

FlightPlan

A VOLUNTEER NEWSLETTER BY VOLUNTEERS



Operation Credible Sport

Page 12

GBU-57 Massive Ordnance Penetrator

Page 15

Remembering Malcolm Tabor

Page 20

EVERGREEN
AVIATION & SPACE
MUSEUM



VOLUME 13
ISSUE 1
JANUARY 2026

BILL KOLB

FLIGHTPLAN EDITOR, MONDAY DOCENT

Happy New Year! We're starting 2026 with a fresh edition of FlightPlan, focusing on Rockets and Missiles. At the Museum, we have an impressive collection of these historic artifacts, ranging from a replica of Dr. Robert Goddard's groundbreaking liquid-fueled rocket to the colossal Titan II, the Cold War guardian that also powered the Gemini missions into space.

Be sure to read the feature on the GBU-57 Massive Ordnance Penetrator (MOP), the advanced bunker-busting bomb recently used in combat by USAF B-2 Spirits against deeply buried Iranian nuclear sites. Later this month, we'll be adding a full-sized technical specimen of this 20-foot behemoth to our collection in the East Pavilion.

Thank you for your continued support and readership! ➤

MONTHLY THEMES

We are assigning themes to each month of the FlightPlan. These are not exclusive of other topics, but perhaps they may motivate you to make a contribution.

JANUARYMISSILES & ROCKETS

MAYTHE EARLY DAYS OF AVIATION

FEBRUARYTHE CENTURY SERIES OF FIGHTERS

JUNETHE EARLY DAYS OF SPACE
EXPLORATION

MARCHSOVIET MIGS

APRILSTEALTH

GUIDELINES FOR SUBMITTING ARTICLES TO FLIGHTPLAN

1. The FlightPlan (FP) is published on the 1st of each month
2. Stories for the next issue can be filed up to the 10th of the prior month
3. Articles should be associated with an artifact at the Museum
4. Sources for specific information in the article should be provided
5. Stories should be approximately 500 words long
6. If appropriate, include one or two photos for publication with the article
7. Include name, day, and title at the bottom of each article submitted
8. Email articles to: flightplan@evergreenmuseum.org
9. Feedback is encouraged; submit to flightplan@evergreenmuseum.org

CAPTAINS CORNER

DAN OVEN

SUNDAY DAY CAPTAIN

December 3, 2025, BOC meeting was productive with many topics before the Board. Topics are presented below; to avoid a multi-page report, anyone with further questions regarding the discussions can contact their Day Captain.

Scot Laney – Chief Executive Officer

- Scot reminded all that each new Museum guest is the key to the Museum's future. We should emphasize greeting each guest and giving a quick orientation. He illustrated the point by a story: A prominent Lockheed executive was so impressed by his greeting and the Skunk Works tour that he offered a major new artifact to Evergreen rather than the Smithsonian and other major museums.
- The waterline problems in the East Pavilion began in December 2021. McMinnville Properties is paying for the repairs, but the Museum absorbed the cost of the lost water.
- The first weekend of the Goose Lights event was well attended. Weekdays have been slow, but the event began earlier than in prior years. Attendance is expected to pick up, particularly since the ice-skating rink is an added attraction.
- The heating system in the West Pavilion is not working. It will be repaired in early 2026.
- The PA system in the West Pavilion has been repaired. The system in the East Pavilion is installed and will be operational soon.
- A memorial service honoring Paul Gelinias will be held in January.
- Guests can get much closer to exhibits in our Museum than in most other museums. Future plans will continue to offer this opportunity.
- Scot wants to expand volunteer outreach programs, including other cities (Salem, Portland, Eugene).

The Training Officer's November report was reviewed.

Old Business:

- Nominees for the 2025 John Rasmussen Award were reviewed and a vote taken.
- A committee is continuing work on a revision of the Volunteer Handbook.

New Business:

- With the museum's 10am opening hours throughout the holiday period, the 10am Restoration tour start time will be adjusted as needed on each day.
- The Year of the Volunteer 2025, accomplishments for the year were reviewed and will be addressed at the annual volunteer dinner.
- Plans are being made for the volunteer dinner, which will take place in mid-January.

The meeting was adjourned at 11:37 am. ✈

How the Space Race Created a Nuclear Dyad

SCOT LANEY

MUSEUM CEO

Once upon a time, in a land not far away (the United States to be specific), there was a serious debate taking place in the halls of power over the future security of the country. Military planners were at odds, almost to the point of exchanging blows, over the question of how best to deliver the ever-increasing arsenal of ever-increasingly powerful nuclear weapons that we were designing and producing at a torrid clip.

On one side was the old WWII warrior Curtis LeMay. LeMay argued ad-nauseam that what the US needed were large numbers of more advanced tactical long-range bombers under the control of the United States Army. On the other side of the table were advocates of a new type of weapon, the Intercontinental Ballistic Missile, under the control of the nascent United States Air Force. LeMay had the upper hand, and the ear of almost everyone, that the bomber was the future.



Then LeMay's arguments took a left upper cut out of nowhere, right in the Sputnik.

Overnight, the whole debate changed. The USSR had just demonstrated the undeniable and pretty much indefensible ability of the ICBM to put a load of

whatever (satellite, nuclear warhead) wherever and all on only a moment's notice.

Because of this, the ICBM could now be developed in the light of day, in full view of everyone, because it had a seemingly peaceful new mission: to take a human to the Moon and safely return said human from the same. It was all very convenient to the ICBM disciples and a major break for the whole Air Force ICBM crowd.



Quickly, a compromise was negotiated. One side would work on making the ICBM more robust and capable under the guise of the space program, the other would do the same with new generations of heavy bombers under the operational control of the Strategic Air Command (SAC), which had no guise to hide anything. LeMay even got to be in command of SAC, so his voice would continue to shape the debate well into the future.

The result was the Nuclear Dyad, the concept that both ICBMs and bombers had distinct roles in preserving the country's security. Soon, the Navy got in the game as well, and the Dyad expanded to a Triad with the mounting of ICBM missiles on a new type of submarine, the Nuclear Missile Sub, aka "The Boomer."

Today there is discussion about returning to a Dyad, this one being bomber and submarine specific. Seems like maybe the poor ICBM might soon be tossed on the scrap heap. But it did get us to the Moon so there is that. ➤

The AGM-78 Standard Anti-Radiation Missile (ARM): Evolution and Combat History in SEAD Operations



BILL KOLB

MONDAY DOCENT

The **AGM-78 Standard Anti-Radiation Missile (ARM)**, known as STARM (Standard ARM), was a key U.S. weapon developed in the late 1960s for suppression of enemy air defenses (SEAD). General Dynamics adapted it from the Navy's RIM-66 Standard surface-to-air missile airframe to overcome the AGM-45 Shrike's limitations, including short range (15-25 miles), small warhead, narrow-band seeker needing pre-mission tuning, and vulnerability to radar shutdowns.

This rapid "off-the-shelf" modification enabled trials in 1967 and operational use in early 1968. The missile measured about 15 feet (4.6 m) long, weighed over 1,300 pounds (620 kg), and used a dual-thrust solid rocket motor for speeds up to Mach 2 and ranges of 50-75 miles.

The initial AGM-78A retained the Shrike's seeker on a gimballed mount for better field of view, paired with a larger blast-fragmentation warhead. The AGM-78B (1969) introduced a broadband seeker that covered multiple frequencies without preselection, plus a memory circuit to guide it to the last known position if the radar shut down—a significant advance against North Vietnamese tactics.

Later variants included the AGM-78C (cheaper, more reliable, with white phosphorus markers for follow-up strikes) and AGM-78D (1973-1976, improved motor, digital upgrades, active optical fuse, and ~100 kg warhead).

Despite its advantages—longer standoff, heavier payload, greater resistance—the AGM-78 cost far more than the Shrike, limiting production to around 3,000 units; it supplemented rather than replaced the cheaper option.

It saw heavy use in Vietnam, fired from USAF "Wild Weasel" F-105F/G Thunderchief (up to two missiles) and later F-4G Phantom II, plus Navy A-6 Intruder for "Iron Hand" missions. Crews launched from beyond SA-2 range to destroy SAM radars, often mixing with Shrikes due to cost.

Exports reached Israel, which used it in conflicts and adapted it for ground launch.

Production halted in the late 1970s; the missile phased out in the 1980s, succeeded by the superior AGM-88 HARM with greater speed, flexibility, and affordability. The AGM-78 marked a vital SEAD evolution, enabling safer attacks in radar-heavy environments and bolstering U.S. air dominance. Our AGM-78 is on loan from the National Museum of the Air Force. ➤



The Gorgon IIA

America's First Guided Air-to-Air Rocket Missile

BILL KOLB

MONDAY DOCENT

The Gorgon IIA (also known as Gorgon II-A, KA2N-1, KU2N-1, CTV-4, or CTV-N-4) was an experimental air-to-air missile developed by the U.S. Navy during the final years of World War II. Part of the broader Project Gorgon—a family of guided missile prototypes initiated in 1943 by the Naval Aircraft Modification Unit (later Naval Air Development Station) in Warminster, Pennsylvania—it represented one of America's earliest attempts at a powered, guided air-to-air weapon.

Designed primarily to intercept enemy bombers, the Gorgon IIA featured a distinctive canard configuration (forward control surfaces), a high-mounted main wing, and twin vertical fins. Its airframe was mainly constructed of laminated wood for rapid production, with a clear plexiglass nose dome housing an early RCA television camera. This innovative (but primitive) guidance system transmitted live video back to the launching aircraft, allowing the pilot or operator to steer the missile via radio commands—essentially, remote control based on the missile's-eye view.

Propulsion came from a Reaction Motors liquid-fueled rocket engine using aniline (or monoethylaniline) and red fuming nitric acid, delivering about 350 pounds of thrust for roughly 130 seconds. The missile had an

estimated range of up to 18 miles and was intended to reach speeds sufficient for bomber intercepts.

Testing began with unpowered glide flights in early 1945, progressing to fully powered guided flights in March. Remarkably, it became the first jet- or rocket-powered radio-controlled aircraft to fly successfully in the United States. However, the television/radio command guidance proved impractical for air-to-air combat: high closing speeds overwhelmed the operator's ability to maneuver the relatively sluggish missile effectively, and TV signal quality was poor.

With the war's end in 1945, operational urgency faded. Production contracts (including those from Singer Manufacturing Company) were canceled or redirected toward research. By 1946-1948, the Gorgon IIA was redesignated as a Control Test Vehicle (CTV) for advancing missile guidance, control systems, and propulsion technologies.

Only 21 Gorgon IIAs were ever built, but none entered operational service. We have one painted bright yellow hanging near the Mercury Redstone rocket in the East Pavilion.

***Editor's Note:** In case you were wondering, the Gorgons were three sisters in Greek mythology who had the power to turn anyone who looked at them into stone. The most famous sister was Medusa. ➤*

Sparked by Sputnik: Homer Hickam's Path to the Stars

BILL KOLB

MONDAY DOCENT

Homer “Sonny” Hadley Hickam Jr., born February 19, 1943, in Coalwood, West Virginia, grew up in a company-owned coal-mining town where his father served as mine superintendent. Expected to follow into the mines, Hickam’s path changed dramatically in October 1957 when, at age 14, he witnessed Sputnik crossing the night sky, igniting a lifelong passion for rocketry and space exploration.



Inspired, Hickam and five friends formed the Big Creek Missile Agency (BCMA), launching over 35 amateur rockets named the “Auk” series—after the flightless great auk bird, nodding to their early failures. Starting with simple designs using black powder propellant (saltpeter, sulfur, charcoal) in small tubes, initial launches like Auk I barely reached 6 feet before exploding or failing.

Through trial and error, they advanced to “rocket candy” (melted potassium nitrate or chlorate with sugar) for better performance. Admiring Wernher von Braun, Hickam received encouraging technical advice from the rocket pioneer via correspondence arranged by his mother, which helped refine nozzles and calculations.

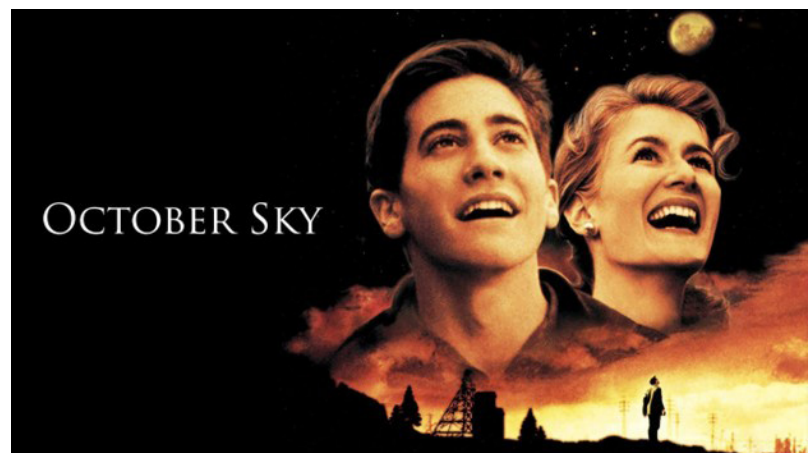
Later rockets featured machined steel casings, stable fins, de Laval nozzles, and “Zincoshine” propellant (zinc dust and sulfur, mixed with moonshine). The climax was Auk XXXI in May 1960: over 6 feet tall, it soared to nearly 31,000 feet (about 6 miles), watched by hundreds of townspeople. Supported by teacher Freida Riley and eventually the community, the boys won medals at the 1960 National Science Fair.

After graduating from high school in 1960, Hickam earned a BS in industrial engineering from Virginia Tech in 1964. He served as an Army lieutenant in Vietnam (1967–1968), earning the Bronze Star and Army Commendation Medal. From 1971, he worked in rocketry, then joined NASA in 1981 at Marshall Space Flight Center, contributing to spacecraft design, astronaut training (including Japan’s first crew), Hubble repairs, and the International Space Station until retiring in 1998.

That year, he published *Rocket Boys: A Memoir*, a bestseller recounting his teenage adventures, Coalwood life, and triumphs. It inspired the acclaimed 1999 film *October Sky*.

Hickam’s journey from a mining-town boy, sparked by Sputnik, to a NASA engineer exemplifies how determination and curiosity can defy expectations and reach the stars.

Editor’s Note: *October Sky* is an anagram of *Rocket Boys*. ➤



Dr. Wernher von Braun: Visionary Rocket Pioneer from Germany to the Saturn V



BILL KOLB

MONDAY DOCENT

Wernher von Braun's inspiring journey from a starstruck boy in Germany to the architect of America's triumphant Moon landings embodies the boundless human dream of exploring the cosmos. Born on March 23, 1912, in Wirsitz, Germany (now Wyrzysk, Poland), young von Braun was captivated by the stars after receiving a telescope from his mother ("Wernher von Braun"). Inspired by science fiction from Jules Verne and H.G. Wells, and especially Hermann Oberth's groundbreaking 1923 book *The Rocket into Interplanetary Space*, he mastered calculus and trigonometry to unlock the secrets of rocketry. As a teenager, he joined Germany's rocket society in 1929, fueling his passion for space travel.

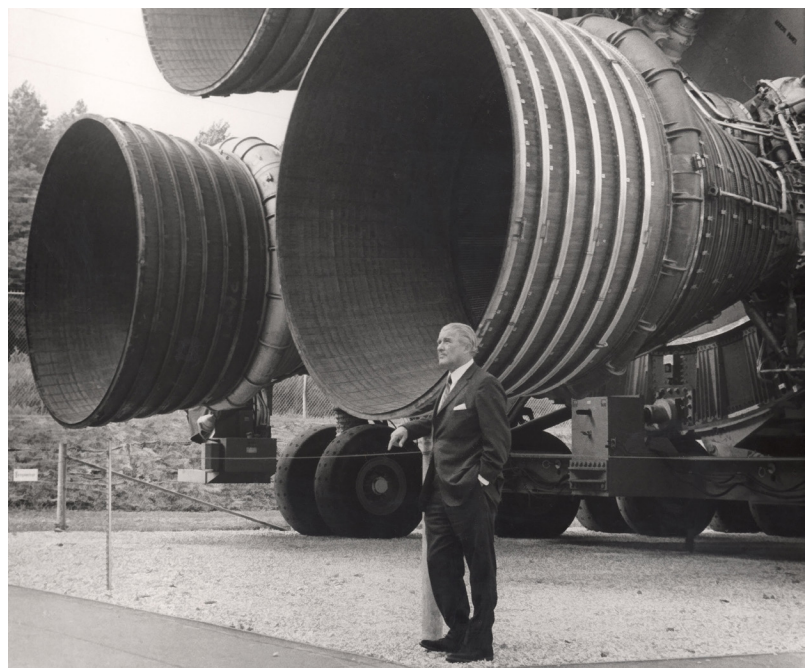
In 1932, von Braun eagerly joined the German Army's rocket program to build larger vehicles, earning his doctorate in physics in 1934. His innovative team developed the V-2, the world's first ballistic missile

and precursor to modern space launchers. After World War II, von Braun and his colleagues were welcomed to the United States through Operation Paperclip, bringing their expertise to advance peaceful exploration.

Settling in Huntsville, Alabama, von Braun led the development of the Redstone rocket, which powered America's first satellite, Explorer 1, in 1958, and early human suborbital flights. In 1960, his team transferred to the newly formed NASA Marshall Space Flight Center, where von Braun became director and chief architect of the mighty Saturn V—the super booster that would carry astronauts to the Moon.

With charisma and visionary leadership, von Braun inspired thousands, turning President Kennedy's bold challenge into reality. The Saturn V's flawless performance launched Apollo missions, culminating in Apollo 11's historic 1969 Moon landing. Von Braun's lifelong dream of human spaceflight became humanity's greatest adventure, proving that bold visions can propel us to new worlds.

His legacy endures as a champion of exploration, reminding us that reaching for the stars unites and elevates us all. ➤



The Atlas Rocket: From ICBM to Space Pioneer

BILL KOLB

MONDAY DOCENT

The Atlas rocket, developed in the post-World War II era, became the United States' first operational intercontinental ballistic missile (ICBM). Development began in 1945 under the U.S. Army Air Force, advancing quickly in the 1950s during Cold War tensions. Designed by Convair under engineer Karel J. Bossart, it featured innovative "balloon tanks"—thin stainless-steel structures pressurized by fuel to maintain rigidity, reducing weight. The first successful launch occurred on December 17, 1957, marking a milestone in American rocketry. Powered by Rocketdyne engines using liquid oxygen and RP-1 kerosene, early models like Atlas A and B underwent rigorous testing, with Atlas B achieving orbit in 1958 by deploying SCORE, the world's first communications satellite, which broadcast President Eisenhower's voice from space.

Atlas's most iconic early role was as the launch vehicle for Project Mercury's five orbital missions, marking the transition from military to manned spaceflight. NASA adapted the SM-65D variant by thickening the tank walls, adding an abort detection system, and enhancing reliability to improve human safety.

Mercury Flights

The first orbital mission was Mercury-Atlas 5 (MA-5) on November 29, 1961, which carried chimpanzee Enos on two orbits to test life support and reentry, though an early abort cut the flight short. This paved the way for manned missions.

MA-6 followed on February 20, 1962, launching John Glenn aboard Friendship 7 for three orbits, making him the first American in orbit and traveling over 75,000 miles in nearly five hours. Despite a false heat shield warning, the mission succeeded, boosting U.S. morale in the Space Race.

MA-7 on May 24, 1962, sent Scott Carpenter on Aurora 7 for three orbits, focusing on scientific experiments such as the behavior of liquids in zero gravity.



Walter Schirra's MA-8 on October 3, 1962, aboard Sigma 7, completed six flawless orbits over nine hours, emphasizing engineering reliability.

The final, MA-9 on May 15, 1963, saw Gordon Cooper on Faith 7 endure 22 orbits in 34 hours, conducting photography and biological tests despite systems failures late in the flight. These missions validated orbital flight, reentry, and human endurance, with Atlas proving robust despite occasional over-acceleration issues.

Beyond Mercury

The Atlas family evolved into a workhorse for satellite deployments, launching over 600 vehicles across decades.

Variants like Atlas-Agena (1960s) orbited Ranger lunar

(CONTINUED NEXT PAGE)

The Atlas Rocket: From ICBM to Space Pioneer

(CONTINUED FROM PREVIOUS PAGE)

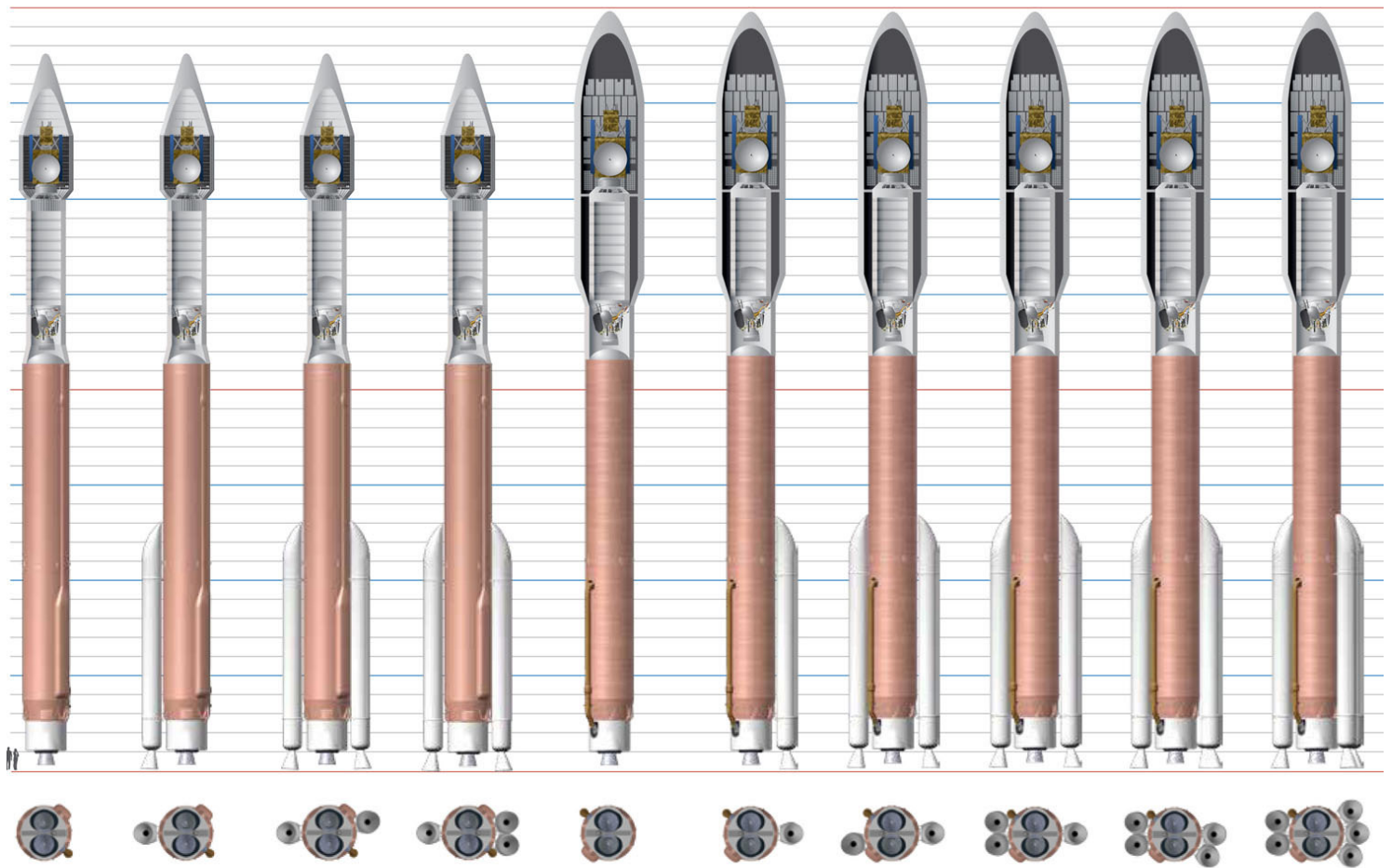
probes, Mariner flybys of Venus and Mars, and Gemini Agena targets.

Atlas-Centaur, debuting in 1962, sent Surveyor landers to the Moon, Pioneer probes to Jupiter and beyond, and New Horizons to Pluto in 2006.

Upgraded models—Atlas I (1990), II (1991), III (2000 with RD-180 engine), and V (2002)—deployed military reconnaissance, weather, communications, and Earth observation satellites, including SOHO (1995) and Mars Science Laboratory (2011).

Atlas V continues operations, supporting national security and science.

The Museum does not have a complete Atlas rocket in its collection, but it does have an engine on display near the Mercury capsule in the East Pavilion. ➤



Atlas V 401	Atlas V 411	Atlas V 421	Atlas V 431	Atlas V 501	Atlas V 511	Atlas V 521	Atlas V 531	Atlas V 541	Atlas V 551
----------------	----------------	----------------	----------------	----------------	----------------	----------------	----------------	----------------	----------------

United Launch Alliance: ULA



Jet-Assisted Take-Off (JATO)

BILL KOLB

MONDAY DOCENT

Jet-Assisted Take-Off (JATO) bottles, also known as Rocket-Assisted Take-Off (RATO) units, were auxiliary rocket motors developed during World War II to provide supplemental thrust for aircraft during takeoff. These self-contained devices used either solid or liquid propellants to generate short bursts of power, addressing limitations of piston-engine aircraft. Solid-fuel JATO, such as the 14KS1000 (“Old Smoky”), consisted of steel casings filled with potassium perchlorate and a tar-like propellant, delivering 1,000 pounds of thrust for 14 seconds. Liquid variants, such as the GALCITI400-ALDW, employed hypergolic fuels (e.g., monoethylaniline and red fuming nitric acid) for automatic ignition, producing 1,400 pounds of thrust with regenerative cooling to prevent nozzle erosion. Bottles could be recovered by parachute, minimizing post-use weight penalties.

The concept originated in the early 20th century, with pioneers like Robert Goddard exploring rocket-assisted takeoffs. In the 1930s, Caltech’s Guggenheim Aeronautical Laboratory and the American Rocket Society advanced development, leading to the formation of Aerojet Engineering Company. WWII accelerated adoption; the first U.S. JATO flight occurred in 1941 on an Ercoupe aircraft for U.S. Army Air Corps studies to shorten takeoff distances. By 1944, the U.S. Navy contracted with Aerojet for liquid JATO systems, testing them at Coast Guard Air Station San Diego under the direction of CDR William MacDiarmid. Challenges with liquid fuels—leaks, corrosion, and handling hazards—led to a mid-1944 shift to solid propellants for reliability amid wartime constraints.

JATO bottles were attached to aircraft hard points, typically under wings, in engine nacelles, or on fuselages, in arrays of 4–8 units. During takeoff, pilots ignited them at full throttle via electrical systems; solid units burned continuously, while liquid units could be shut off. They were jettisoned after 10–15 seconds of thrust, often digging holes in the ground or water from the exhaust. U.S. Navy seaplanes such as the PBM-3 Mariner, PB2Y-3 Coronado, and PBV-1 Catalina used JATO for open-sea operations; for instance, six units on the JRM-2 Philippine Mars in 1945 reduced takeoff runs by half in calm San Francisco Bay, aiding Pacific logistics. Germany employed JATO on Junkers Ju-52 transports during the 1942–43 Battle of Stalingrad to evacuate wounded from short, icy fields, preventing crashes from overload. The Luftwaffe also used it on Me 321 gliders and Hawker Hurricanes for convoy defense.

JATO was essential for overcoming short or unprepared runways, heavy payloads (e.g., fuel, bombs, troops), high-altitude/hot conditions that strained engines, and seaplane issues such as surface tension or rough waves that risked propeller damage or engine flooding. In the Pacific theaters, it enabled B-29 bombers to operate from island atolls; for search-and-rescue, it facilitated short landings and quick departures, supporting invasions and improving survival rates. Though not ubiquitous during WWII due to testing phases, JATO bridged the gap until jet engines emerged postwar.

Editor’s Note: Please see the companion article on Operation Credible Sport, about the plan to use significantly modified C-130s to evacuate the American hostages held by Iran in 1979-1980. ➤

Operation Credible Sport: The Rocket-Boosted C-130s and America's Audacious Plan to Rescue the Iran Hostages



BILL KOLB

MONDAY DOCENT

Editor's Note: We just read about the use of JATO bottles in WWII. What follows is an extreme example of jet-assisted take-off and landing, where, in 1980, three Lockheed C-130s were fitted with 30 solid fuel rockets each in an effort to free the American hostages held by the Iranian government. It never came to fruition, but it is still a fantastic adaptation of standard equipment for an extraordinary mission.

In the aftermath of the Iran Hostage Crisis—beginning November 4, 1979, with the seizure of the U.S. Embassy in Tehran and 52 Americans—the failed Operation Eagle Claw in April 1980 revealed severe limitations in helicopter-based extraction, including mechanical issues and a fatal collision killing eight servicemen. This spurred contingency efforts under Operation Honey Badger, leading to Operation Credible Sport: a fixed-wing solution using radically modified Lockheed C-130H Hercules for extreme “Super STOL” capabilities.

Three C-130H airframes (serials 74-1683, 74-2065, and 74-1686) from the 463rd Tactical Airlift Wing were selected in late 1980 for urgent upgrades by a joint Air Force-Navy-Lockheed team at Eglin Air Force Base, Florida. The aim: land in Tehran's Amjadieh Stadium—opposite the embassy—to embark Delta Force operators and hos-

tages after the raid, then extract without helicopters or remote airfields.

Approximately 30 solid-fuel rockets were installed in clusters:

- Eight forward-facing ASROC rockets on the forward fuselage for retro-braking.
- Eight downward-facing Shrike rockets above the wheel wells to arrest descent.
- Eight rearward-facing MK-56 rockets on the lower rear fuselage for takeoff thrust.
- Paired Shrikes on wing pylons for yaw stability.
- Additional ASROCs at the tail to prevent over-rotation.

Additional features included double-slotted flaps, extended ailerons, dorsal/ventral fins, a tailhook for possible carrier recovery, and advanced avionics like terrain-following radar and inertial navigation from the MC-130E Combat Talon.

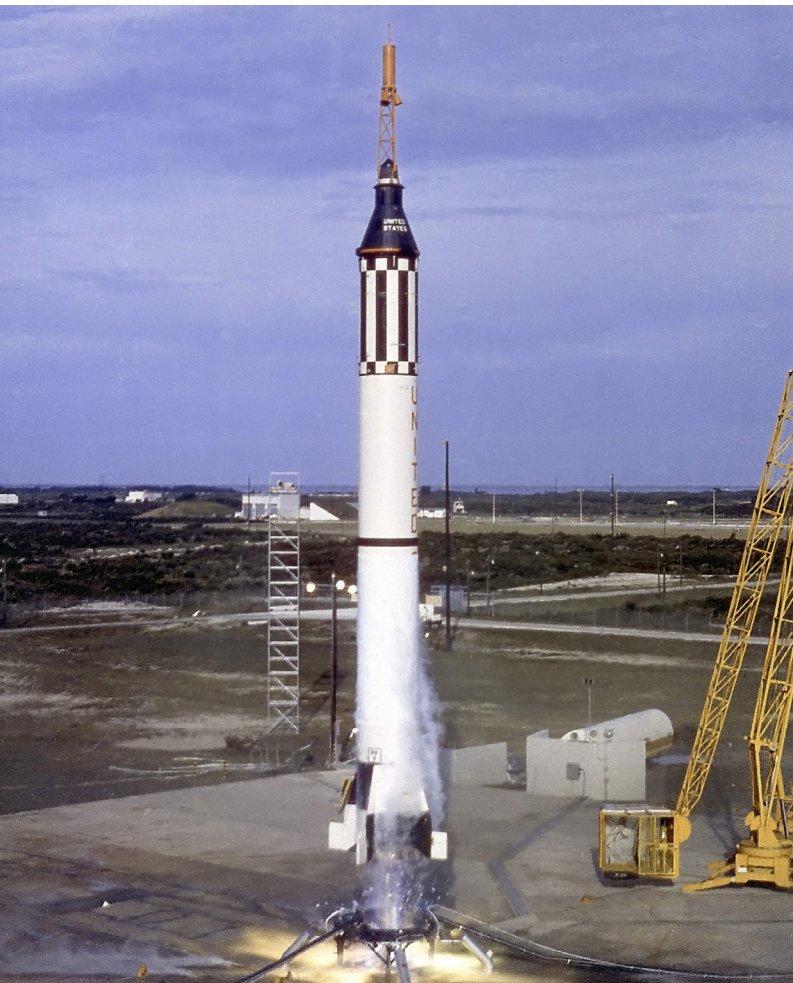
The concept involved two modified C-130s flying low-level from the U.S., refueling multiple times, infiltrating at night, extracting from the stadium, and potentially recovering to a carrier.

Testing started in the fall of 1980. On October 29, the first fully modified aircraft (74-1683) crashed at Duke Field when retrorockets ignited prematurely, causing a hard landing and destruction—crew unharmed.

Diplomatic advances intervened: Iran's parliament approved an Algerian-mediated release on November 2, 1980, amid Ronald Reagan's election. Hostages were freed on January 20, 1981, canceling Credible Sport.

Surviving airframes were demilitarized; one resumed standard service, while 74-1686 became the prototype for the MC-130H Combat Talon II via Credible Sport II. Though unused in Iran, the effort advanced STOL techniques and shaped special operations aviation. ➤

The Mercury-Redstone Rocket: From Battlefield Missile to Space Pioneer



BILL KOLB

MONDAY DOCENT

The Mercury-Redstone rocket stands as a pivotal bridge between U.S. military rocketry and human spaceflight. Developed amid Cold War tensions, it originated as the Redstone missile, America's first operational intermediate-range ballistic missile (IRBM), before being adapted for NASA's Project Mercury to launch the nation's initial astronauts on suborbital trajectories. This evolution highlighted the dual-use nature of rocket technology, transforming a weapon designed for nuclear delivery into a vehicle for peaceful exploration.

The Redstone's roots trace to post-World War II efforts, when German rocket scientists, led by Wernher von

Braun, relocated to the U.S. under Operation Paperclip. In 1950, the team moved to Redstone Arsenal in Huntsville, Alabama, where they built upon V-2 designs to create a surface-to-surface missile capable of carrying a 6,900-pound payload over 200 miles. The rocket, named Redstone in 1952, featured a single-stage design with a Rocketdyne NAA 75-110 A-7 engine producing 78,000 pounds of thrust for 117 seconds, using liquid oxygen (LOX) and alcohol propellants. Its aluminum fuselage included pressurized tanks, stabilizing fins, and carbon jet vanes for control. Chrysler served as prime contractor, with the first test flight occurring on August 20, 1953, at Cape Canaveral.

As the Space Race intensified after Sputnik's 1957 launch, NASA formed Project Mercury in October 1958 to achieve manned orbital flight. The Army agreed to supply Redstone variants for suborbital tests, funding eight vehicles in January 1959. "Man-rating" the missile for human safety involved extending the propellant tanks by 6 feet, lightening the structures, and boosting thrust to 78,000 pounds for a 143.5-second burn, enabling a 100-nautical-mile apogee with a 2-ton payload.

The rocket's legacy culminated in its role as the launch vehicle for America's first two manned suborbital missions. On May 5, 1961, MR-3 propelled Alan Shepard aboard Freedom 7 to an altitude of 116.5 miles in a 15-minute flight, reaching 5,180 mph. Shepard manually controlled the attitude, validating human performance in space despite Soviet Yuri Gagarin's prior orbital feat. MR-4 on July 21, 1961, launched Virgil "Gus" Grissom on Liberty Bell 7 to 118 miles, but recovery complications arose when the hatch prematurely blew, sinking the capsule. These flights demonstrated life support, reentry, and recovery operations, paving the way for orbital Mercury-Atlas missions.

The Mercury-Redstone exemplified technological repurposing, from ICBM origins to enabling the U.S. to enter the manned space era. Deactivated in 1964, its success bolstered NASA's Apollo ambitions, underscoring rocketry's shift from warfare to wonder. ✈



Operation Paperclip: Recruiting German Expertise for Postwar America

BILL KOLB

MONDAY DOCENT

Operation Paperclip was a secret U.S. intelligence program that recruited over 1,600 German scientists, engineers, and technicians after World War II to bolster American military and technological capabilities during the emerging Cold War. Initially code-named Operation Overcast in July 1945 by the Joint Chiefs of Staff, it aimed to exploit German advancements in rocketry, aeronautics, and other fields while denying them to the Soviet Union.

As Allied forces advanced into Germany, U.S. teams located key figures like rocket pioneer Wernher von Braun and his Peenemünde team, who had developed the V-2 ballistic missile. In May 1945, von Braun surrendered to American troops, and soon after, he and about 125 colleagues were brought to the United States under military custody. President Harry Truman approved the expanded program in September 1946, despite initial directives excluding active Nazis, leading to altered records—hence the “paperclip” name attached to sanitized dossiers.

The recruits, including von Braun, Kurt Debus, and Arthur Rudolph, initially worked at Fort Bliss, Texas, and White Sands, New Mexico, testing captured V-2s and developing guided missiles for the Army. In 1950, von Braun’s group relocated to Huntsville, Alabama’s Redstone Arsenal, where they designed the Redstone rocket, precursor to NASA’s launch vehicles. By 1960, the team transferred to NASA’s Marshall Space Flight Center, with von Braun as director. Their expertise proved instrumental in the Saturn V rocket, enabling the Apollo program’s lunar landings, including Apollo 11 in 1969.

Beyond rocketry, Paperclip scientists advanced jet propulsion (e.g., Hans von Ohain), aerodynamics, and aerospace medicine, contributing to U.S. superiority in aviation and space. The program, managed by the Joint Intelligence Objectives Agency, brought families for long-term integration, with many recruits becoming citizens.

Operation Paperclip accelerated American progress in critical technologies, helping secure advantages in the Space Race and Cold War defense. While controversial for overlooking past affiliations, it harnessed wartime innovations for peaceful and strategic gains, shaping modern rocketry and exploration. ➤

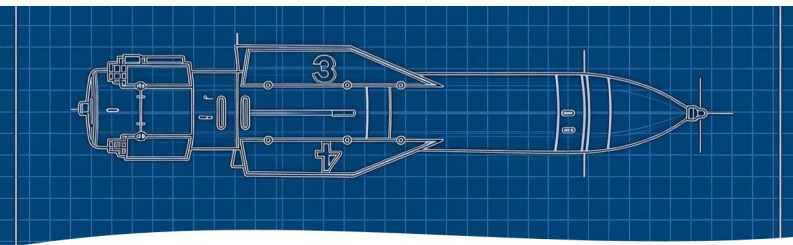
The GBU-57 Massive Ordnance Penetrator Coming to a Museum Near You



BILL KOLB

MONDAY DOCENT

In late January, EASM will be receiving a mock-up of the GBU-57 Massive Ordnance Penetrator (MOP), used for the first time in the U.S. Air Force attack on Iran's deeply buried Fordow Nuclear Fuel Enrichment Plant last June. Officially called a Technical Specimen, the GBU-57 is a full-scale inert version of the bomb, which is over 20 feet long. It will be displayed in the East Pavilion.



A Little Background

The GBU-57 MOP is the U.S. Air Force's most powerful non-nuclear bunker-buster bomb, designed to destroy deeply buried and heavily fortified targets like underground nuclear facilities or command bunkers. It represents a critical conventional capability for defeating hardened targets, bridging the gap between standard bombs and nuclear options.

Boeing developed it in the early 2000s under the "Big BLU" program, responding to lessons from the 2003 Iraq

War, where earlier penetrators proved insufficient. The MOP reached initial operational capability in 2011, with ongoing upgrades through variants such as the GBU-57F/B.

Key Specifications

- Weight: Approximately 30,000 pounds
- Length: 20.5 feet
- Diameter: 31.5 inches
- Warhead: 5,300–5,700 pounds of high explosives

Its casing uses a special high-performance steel alloy to withstand extreme impact forces, enabling penetration of up to 200 feet of earth or significant reinforced concrete before detonation. Guidance is provided by GPS-assisted inertial navigation, with lattice-grid fins for precise control and a smart fuse (Large Penetrator Smart Fuse) that optimizes explosion timing based on depth and target structure. (Think: Decelerometer)

Only the B-2 Spirit stealth bomber can carry it (up to two per aircraft), though the new B-21 Raider will soon be compatible. The bomb's massive size limits its use to strategic, high-value targets.

(CONTINUED NEXT PAGE)

The GBU-57 Massive Ordnance Penetrator Coming to a Museum Near You

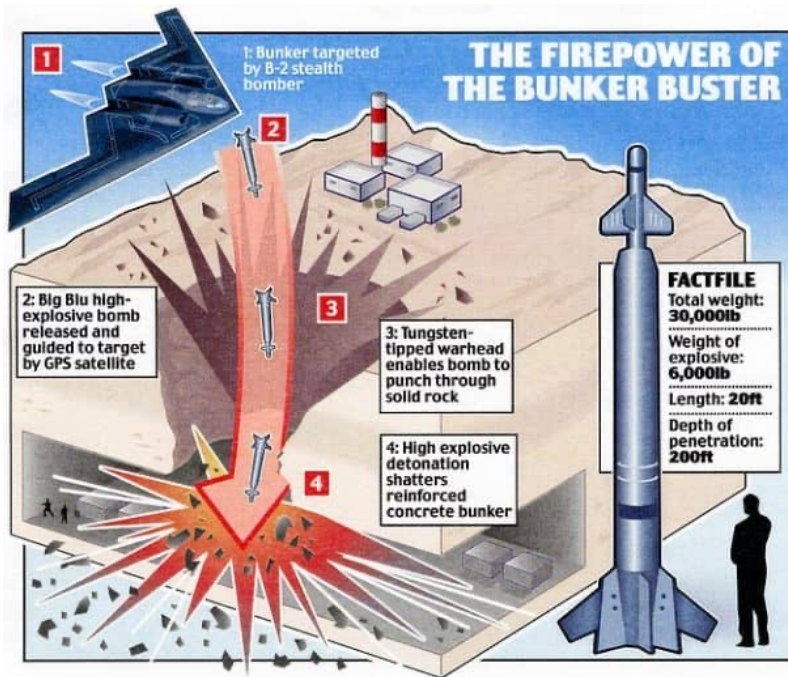
(CONTINUED FROM PREVIOUS PAGE)

Operation Midnight Hammer

After more than two decades of development and testing, the GBU-57 saw its first combat use during Operation Midnight Hammer on the night of June 21–22, 2025. Seven B-2 Spirit bombers, launched from Whiteman Air Force Base in Missouri, flew a round-trip mission exceeding 30 hours, supported by over 125 tankers, electronic warfare, and fighter aircraft, plus Tomahawk cruise missile strikes on supporting infrastructure. A total of fourteen MOPs were released, with the majority targeted against the deeply buried Fordow Fuel Enrichment Plant and the remainder against Natanz. The operation achieved complete tactical and strategic surprise; no defensive intercepts were reported. Subsequent Pentagon assessments confirmed significant degradation of Iran's underground nuclear capabilities, validating the weapon and the concept of long-range stealth precision strike.

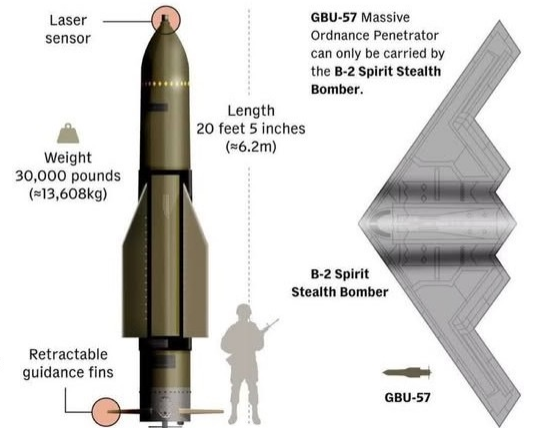
Currently, the U.S. Air Force is developing a successor to the Next Generation Penetrator (NGP) to address evolving threats and potentially enable broader platform integration.

The GBU-57 represents a critical conventional capability for defeating hardened targets, bridging the gap between standard bombs and nuclear options. ➔



A look at the US' bunker-buster bomb

Officially known as the GBU-57 Massive Ordnance Penetrator, the bomb is designed to target deeply buried and fortified facilities, including bunkers and tunnels.



The Titan II Rocket: Guardian of the Cold War and Gateway to the Stars



BILL KOLB

MONDAY DOCENT

In the shadow of escalating Cold War fears, the Titan II rocket emerged as a formidable force in America's arsenal. Developed by the Martin Company (later Martin Marietta) starting in 1958, with Air Force approval in October 1959, this liquid-fueled behemoth was designed primarily as an intercontinental ballistic missile (ICBM). Standing 103 feet tall and 10 feet in diameter, it carried a W-53 thermonuclear warhead with a 9-megaton yield—over 600 times more potent than the Hiroshima bomb. Powered by Aerojet LR-87 and LR-91 engines using hypergolic storable propellants (aerozine-50 and nitrogen tetroxide), it could launch from underground silos in under a minute, reaching targets 9,000 miles away. The

first test launch occurred on March 16, 1962, from Cape Canaveral, and by 1963, 54 missiles were deployed across bases in Arizona, Arkansas, and Kansas. These ICBMs stood vigilant until 1987, embodying deterrence amid nuclear brinkmanship.

Yet, the Titan II's legacy transcended warfare. As the Space Race ignited, NASA repurposed it as the Gemini Launch Vehicle (GLV), or Titan II GLV, for the Project Gemini program from 1964 to 1966. Modifications included removing the warhead, adding a second-stage guidance system, and enhancing safety features, such as redundant systems, to “man-rate” it for astronauts. The first unmanned test, Gemini-Titan 1, lifted off on April 8, 1964, validating the design. The Titan II eventually powered all 10 manned Gemini missions, enabling breakthroughs like spacewalks, rendezvous, and docking—crucial rehearsals for Apollo. On March 16, 1966, Gemini 8 with Neil Armstrong and David Scott achieved the first orbital docking, despite a thruster malfunction forcing an early return. The Titan II's reliability, with 12 successful launches, propelled America toward the Moon.

President Reagan initiated the 1981 Strategic Forces Improvement Program, which saw the deactivation of all Titan II ICBMs from 1982 to 1987. The USAF asked Martin Marietta Astronautics to modify 14 of the former Titan II ICBMs to carry payloads weighing up to 4,000 pounds into low-Earth orbit. The first Titan II Space Launch Vehicle (SLV) was launched from Vandenberg on September 5, 1988. [The Titan II SLV was also known as the Titan 23G and the Titan II(23)G.] The USAF successfully launched 13 of the 14 Titan II SLVs before the program ended. The Titan II in the East Pavilion was the 14th SLV. It was donated by the USAF to EASM shortly after the program ended in later 2003. The Museum excavated a 100-foot-deep silo exhibit to display the rocket vertically, complete with an authentic launch-control-room simulator that lets visitors experience a mock countdown. It is the only intact Titan II SLV on public display, preserving its dual history as both nuclear sentinel and space pioneer. ➤

Collections Mystery Corner

BILL KOLB

MONDAY DOCENT

In this and future editions of the FlightPlan, Collections will provide a picture of an artifact/item for which they have no idea what it is, how it came about, or where it originated.

Readers are encouraged to provide Collections with their best answer/guess by responding to Jean Herkamp at: jean.herkamp@evergreenmuseum.org.

The following month, Collections will provide the answer or the best-guess submissions. ➤

THIS MONTH'S MYSTERY IS:



Band of Brothers



The McMinnville, Oregon Band of Brothers meets on the **first Thursday of each month** in the large glass-walled room to the left of the primary admissions desk in the West Pavilion (formerly the Aviation Museum). **Meetings run from 11:30 am to 12:30 pm**, with coffee and cookies served. More details can be found at the group's **Facebook page: <https://www.facebook.com/groups/838928846550343>**

JOHN BURLESON

COLLECTIONS & SUNDAY DOCENT

JANUARY 8

The January speaker will be Kellie Menke, a former McMinnville City Councilor who served for 20 years. She will share experiences about her time on the Council and her public service for the city.

FEBRUARY 5

Our speaker for February will be Gary Sohn. Gary is a long time docent at the Museum, assigned to the East Pavilion/Space Museum building. Gary's presentation will be on the Lockheed SR-71 *Blackbird*.



Remembering Malcolm Tabor

1945 - 2025



BILL KOLB

MONDAY DOCENT

Malcolm Donald Tabor, a beloved and dedicated member of the Evergreen Aviation & Space Museum community, passed away peacefully on December 15, 2025, at the age of 80.

Born on October 1, 1945, Malcolm became a fixture at the Evergreen Aviation & Space Museum after joining in the early 2000s. His commitment and passion for aviation shone through in every role he embraced. He faithfully served as a docent and day captain, sharing his knowledge and enthusiasm with countless visitors. Malcolm's leadership extended to the Board of Directors, where he served as a member from 2012 to 2016, Vice Chair from 2017 to 2019, and Member Emeritus from 2020 until his passing. In June 2017, he also served as Chair of the Board of Captains, guiding his fellow volunteers with steadiness and care.

To his many friends and colleagues at the Museum, Malcolm was known as dependable, smart, and quick-witted. He was fun to be around and, above all, a genuinely nice man whose warmth and kindness touched everyone he met.

A memorial service to celebrate Malcolm's life and legacy will be held on February 14, 2026, at 1:00 p.m. at The Lodge.

Malcolm's presence will be deeply missed, but his contributions to the museum and the lives he enriched will endure. ✈



MUSEUM MISSION

Evergreen Aviation & Space Museum is a force of curiosity and courage for kids of all ages to gain the confidence to take flight.

NOVEMBER FLIGHTPLAN NEWSLETTER CONTRIBUTORS

EDITOR: BILL KOLB BILL@KOLBVINEYARDS.COM
FEATURE WRITERS: BILL KOLB, SCOT LANEY
LAYOUT: ROB ZEH

.....

EMAIL SUBMISSIONS TO: FLIGHTPLAN@EVERGREENMUSEUM.ORG