HORIZONS

A publication of the Massachusetts Air and Space Museum

The Massachusetts Air and Space Museum inspires new generations to explore, experience, and pursue interests and opportunities in science and technology

Vol. 9 Issue 1 March 2023

Passing of A Queen

Last Boeing 747 "Empower" Rollout for Final Delivery

It would be easy to dedicate this entire edition of Horizons to the legend of the Boeing 747, because frankly there is just that much to be said about this amazing machine. For over five decades, Boeing Aircraft has been producing the original and first-ever wide-body, four-engine jet aircraft originally identified as the Superjet. During the production run, Boeing built 1,574 of these graceful giants and every major commercial airline, passenger and cargo, purchased one or more of them: the Boeing 747. Soon these behemoths earned the title of "Queen of the Skies."

January 2023 marked the end of the 747 era when Atlas Air took delivery of registration number N863GT. The 747 in its various configurations has been among the most popular aircraft ever built. Her

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Win The Beatles Airplane!

The Beatles Last Album Together

OWN A PIECE OF "THE BEATLES" HISTORY *(Sort of)*

Portions of this article were published in the April 2022 issue of AOPA Pilot magazine

By: Kevin R. Currie, MASM Chairman of the Board

As pilots, we all try to be somewhat knowledgeable about the different planes that are out there. The more unique (think Ercoupe, VariEze, Osprey, etc.), the more apt we are to give it a second look and remember it. We are often puzzled and intrigued when we see an aircraft of different design. Wondering why an extra piece would be added such as canards in Burt Rutan's designs or controls removed like rudder ped-

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From the Cockpit

With the opening of the museum in our new location at 438 Main Street Hyannis, the Massachusetts Air and Space Museum is now poised to better fulfill our mission of preserving the rich air and space history of the Bay State, but also educating and energizing generations of young people to become involved in these disciplines as career paths.

The MASM board of directors, officers, staff, and wonderful volunteers continue working diligently to provide a unique educational and entertaining experience with the many exhibits, interactive activities, and historical artifacts that are available to the public at the museum. I urge you to come see for yourself the museum's fascinating collection, try flying one of the simulators, and be sure to visit the gift shop where you will discover many treasures, including author-signed books for purchase!

Any season is a good time to visit the museum. Why not make the trip now?

Kevin Currie, MASM Board Chairman

Board Chairman Kevin Currie kcurrie@massairspace.org
Board Vice-chair Joe Dini jdini@massairspace.org
President Georgia Pappas gpappas@massairspace.org
Curator Barbara Jagla bjagla@massairspace.org
Interim Exec. Director Keith Young kyoung@massairspace.org
Operations Manager Bryan Mckay bmckay@massairspace.org

Museum located at:
438 Main Street Hyannis, Massachusetts
(508) 827-6300

Museum Hours:
Thursday, Friday & Saturday 10:00 AM to 4:00 PM
Admission: Adults $10.00 Children (ages 5-11) $6.00
Active Military with ID: Free

MASM Business Mailing Address:

200 Hanscom Drive, Bedford, Massachusetts 01730

Horizons is a production of Berkshire Cottage, LLC
148 Union Street, Milford, NH 03055-4430
***Exclusively for* the Massachusetts Air and Space Museum**
Editor-in-chief: Paul D. Bagley, *esq*.
email: paul@berkshirecottage.com or: horizons@massairspace.org

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als in the case of the Ercoupe, pilots delve deeper into the plane, wanting to touch, understand, and explore the uniqueness of something novel. Pilots seem to be, for the most part, inquisitive and politely gregarious when around like-minded folks.

Every time someone walks by the open hanger door when I am washing the plane, I get similar comments. "Nice plane. What kind of homebuilt is it? A Kingfisher (or some other homebuilt amphib)?" And every time my response is the same, "Thanks. But it's not homebuilt. It's a Thurston Teal." They squint a bit, tilt their head to the side, and say, "Thurston Teal? Never heard of it. Is it new?" It's not surprising that these folks are not familiar with an airplane that received its FAA certification in 1970, was manufactured in Sanford, Maine; and only had a run of 38 planes built.

Thurston Teal N501ME

The Massachusetts Air And Space Museum (MASM) was featured in a piece by Julie Summers Walker in the May 2021 issue of AOPA Pilot. Dr. Nat Sims, a MASM supporter, donated his Thurston Teal to the museum to be raffled off as a fundraiser for the museum's educational efforts. After having an annual performed at its home field in Newport, Vermont, Mike DuPont, an A&P, IA and owner of American Aero Services in Taunton, MA, donated his time to go up to Vermont and fly the Teal back to our hanger in Mansfield, MA. N501ME started out life in 1970 as N2011T and was initially scheduled to go to the Bahamas for use by *The Beatles*, but more on that later.

N501ME was designed and built by David Thurston in his factory in Sanford, Maine. Thurston

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atypical body configuration, with the elevated cockpit riding above the main body of the fuselage, is likely the most recognizable aircraft silhouette around the globe. Even the airplanes primarily known as Air Force One are of the 747-200B design, but they are hardly the run-of-the-mill passenger jet liner with which most people are familiar. Still, Air Force One is arguably the most identifiable single airplane in the world, primarily because of her distinctive 747 airframe design and of course her unique livery first inspired by U.S. First Lady Jacqueline Kennedy.

Harkening back to a time when major airlines were in fierce competition for a flying public that was growing every day, Juan Tripp, C.E.O. of Pan American World Airways challenged Boeing to create an airplane that was double the capacity of the ever popular Boeing 707. Assigned to take up the project was engineer Joe Sutter who oversaw a design team of roughly 4,500 eager engineers. Together they would formulate, build, test, evaluate, and finally produce the world's first wide-body aircraft that was suitable for both passenger and cargo applications.

Although this radical new design has multiple decks that can be occupied by passengers and crew, Tripp preferred that instead of putting two 707 fuselages on top of one another to double the capacity, that Boeing instead put them side by side, creating the first twin-aisle aircraft.

Sutter's team managed to develop this *Superjet* in record time, meeting Pan Am's deadline. Pan Am had placed its initial order for 25 airplanes in 1966 and Boeing rolled out its first delivery to the airline on January 22, 1970. Pan Am would go on to purchase a total of 65 of these wide bodies in three different versions (the 747-100, 747-200B, and the 747SP), and somewhere along the way this veritable giant gained the moniker of ***Queen of the Skies***.

First 747 "City of Everett"

Joe Sutter is known as the father of the 747, and he always referred to his team as ***The Incredibles*** for accomplishing what no other group in aviation history had done.

Boeing 747 Registration Number N863GT

As Boeing 747 registration number N863GT was rolled out for delivery to Atlas Air at the end of January, on her starboard side she displayed the image and name of Joe Sutter, head of that team that created her. She was named ***Empower***, and she carries the inscription "*Forever Incredible*" below Joe Sutter's image.

Although the rollout ceremony of ***Empower*** marked the end of 52 years for 747's production run, it in no way marks the end of the service life of the 747 fleet. Two new 747-8s will soon be delivered to the U.S. Air Force to replace the aging 747-200B Air Force One fleet, promising at least two and a half more decades of service shuttling the President of the United States around the country and the world.

In addition, numerous 747 airplanes that were mothballed and languishing in the arid desert of America's southwest were recently and quickly brought back to life and employed delivering humanitarian aid to the regions in and around war-torn Ukraine during the past year.

And Atlas Air, with its fleet of 54 Boeing 747s, is dedicated to this versatile airplane and her dynamic capabilities. The resilience and that versatility are just two of the many elements that will keep this airplane flying for multiple decades to come. Fear not, aircraft spotters, you'll continue to see the Queen of the Skies well into the future.

Shout Out for R.C.

Flying is tough enough, but flying an aircraft in which you are not actually seated is even tougher. Enter the world of radio controlled aircraft, which are built to more demanding standards, and which are much less forgiving when flying mistakes occur.

For these reasons we offer a great big "Shout Out" to one truly talented MASM volunteer docent, ***Colin Towers***, for building and loaning his Radio Control Model Airplane Right Flyer 40. Colin is a Flight Instructor with the ***Discover RC Flying Club***, AMA 3655 in Marstons Mills, Massachusetts:

www.discoverflying.org

Stop by the museum to see this RC plane in the new front display depicting the art of model building, radio control airplanes and John Hays Hammond – the "Father of Radio Control".

Radio Control Exhibit on Display Now at the Mass. Air and Space Museum

Inside the Saturn V

NASA's Saturn V Rocket being launched

Have you ever given any thought to just how we were able to get all those men and all that hardware to the moon? Were it not for the Saturn V rocket, twelve human beings would not have set foot on the moon between 1969 and 1972.

A total of 13 Saturn V rockets were launched between 1967 and 1973. Standing 363 feet from tip to tail, this monster machine was able to go from zero to 767 MPH [Mach 1] in sixty seconds due to the thrust produced by her five first-stage engines. Each engine generated over one million pounds of thrust in order to push both the rocket's upper two stages and the payload to the desired circum-terrestrial orbit. The orbits and the payloads varied greatly ranging from the Apollo manned missions to parking Sky Lab in its initial orbit, and Saturn never had a catastrophic failure during any of her thirteen missions.

From the Collection

By Barbara Jagla, MASM Curator

General Electric, River Works Facility, Lynn, MA

The family of Samuel Melenchuk recently donated some of his personal photographs and documents from his time at General Electric, River Works Facility, Lynn MA. Melenchuk was awarded a United States patent in 1965 for a Turbine Blade Lock and a patent in 1971 for Turbine Cooling relating to jet engines.

Melenchuk documents and photo donated to MASM

The official letter from Army Air Forces Material Command states that Samuel Melenchuk was assigned to the River Works Facility in April 1945 as Assistant Army Air Forces Inspector in Charge, responsible for the supervision, inspection, testing, and acceptance of all Army Air Forces jet engines, turbosuperchargers, and miscellaneous electrical equipment such as aircraft instruments, engine starters and generators.

Plaque commemorating Samual Melenchuk's contribution to the development of the turbojet engine

Melenchuk's invention was directed to improving the cooling of turbines, more specifically to improving the cooling of the first to second stage spacer and the first and second stage rotor wheels of a known type of high temperature turbine which forms a part of the well-known Allison Model 501 engine, military designation T56, as well as other engines.

In October 1941, soon after the London Blitz had ravaged that city, a group of General Electric engineers in Lynn received a secret shipment from King George VI of England. Stacked inside several crates were parts of the first jet engine successfully built and flown by the Allies. The Lynn engineers' task was to improve on the handmade machine and bring it to mass production.

The U.S. War Department and U.S. Army Air Corps commissioned G.E. to rebuild and commercialize the engine invented by British engineer Frank Whittle. Because they were given a short window to redesign the engine, the American engineers worked nonstop, guided by Whittle's blueprints.

The U.S. government selected General Electric for the secret project because of its knowledge of the high-temperature metals needed to withstand the heat inside the engine, and its expertise in building superchargers for high-altitude bombers, as well as turbines for power plants and battleships.

Modern aircraft are powered by gas turbine engines that pass air through a series of stages where it is compressed, ignited, and expelled. This process creates a high-pressure exhaust that is used to drive rotating engine parts and produce thrust.

In the late 1940s and early 1950s, General Electric assembled more than 30,000 J47 engines, making it the most produced jet engine in history. The J47 engine eventually powered everything from fighter jets, such as the F-86 Sabre, to the Convair B-36 strategic bomber.

General Electric is a leading supplier of jet and turboprop engines, avionics, and electrical power and mechanical systems. Its products are used in a wide variety of commercial, military, business and general aviation aircraft.

Every two seconds, an airplane or helicopter equipped with G.E. engines takes off somewhere in the world. The machines have logged more than 1

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1946 Photo of Samuel Melenchuk [front row, 3rd from left] and the Army Air Forces Administrative Office

billion flight hours and currently power everything from F-16 jet fighters and Apache helicopters to Airbus A320 and Boeing 787 jetliners.

General Electric was formed through the 1892 merger of Edison General Electric Company of Schenectady, New York, and Thomson-Houston Electric Company of Lynn, Massachusetts, with the support of Drexel, Morgan & Co. Both plants continue to operate under the G.E. banner to this day. By 1894, the Lynn plant was known as the "*River Works*" in deference to its position along the Saugus River. This G.E. Aviation Division was formerly known as Air Force Plant 29, now known as G.E. Aerospace, Lynn.

Message from the Curator

If you have items you wish us to consider for inclusion in the Massachusetts Air and Space Museum's collection or for exhibit, please review our donation guidelines and fill out our online donation form on our **Donate** webpage.

Thank you!

Barbara Jagla, MASM Curator

A Museum Update

by Keith Young - Interim Executive Director

I was hoping that this article would be highlighting the Grand Re-opening and Ribbon Cutting Ceremony for the museum's new location on Main Street in Hyannis. The bad news is that it hasn't happened as of the writing of this article. The good news is that you can add the event to your calendar! On **Friday, March 17** at **noon** we will officially recognize the reopening of the museum at our new location at 438 Main Street Hyannis. The reason for the delay is the same story that everyone doing construction is experiencing, a lack of qualified craftsmen (craftspeople?) and limited availability of material in order to get the rear part of the museum completed.

Having stated that, now that the multi-function room and back area of the space is finished with renovations, the museum is poised to move forward in enhancing our mission to educate the public. I anticipate having regular, ongoing, interesting and engaging presentations that touch on aviation and space exploration. A sample is having Glenn Davison of KitingUSA.com speak about the history of kites through the ages followed by a kite building workshop. Other people include the authority from the Springfield and Smithsonian museums on the Granville Brothers, builders of the famous GeeBee racing airplane, General Quinneville, who issued the orders from Otis Air Force base for the F-15's on September 11, 2001, and author talks covering a range of topics from flying around the world to flying into space.

Other areas that have had a setback are the museum's pursuit of a facility at the Cape Cod Gateway Airport. We hit a bit of a hiccup in the process but the museum is still committed to having a presence at the CCGA including an area where we can display and educate about historic aircraft/spacecraft, especially those with Massachusetts ties.

I believe it goes without saying, but I'm going to say it anyway - none of this is possible without your continued support, both in sharing with people you know

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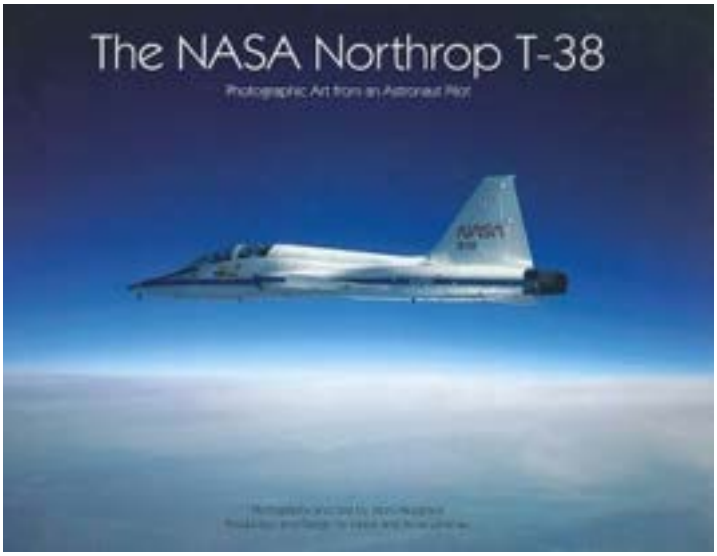
Books Written and Signed by Astronaut at MASM

MASM Operations Manager Bryan McKay obtained personally autographed copies of Astronaut Story Musgrave's books: ***The NASA Northrop T38 - Photographic Art from an Astronaut Pilot*** and ***Australia from Space - The beauty, the glory, and the sacred***. *Dr. Story Musgrave* is the only astronaut to fly on all five space shuttles and Musgrave commanded the mission to repair the damaged Hubble Space Telescope.

Please come in soon and purchase your own copy of these beautiful books, complete with a hand written autograph by Story himself. Very limited supply and going fast!



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received his Aeronautical Engineering Degree from New York University just before the start of World War II. In 1942 he went to work for Grumman Aircraft and after the war assisted Leroy Grumman in the design of numerous amphibious aircraft being developed for the general aviation market. Thurston also designed and built the Colonial Skimmer, which later sold and ultimately became the Lake Buccaneer.

Thurston Teal cockpit with stick controls, and manual main and tail gear controls.

As you can see from the accompanying photos, N501ME is a classically beautiful plane even when sitting on the ground. David Thurston built the Thurston Teal with usability, simplicity and functionality in mind. The Teal has a manually operated retractable gear system. The photo of the floor area shows the two bars between the seats that are used for lowering and retracting the gear along with the rudder control for water operations. A larger bar is used for the mains and a smaller one, right beside it, is for the tailwheel. Throttle, mixture, carb heat, and propeller pitch are all located on the ceiling.

With its 150hp Lycoming engine, constant speed prop, and two-place setup, N501ME has plenty of power for its designed recreational flying. Operating speeds are given in miles per hour and are what you would expect from this size amphib:

116 mph max level cruise

106 mph 75% power at 5,000 feet

95 mph 65% power at 5,000 feet

Ground takeoff is listed at 500 feet and landing at

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400 feet. Water takeoff is listed at a bit longer at 600 feet while landings are shorter at 400 feet. With its 24.5 gallon fuel tank (24 usable), its 75% power setting will get you a 250 mile range.

Flying the Teal from land is like flying all close gear tail draggers (think Piper Pacer or Pitts) – keep your feet alive and fly the plane through takeoff and landing. But the Teal does love water landings and takeoffs as long as you have the landing gear in its proper position. When Mike DuPont flew it down from Vermont, he was so impressed with it that he bought three raffle tickets in the hope that it would become his. But just to make sure that the new owner is comfortable and capable, MASM is providing the raffle winner with $3,000 to be put toward a new rating or endorsement. With only 1,350 total time on the airframe and 130 hours since engine and prop overhaul, this craft has plenty of life in it.

Currently, there are only five Thurston Teals listed in the FAA registry. Most of the remaining planes are located outside of the United States and that makes a lot of sense when you think about it. Canada has plenty of spots that are only accessible by air and water, and Europe has a rather restrictive general aviation policy. In most places in Europe, every time you fly you are charged an airport departure fee, a landing fee, and myriad other fees if you need to file a flight plan or ask for a weather briefing. Some European pilots have gotten around many of these fees by flying their Teals in water mode using lakes and rivers near their homes. Twenty-four of the Thurston Teals listed on the website have some form of non-USA registration numbers listed. **http://seabee.info/teal.htm**

And as promised, *The Beatles* connection: A note was sent by David Thurston to Mark O'Malia, the son of the original owner, in 1973 (a copy of which will be provided to the raffle winner through the graciousness of Mark). Mark's father Charles J. O'Malia was the first person to take possession of N501ME and the note helped to explain why a 1970 plane was being delivered to him as a new plane in 1973. It seems that the aircraft was purchased by a NYC management company for Apple Records in July of 1970 and was scheduled to be delivered to *The Beatles* while they spent time together in the Bahamas. Unfortunately, the Fab Four broke up in 1970 before the plane could be delivered. It was stored in the Thurston Teal factory while the courts settled the band's issues.

The Massachusetts Air And Space Museum's mission is to educate, promote, and share with the public the many contributions that area companies, organizations, and individuals have made and continue to make within aviation. In addition, MASM works to educate younger people in the career opportunities available to them beyond being a pilot, aircraft mechanic, or rocket scientist. The funds made available by raffling this exceptional Thurston Teal will go a long way toward making this happen. For more information on both MASM and the Thurston Teal raffle, please visit the museum's website at **www.massairspace.org**. You could take a chance on owning your own unique amphibious aircraft and a piece of Beatles history (*sort of*). The raffle closes on March 31, 2023 at 5:00 P.M. [EST], with winning ticket to be drawn and announced shortly thereafter. So, get your tickets now!

NASA's New Airliner Experiment To Make Flying Less Expensive

Most people assume that NASA [National Aeronautics and Space Administration] focuses its efforts primarily on missions involving space exploration. It is true that NASA is the primary U.S. agency that deals with all things space. But before "Space" in their name there is "Aeronautics", and exploring all things aeronautical is a giant part of the tasks set before them.

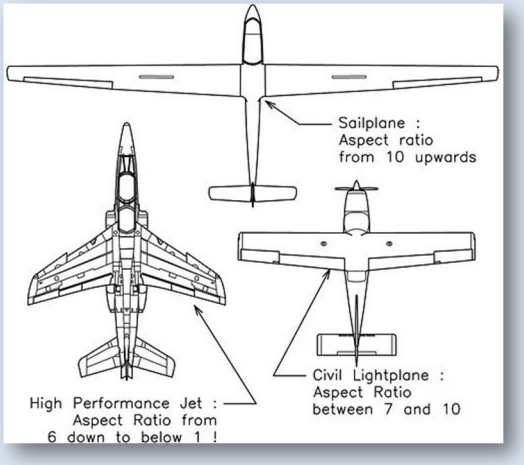


Figure 1

One such task is trying to find efficiencies in flight that can offer us flying at much lower costs. While there are all kinds of recurring fees associated with flight such as landing and parking fees, and special peripheral one-time apparatus purchases which are required beyond the airplane itself, purchases such as headphones, the big cost in flying over any other mode of transportation has to be the cost of fuel. This is where NASA has been targeting its research in pursuit of more fuel-efficient airframes that can eventually be incorporated into airliner designs by major manufacturers. What is this new design, you ask? Would you believe it is based upon that ancient aeronautical paradigm ***aspect ratio***?

NASA is teaming with Boeing Aircraft to develop a full-scale airliner that employs a transonic, high-aspect, truss wing design for creating lift. What does that mean? It means using really long wings, like those you see on glider aircraft [see Figure 1]. After careful analysis of aviation data, NASA has basically re-discovered that by increasing the aspect ratio within the geometry of the wing, the efficiency of the wing increases correspondingly.

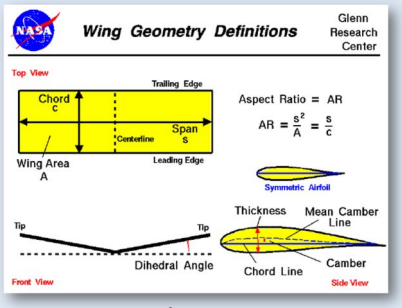


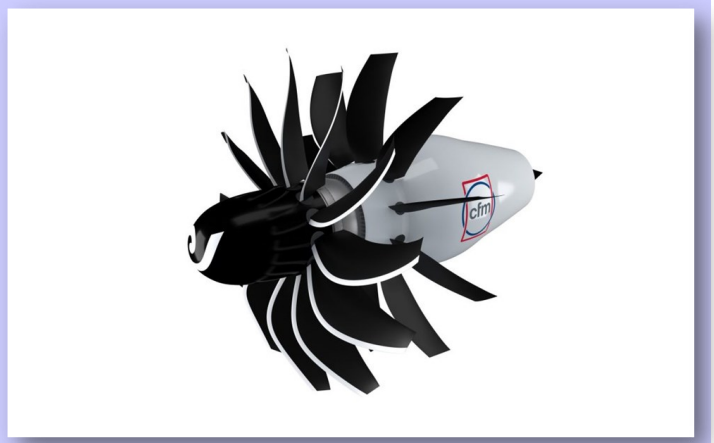
Figure 2

Figure 3

Now, in order to upscale the length of a narrower wing, it must be supported by a truss that emanates from the base of the fuselage [see Figure 3]. Rather than the truss acting only as a support mechanism for these long wings, they will likely be fashioned as airfoils, just like the wing, thereby adding to the overall lift of the system.

Let us hope that Boeing follows through properly with this project and provides NASA with the proof of concept that it is seeking. Stay tuned!

CFM RISE?
Is This the Next Step?



The CFM R.I.S.E. Open Fan Propulsion Engine

As bizarre as it may seem, the next leap in avia-

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Then and Now!

MASSACHUSETTS AIR AND SPACE MUSEUM

HORIZONS

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L.E.S. Was More

In the fall of 1962 the world came to the brink of nuclear war. As a result, President John F. Kennedy was compelled to look closely at what had transpired during the crisis and realized that there were many shortcomings with the command-and-control system that the president employed to maintain civilian authority over the military. He recognized that the commander-in-chief needed to be able to speak directly with a military unit leader in the field, right down to a second lieutenant holding a walkie-talkie. He called upon the scientific community to analyze the problem and find a solution. Prior to this, in 1958, scientists at M.I.T.'s Lincoln Laboratories at Hanscom Field in Massachusetts came up with a way for the military to send full duplex signals (in two directions simultaneously) without the risk of signals being jammed. The ionosphere had been useful in reflecting signals, but that ability becomes compromised after a nuclear detonation because the ionosphere is disrupted and remains so for a consideration length of time after an atmospheric blast. Recognizing that immediately following a nuclear attack would be the time when effective communications would be needed most, the team went about creating an artificial ionosphere. They launched into circumterrestrial space millions upon millions of tiny pieces of copper wire that enshrouded the earth. These three-quarter inch long pieces of copper would act as miniature dipole antenna allowing a signal to be reflected back and forth between ground stations. The big benefit was that an enemy couldn't jam either duplex transmission be-

M.I.T. Lincoln Laboratory photograph
Photo of L.E.S. – 2 Package

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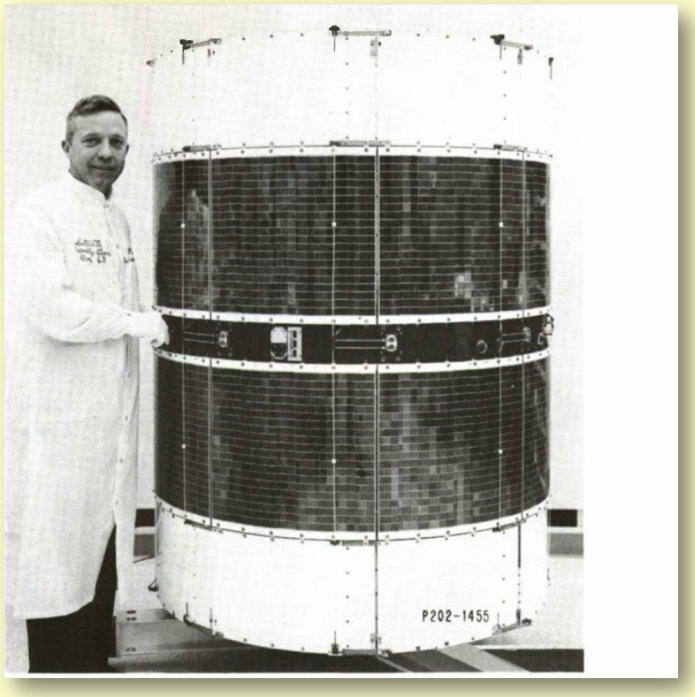
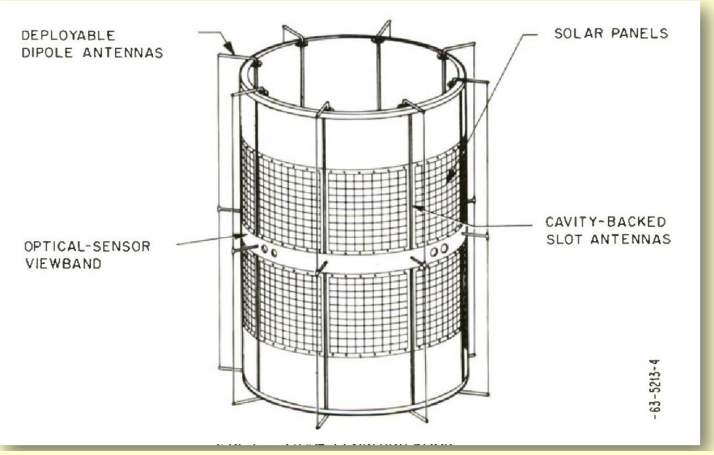


MIT Lincoln Laboratory's LES-5 prior to its launch in 1967

Something new has happened! Eight years ago the inaugural issue of Horizons carried a lead historical piece about the Massachusetts Institute of Technology's Lincoln Laboratory space initiative simply known as L.E.S. (Lincoln Experimental Satellite). In the mid-1960s, Lincoln Lab partnered with the U.S. Air Force, Army, and Navy in the development of U.H.F. (ultra-high frequency) telecommunications via space-based relay systems. This series of satellites was the forerunner to later more sophisticated systems such as G.P.S. (global positioning system) that has become part of everyday life here on earth. It was also the template used for a series of military communications satellites that saw the United States safely through the Cold War.

A total of eight (8) LES satellites were sent aloft by Lincoln Laboratory. The first four (4) never achieved their intended geosynchronous orbits due to launch malfunctions with their delivery vehicle. Despite these setbacks in their planned deployment, each still returned vital information and performed their missions. LES-5, 6, 8, and 9 all reached their intended orbits and performed well beyond expectations. LES-5 had already completed its initial assignment within a day and a half of reaching its final orbit.

Very recently a new wrinkle has developed concerning the L.E.S. program from over a half a century ago. An amateur radio buff from Canada, Scott Tilley, spends some of his free time hunting down lost and outdated satellites. He's even worked with NASA tracking down wayward and abandoned packages that have been left gradually falling toward earth due to orbit decay (also known as gravity).



LES Satellite nomenclature

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During the Covid-19 lockdown in Canada, Tilley had more time than usual to explore the heavens for these objects that are now what is affectionately known as *space junk*. As a result of his efforts, he found that LES -5, sitting in geosynchronous orbit some 22,000 miles in circum-terrestrial space has come back to life. Designed to shut down back in 1973, LES-5 is up and running and constantly broadcasting data back to earth.

From what anyone is able to determine, LES-5 is the oldest functioning satellite in geosynchronous orbit existing in space. Launched in 1967 aboard a Titan 3C space booster, and internally powered by electrical energy generated by her solar panels, this half-century old relic of the Cold War is still cranking out 100 bits of information every second, mostly updating the condition and status of the six-foot tall by four-foot diameter cylinder. Well done, MIT Lincoln Laboratory. Your work has certainly gone the distance.

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Message From Interim Director-Continued

about the museum's mission, and helping out financially. Building a museum from scratch is a daunting undertaking yet we are well on our way. I continue to receive nothing but positive feedback about how we present the exhibits that we have and the information that we share. None of this would be possible without the ongoing support of people like you!

Please be on the lookout for happenings at the museum as we push forward into 2023 and I hope that you will put it on your calendar to visit. The experience is nothing short of inspiring and engaging. I hope to see you at the ribbon cutting on the 17th or sometime this year!

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tion advancements may be reliant upon a technology from as far back as the 1980s. It could be that a modern hybrid of the Wright Brothers first primitive propellor might be the way to increase engine efficiency by as much as 20% with current jet engines.

The problem with conventional jet engines is they keep getting larger and larger with corresponding increases in their weight. As the intake fans grow in size to compress more air into the combustion chamber of the engine, so also do the nacelles that house these engines. Not only does this add weight, it adds girth. Engine sizes are rapidly coming to the point where they are so large they won't be able to be mounted under a wing without touching the ground. To move heavier and heavier loads, engines need to produce more and more thrust, hence the reason for the ever-widening radius of the powerplant. Enter the CFM RISE?

Three decades ago two companies were engaged in an experiment involving turbofan engines that had exterior fan blades producing propulsion outside the confines of the combustion chamber of the engine. Although these engines performed as anticipated, the one unintended consequence was a dramatic increase in the noise generated. Ultimately, it was this noise issue that drove manufacturers away from the idea.

But now it appears that CFM has more or less solved the noise problem by eliminating the two counter-rotating set of vanes in exchange for one set of moving variable-pitch vanes, and one fixed set directly behind them on the external portion of the engine.

A possible additional feature that will likely make these new engines popular is their ability to utilize both conventional fuels and hydrogen when it becomes available in quantity. Let us hope that this innovative use of an old idea catches on quickly!

C.A.V.U

Most people familiar with aviation know that the abbreviation "CAVU" stands for *"Ceiling and visibility unrestricted."* In this recurring feature of ***Horizons***, your ability to see clearly into the history of aviation will be tested through identification of flying machines that once were. The first reader who submits the correct answer will be entitled to bragging rights and have their name and answer published in the subsequent edition of ***Horizons***. Submit your name, the name of the aircraft, the type or version (if applicable), and the country where it was manufactured to the editor-in-chief of ***Horizons*** at: **horizons@massairspace.org**

Here is your challenge for this edition:

For additional content, click on many of the photos in this edition except this one. You'll find videos and links for more information!

December 2022 Edition's Answer:

BAC TSR.2- Great Britain
Two seat tactical strike medium bomber**—Max. speed:** 1,485 MPH (2,390 km/h) **Ceiling:** Not revealed **Radius:** 2,300 miles (3,701 km)
Dry weight: 44,850 lb (20,344 kg) **Max. take-off weight:** 96,000 lb (43,545 kg)
Dimension: Wing span: 37 ft 8 in (11.28 m); length 89 ft 0 in (27.13 m); height 23 ft 5 in (7.13 m); wing area 700.0 sq ft (65.03 m^2)
Powered: two 19,600 lb (8,891 kg) afterburning thrust Bristol Siddeley Olympus Mk 22R turbojets
Armament: Up to 6,000 lbs. (2,722 kg) disposable stores carried internally, and 4,000 lbs. (1,814 kg) of disposable stores carried on 4 underwing hardpoints.
Correct Answer: Robert Segal