occupied spaces as well as rooms for machinery, telecom, and storage. It is worth noting that while exploring ways to reduce overall facility cost, the design team arrived at a structural concept consisting predominantly of pre-stressed, pre-cast concrete. This design choice reduced overall construction cost and schedule and is projected to reduce operating and maintenance costs over the facility's life span. A photo of the completed building is in Fig. 8. A photo of the drive fans and motors in one of the return air towers is shown in Fig. 9.

Fig. 8. FDRF building (note exposed contraction cone at center)

Entry into the facility is via a lobby, which has both personnel entry doors as well as a large, glazed rollup door for bringing in test articles and other equipment. An oversized elevator is accessed via the lobby and is designed to carry both passengers and freight. Given the long history of the flight-dynamics tunnels preceding FDRF, the NASA-BL Harbert team developed a concept for the lobby to highlight of the people, facilities, and test articles from the late 1920s until today. The result is a timeline along a curved wall with over sixty photos that captures

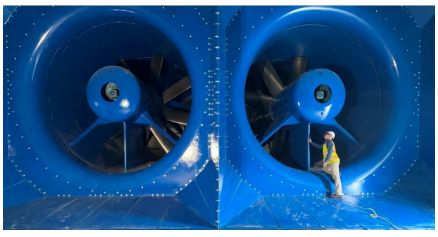


Fig. 9. Drive fan and motors (2 of 4)

Fig. 10. Lobby historical timeline and interactive video

the different eras and terminates at a large video touchscreen that shows current and planned activities FDRF (Fig. 10). Beyond the touchscreen is a built-in glass case (Fig. 11) where models (primarily from the legacy vertical tunnels, but a few from the 12-Foot free-flight tunnel) are displayed, ranging from wooden biplanes (Fig. 12) to 3-D printed spacecraft (Fig. 13).

The control room level is located approximately halfway up the structure and is where the majority of research activity takes place. One of the design requirements was to maximize the amount of available space and keep the area as open and flexible as possible to preserve the successful design

Fig. 11. Legacy test article display

philosophy of the legacy facilities. Figure 14 is a plan view of the control room layout. In general, the right side of the image shows the "industrial" side of the room. This is where technicians and engineers will execute model buildup, instrument installation and calibration, and other test-specific activities. The left side of the image includes the facility operator consoles (closed-loop tunnel control for captive testing, test rig control, open-loop control for free-flight) and research system consoles (data acquisition, digital video feeds, data analysis), and space for NASA personnel and guest researchers to display and review data and other images while not actively operating the tunnel. At the bottom of the image are a small glassed-in break area and restrooms. It is also interesting to note the difference in control room space available in FDRF relative to the VST. Although the 20-foot test section diameter is the same for each facility, the difference is dramatic. In Fig. 14, the relative location of the VST control room wall is

Fig. 12. Hand-carved wooden spin models from the 1930s

represented by the red dashed circle on the FDRF plan view.

Photos showing the control room, model build-up area, and primary test rigs can be seen in Figs. 15–18. The test section is designed to maximize test article observability via large windows that wrap around 120 degrees, in addition to multiple digital camera views available to researchers via large overhead monitors. Other transparencies in the test section enable sixteen Vicon motion capture cameras to track free-flight models under test, and an extensive LED lighting system that can be adjusted best illuminate unique test situations to be used. For model changes during a test, either of the test rigs can be retracted and re-injected as noted earlier, or for situations that do not require access to the entire model, a rail-mounted "deployable work platform" can be quickly extended up the center of the test section to allow a technician to make an adjustment or other minor change.

Fig. 13. 3-D printed entry vehicle models

Current Status of FDRF

The staff of the Vehicle Dynamics and Control Branch is currently conducting flow surveys to augment the information that was obtained by the FDRF contractor during acceptance testing during the spring. Baseline testing with two purpose-built check standard models that were previously used in the VST and 12-Foot prior to those facilities being shut down will start by the end of August. The data will be used for comparison to results from the old tunnels, as well as to begin building a database for tracking data quality over time. The first two research test entries will range from an airplane stability and control assessment to dynamic stability of a planetary science probe. These tests are planned to begin in the late September timeframe and will continue well into fall. Early in 2027, a powered electric multi-rotor vehicle with an active control system will utilize multiple test rigs and techniques for a project that plans flight testing of a full-scale vehicle in the future. ◆

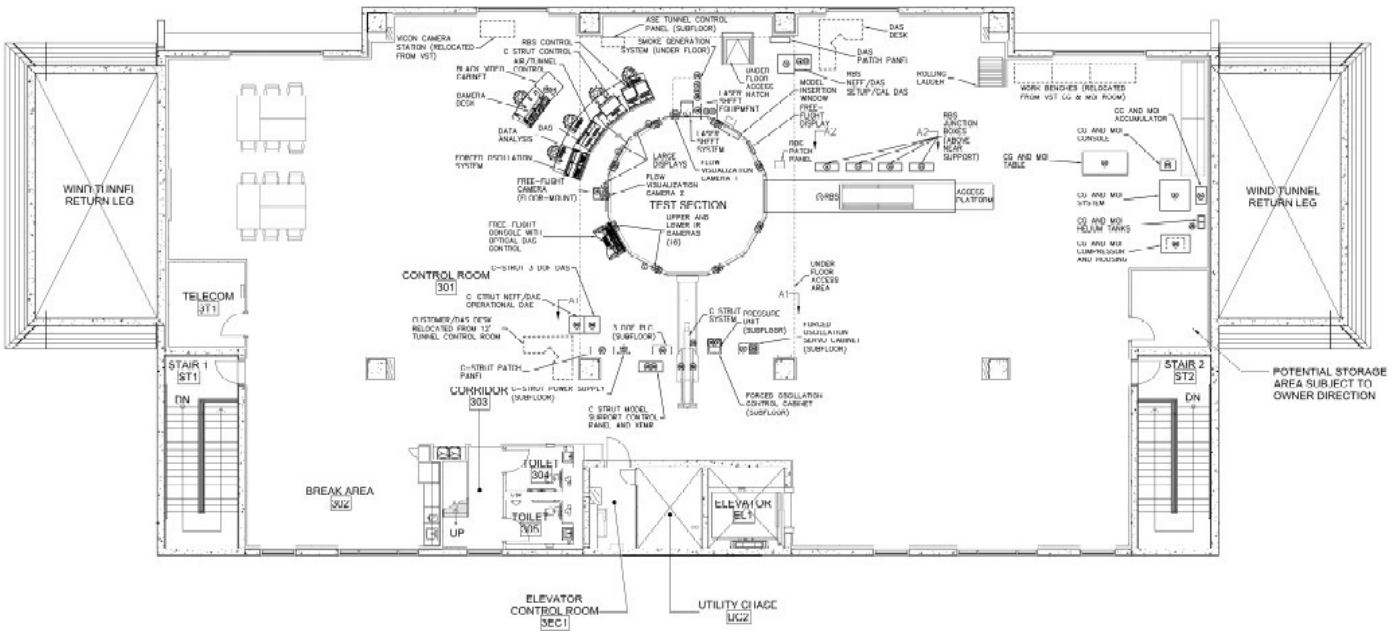


Fig. 14. FDRF control room layout

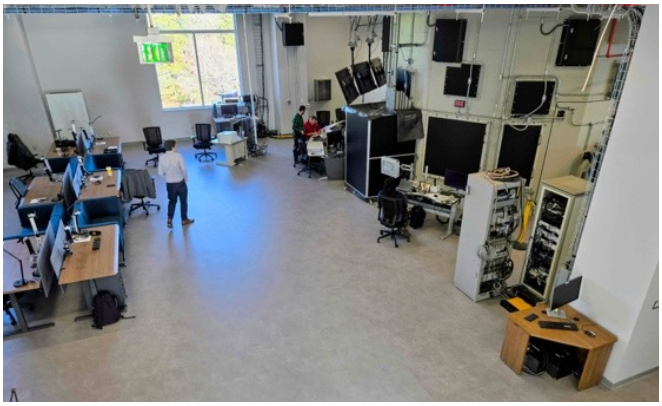


Fig. 15. FDRF control room. The test section is on the right. Note that the viewing windows are blacked out in preparation for laser operations.

Fig. 16. FDRF control console. The free-flight operator station is out of view on the right.

Fig. 17. Overhead-rail mounted RBS test rig in the retracted position. The deployable work platform is at left with yellow safety rails.

Fig. 18. C-strut test rig injected into the test section. The large black tube is the cable management system.

VASBA Lunch and Learn and Upcoming Gala

By Jack Schlank

On May 28, VASBA hosted one of our lunch and learn events at the Virginia Space Grant Consortium offices. The featured speaker was NASA Wallops Flight Facility (WFF) Center Director Dave Pierce. Joining him was WFF Deputy Director Giovanni Rosanova, Jr. They provided updates on the current and planned activities at their Center, and discussed anticipated benefits that will result from the recent reorganization that has WFF aligned with the Kennedy Space Center. From launch operations and research capabilities to regional partnerships and future opportunities, the conversation highlighted the important role Wallops continues to play in advancing innovation and expanding Virginia's aerospace presence.

(L to R) Giovanni Rosanova, VASBA President Dave Bowles, Dave Pierce

Our June luncheon featured Nancy Grden, President & CEO of the Hampton Roads Executive Roundtable. She shared insights on leadership, collaboration, and building strong professional networks here in the Tidewater, and the discussion that followed was equally impactful. Members and guests from across the aerospace and business communities contributed their own experiences, perspectives, and ideas, creating a dynamic exchange that underscored the value of bringing diverse leaders together.

On July 29th, we held a luncheon at the Newport News–Williamsburg International Airport where Executive

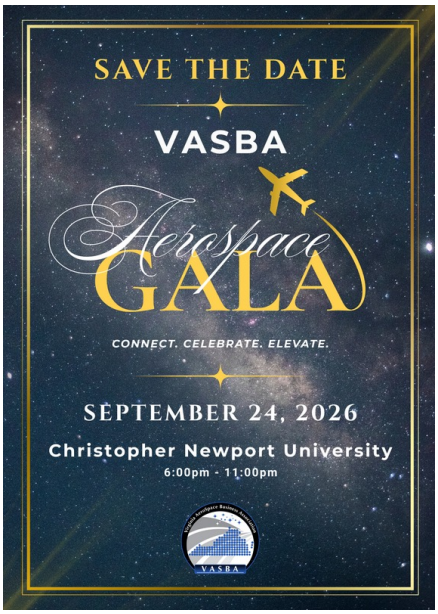
Dave Bowles with June speaker Nancy Grden

Director Christopher Morello gave a presentation on the economic development potential of the Air Commerce Park plans for the facility. These plans include a Mobility Innovation Center, which has already received initial funding to support the development of unmanned aircraft systems, drone testing, and advanced air mobility technologies.

Christopher Morello with Dave Bowles

VASBA is strongly committed to developing the next generation of Aerospace professionals in the Commonwealth. Our approach is to help grow the technicians and engineers that are needed to keep Virginia viable in the future aerospace arena. We know education is a necessary fixture to grow that skilled workforce and in support of that, VASBA provides donations to a number of Virginia colleges and universities, as well as K through 12 STEM student programs. (For more details visit: https://www.vasba.aero/education.html) In 2026, we plan to award eight to nine individual scholarships and sponsor 12 STEM programs by the end of the year. The funds we use for these gifts come from the money raised through our membership fees and what we take in from our annual Gala event, both the corporate table sponsorships and the individual ticket sales. With that in mind, please consider joining VASBA, (https://www.vasba.aero/membership.html), and attending this year's event; we'd love to see you there and our students would be so thankful! This year the GALA will be held in conjunction with the AUVSI Hampton Roads Advanced Mobility Exposition. For more information, visit https://www.vasba.aero/aerospace-gala.html.

To learn how to register for upcoming VASBA events please go to https://www.vasba.aero/news--events.html, and follow us on LinkedIn. ◆



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