FlightPlan

A VOLUNTEER NEWSLETTER BY VOLUNTEERS

Los Angeles Times

DAILY 10¢

84 PAGES

MONDAY MORNING, JULY 21, 1969

VOL. LXXXVIII FIVE PARTS—PART ONE

MAN WALKS ON THE MOON

'Small Step for Man... Giant Leap for Mankind'

EVERGREEN AVIATION & SPACE MUSEUM

VOLUME 12
ISSUE 7
JULY 2025

FROM THE EDITOR

This month's FlightPlan is a few pages longer than our standard length. We needed the extra room to tell the broader story of the Apollo program. We hope you enjoy this month's offering. Next month's focus will be on our Restoration activities.

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.

JULY..APOLLO
AUGUST ....RESTORATION
SEPTEMBER..............................DRONES
OCTOBER.................................COLLECTIONS

GUIDELINES FOR SUBMITTING AN ARTICLE TO THE FLIGHTPLAN NEWSLETTER

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

The June 4 BOC meeting was a busy one 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 volunteers that we need their best effort every day. Visitors rely on our engagement with them, our expertise, our enthusiasm for the Museum and an exceptional visitor experience.
- Museum displays will be changing often to provide a fresh visitor experience.
- Asked that Scott Malandrone be invited to Board of Captains meetings as a staff member.

Terry Howell – Chief Operating Officer

- The Friday, June 13 SR-71 Symposium has sold out.
- The VC-9 "Air Force Two" outside the East Pavilion is in the process of being cleaned up and aired out. Existing mold will be remediated. It should be available for tours this summer season.
- The D-21 drone in the East Pavilion and the accessory equipment for the SR-71 are being moved to accommodate the SR-71 celebration on Father's Day weekend.
- The Apollo Command Module has been lowered to floor level. It is temporarily resting on tires. A permanent resting base will be forthcoming.
- The north parking lot will be cleaned. Cement blocks will be placed so that visitors cannot drive up to the aircraft displayed on the lot.
- The East Pavilion floor is in the process of being refurbished, with some tiles being replaced.
- An iPad-based logging system has been put in place for Spruce Goose tours. Each booking is shown on a monitor placed in the Goose cargo area. Scot Laney has also asked that each booked tour be called up to the Goose tour docents as a reassurance to the visitors.
- Nine helicopters will participate in a fly-in on Friday, June 6.
- Don Keller will set up an information table by the C-47 in the West Pavilion as a part of a D-Day celebration on Friday, June 6.

Training Officer's Report

- The docent recruitment report was reviewed.
- Dan Oven will attend future orientation sessions to encourage candidates to join the Saturday and Sunday crews.
- Kudos to Ron Williamson for an excellent job.
- Saturday docent Mike Duncan has offered to help with the orientation sessions.

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CAPTAINS CORNER

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Old Business:

- Jerry Sauter led a discussion about problems with the new two-way radios. Most of the issues have occurred because of docent's experimenting with the various functions. It was decided that all radios would be permanently set to Channel 1 to avert future problems.
- A discussion of the John Rasmussen Award criteria presented by Jean Herkamp was held, and the criteria were approved as written. It was additionally decided that the Award Year would run from November 1 through October 31. Nominations will be held at the November Board of Captains meeting, and the final decision will be made at each December BOC meeting. The award will be presented at an annual Volunteer Dinner, tentatively set for January.
- Year of the Volunteer: It was discovered that Collections and Restoration do not adhere to a 50-hour training program. They may do so if they wish. They should also submit completed training files to the Training Officer so that their new volunteers can receive completion certificates.
- Dan Oven also assigned review and updating of an old PowerPoint Museum presentation to Vice Chair Jerry Sauter.
- The DVD collection of Museum artifacts and information is being digitized. Four have been done thus far and will be shown on a rotating basis at the Galaxy Theater in the West Pavilion.

New Business:

- Weekend crew assistance schedule has been revised to October, emphasis placed on Saturday with the Day Captain out from June 21 to July 27.
- An emphasis on building up the numbers of volunteers on the Saturday and Sunday crews has been launched and will continue.
- DC-3 tours and signage: The DC-3 area in the West Pavilion has been reorganized for convenience and a neater look. All Day Captains were reminded that a docent is to accompany any guests entering the DC-3's fuselage area. No guests are allowed inside the aircraft without a docent. Guests are not allowed to sit in the seats or in the cockpit.

Other Business:

- Barry Brown announced that the Curation Collaboration Form is being revised and will be a one page document.
- A celebration of life for former docent Dick Kyle will be held on June 21
- The next volunteer orientation session will be on Tuesday, June 24.

The meeting was adjourned at 11:17am.

Imagining the Space Race without the Moon


"All the News That's Fit to Print"

The New York Times.

LATE CITY EDITION

Cloudy and cool today and tonight. Mostly fair tomorrow.

VOL. CVII . . No. 36,414. NEW YORK, SATURDAY, OCTOBER 5, 1957. FIVE CENTS

SOVIET FIRES EARTH SATELLITE INTO SPACE; IT IS CIRCLING THE GLOBE AT 18,000 M. P. H.; SPHERE TRACKED IN 4 CROSSINGS OVER U. S.

HOFFA IS ELECTED TEAMSTERS' HEAD; WARNS OF BATTLE

Defeats Two Foes 3 to 1 —Says Union Will Fight 'With Every Ounce'

COURSE RECORDED

Navy Picks Up Radio Signals—4 Report Sighting Device

By WALTER SULLIVAN

WASHINGTON, Saturday, Oct. 5—The Naval Research Laboratory announced early today that it had recorded four crossings

560 MILES HIGH

Visible With Simple Binoculars, Moscow Statement Says

By WILLIAM J. JORDEN

MOSCOW, Saturday, Oct. 5—

SCOT LANEY
MUSEUM CEO

If October 4, 1957 started like any other day it certainly didn't end like one. Surprise, the Soviets put the world on notice that day that they could launch a not especially handsome little sphere into earth orbit. Not only that, but the little blob also emitted a somewhat annoying little beep for all to hear. Translated from Beep to English (as if that was possible) those beeps said, repeatedly:

"Just think, I could be an atomic weapon, and I could be parked right on the White House steps."

At least that was the take home from a now very worried United States government. Not to mention most other governments in the free world.

So virtually overnight the entire U.S. space program was reconstructed into a tit for tat rocket (read ICBM) demonstration. We had to prove to the Soviets that our ICBM technology was up to the task of bouncing our own atomic weapon off the wall of the Kremlin, maintaining the horrific yet necessary balance of MAD. To not add a new level of stress to an already deeply concerned public why not cloak the whole thing in something grand? Why not shoot for the moon? That way we could develop increasingly more capable space rockets that, naked of the NASA markings, were just more capable ICBMs.

Genius!

But what if Sputnik never went up? What would the space program have looked like? Likely it would have been a continuation of the X-plane project. The X-15 was a capable space vehicle and the next X-planes that were being developed were even more so. Would we even have gone to the moon? It's doubtful since the moon really played a proxy role in the rocket program, the right goal to distract the public from the fact that we were really taking the opportunity to up our "destroy the entire world if necessary" game in the hope that, because we could, no one ever would. Such were the times.

Eventually we did build that next generation X-plane. We called it the Space Shuttle.

Once we worked through the whole rocket thing.

The Caterpillar Club/ Martin Baker "Tie Club"

DON BOWIE
WEDNESDAY DOCENT

The Caterpillar Club is an informal association of people who have successfully used a parachute to bail out of a disabled aircraft.

After authentication by a parachute maker, applicants receive a membership certificate and a distinctive lapel pin.

The club was founded by Leslie Irvin of the Irvin Airchute Company of Canada in 1922. The name "Caterpillar Club" refers to the silk threads that made the original parachutes. There are more than 100,000 members. In 1932, Fay Gillis Wells became the first woman member when she bailed out of her airplane.

On November 14, 1969, Museum Docent Don Bowie became a member when he ejected from a "Flamed Out" F-4E at 120 feet while travelling at 100 Knots. It is estimated that the time from when Don pulled the handle to when he was on the ground was approximately eight seconds. Don says he remembers the canopy leaving, but he was pulling approximately 15 "Gs" when the seat fired, so he does not remember leaving the jet.

The F-4 has the Martin Baker H7 Rocket Ejection Seat with the parachute mounted on top of the seat. The pilot and the back-seater (either a Radar Intercept Officer [Navy] or Weapon Systems Officer [Air Force]) wear a harness out and strap themselves into the seat. To eject, they pull the ejection handle, and the canopy blows off. The seat fires, a guillotine cuts all their straps, they are then separated from their seats, and the parachutes automatically open. They only have to remember to hang on for the landing.

The first seat was designed by Martin Baker in 1946. Since then, more than 7,767 lives have been saved, and those individuals have become members of the Martin Baker "Tie Club." Members get a specially designed MB tie, pin, patch, and a certificate. Don was member 5441.

For the record, Don logged more than 1,000 hours in the F-4.


CATERPILLAR CLUB

Membership Certificate

This is to certify that

MAJOR DONALD A. BOWIE

Is a member of the Caterpillar Club whose life was spared the 14 th day of NOVEMBER 1969 because of an emergency parachute jump from an aircraft. This certificate is bestowed to the end that this safety medium in the art of flying may be furthered.

CATERPILLAR CLUB


Martin-Baker

Tie Club

This is to certify that

Donald A. Bowie

made a successful emergency ejection on

14th Nov 1969

using a H7 ejection seat and is therefore duly enrolled as the

5441st

member of the Martin-Baker Tie Club

Club Secretary

T-38 Talon

DAN GOODRICH
MONDAY DOCENT/USAF T-38 INSTRUCTOR PILOT FROM 1970-1973

The T-38 Talon (East Pavilion) has been the U.S. Air Force's advanced jet trainer since the early 1960s. It is still the primary trainer used to train today's pilots for advanced jet fighters. Let's take a quick review of why and how the plane was first developed, review some of its performance capabilities, how the plane is used for pilot training, and how the plane is used in other roles by the Air Force, the Navy, and NASA.

In the mid-1950s, Northrop and General Electric joined to develop a lightweight high-performance fighter. The concept was for this plane to become a primary fighter for Allied air forces in Europe and Asia. At that time, the engines being developed for US fighter planes typically weighed 3,000 lbs. or more. The aircraft often weighed over 30,000 lbs. when fully fueled and armed. The T-38 engines (General Electric J-85), including afterburners, weighed just 500 lbs. The fully fueled T-38 weighed 12,000 lbs. It is light, quick, and fast.

The fighter version of the T-38 is the F-5. (The Museum has an F-5E Tiger II on display in front of the West Pavilion.) While it was used in Vietnam, it was not highly valued by USAF leaders who wanted planes capable of carrying heavier weapon systems with longer loiter times over enemy target areas. That view was shared with many of our allied countries, though over 30 countries included F-5s in their inventory. The plane was not destined to be a frontline fighter, even though its performance capabilities were impressive with a top speed of Mach 1.5 and a ceiling of over 50,000 ft.

The USAF wanted a supersonic trainer for all new pilots. The idea was to train pilots so well that they could fly any aircraft in the USAF inventory. The T-38 was ideal for that mission. Its tandem seating enabled students to become well-trained for single-seat fighters, and its capabilities allowed for training skills essential in all types of aircraft. After basic jet training in the T-37, students received six months of training in the T-38 before getting their Wings. Training included supersonic flight, aerobatics with restricted air space requirements, instrument flying, night flying, two-ship and four-ship formation flying, basic Air Combat Maneuvering (ACM), and navigational missions at both high and low levels to different military bases. Flying the plane was not easy. It required intensive planning for each flight because the aircraft was fast, and things happened fast. It could climb to 42,000 ft. in 90 seconds from takeoff. It was designed for 7 Gs, and many aerobatic maneuvers, and some ACM required precision flying at the design limits of the plane.

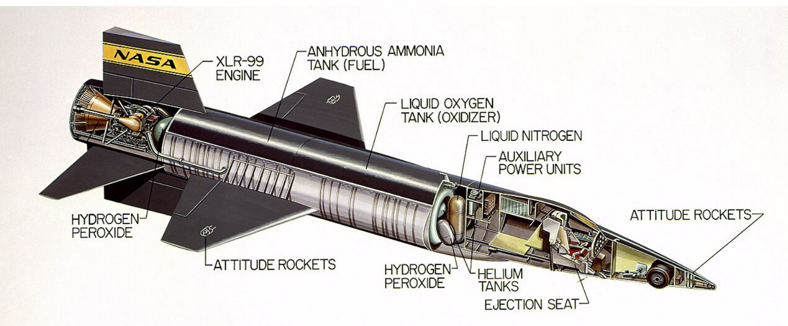
Today's T-38s are the C model, and they include heads-up displays and GPS navigation systems that prepare pilots for our advanced fighters.

The Air Force uses T-38s and F-5s for dissimilar aircraft fighter training in its Red Flag training. They are the primary aircraft used by the Aggressor Squadron for top USAF and allied Air Force pilot ACM training. The USAF Thunderbirds flew the T-38 before moving to F-16s. SR-71 pilots have also used T-38s to keep their flying skills keen between SR-71 missions. The Navy uses them for dissimilar ACM work for its fighter pilots, much like the Air Force. NASA has long used T-38s for astronaut training. When Deke Slayton was the Chief of Astronaut Training, he said he liked the plane because it forced astronauts to think quickly to keep up with it, which was excellent training.

X-15

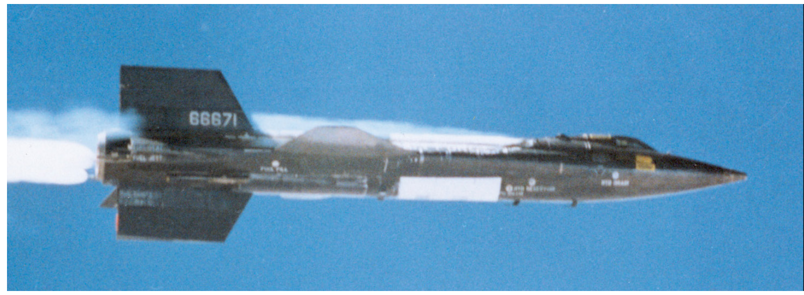
ALAN DEUTMEYER
MONDAY DOCENT

I am privileged to spend my Mondays as a Docent in the East Pavilion of Evergreen Aviation & Space Museum. Many of our visitors love checking out the SR-71, awed by the speed and altitude at which it famously flew. But inevitably, many look up at the X-15 and ask me, "And what was the X-15 used for? It looks fast! Chuck Yeager flew it, right?!"



The North American X-15, a hypersonic rocket-powered aircraft, was a technological marvel of its time. Fueled by the XLR99 engine, it used a combination of liquid oxygen and ammonia to produce 57,000 pounds of thrust, achieving speeds of up to Mach 6.7 (4,520 mph) and altitudes exceeding 67 miles, reaching the edge of space. Its airframe, constructed from titanium and Inconel-X, was designed to withstand extreme heat. The X-15 featured a reaction control system with hydrogen peroxide thrusters for high-altitude maneuvering, serving as a precursor to the controls used in spacecraft. Its inertial navigation system and early computer-based flight controls were cutting-edge, delivering precise data across 199 flights.

I enjoy discussing the X-15 with our visitors, focusing not only on the technical aspects of the plane but also on the impact it had on our fledgling space program and the experience gained by its pilots during test flights. Yes, it flew fast – 4,520 mph on October 3, 1967, piloted by Pete Knight - but it also flew high, reaching 354,200



feet on August 22, 1963, piloted by Joe Walker. To many, it truly was more of a space plane than an airplane. It did fly quickly, but more importantly, it reached such heights that it ventured into space! Learning how to control a vehicle operating outside the atmosphere was critical to the space program, not just for the technical advancements but also for the experiences of flying in little to no atmosphere.

Unfortunately, Chuck Yeager did not fly the X-15, despite his desire to do so. For one X-15 flight, he was assigned as co-pilot of the B-52 mothership, but cloud cover forced an abort; that's as close as he ever came to flying the X-15. However, other notable pilots gained valuable experience flying the X-15 to the edge of space. By the time of the Apollo 11 lunar landing, thirty-one American astronauts had flown into space, and the astronaut-pilots of the X-15 accounted for eight of those thirty-one. It should be noted that there are two different definitions for what qualifies as astronaut-rated space flight. The U.S. Armed Forces defines space as beginning 50 miles above the Earth. However, the Fédération Aéronautique Internationale, which governs aerospace records, designates space as being 100 kilometers (62.14 miles) above the Earth, also known as the Kármán Line. Using the FAI definition of space, Joe Walker is the only X-15 pilot to meet the requirements for the astronaut rating in two separate flights in the Summer of 1963. Interestingly, Neil Armstrong was not among the eight X-15 pilots who earned astronaut designation while flying the plane. His highest altitude in the X-15 reached a mere 207,500 feet, which is 56,500 feet short of qualifying as an astronaut in the X-15!

What Drove Us to the Moon

BILL KOLB
MONDAY DOCENT

The Mercury, Gemini, and Apollo programs, spanning 1958 to 1972, were NASA's response to intense geopolitical and domestic pressures during the Cold War, driven by the Soviet Union's Sputnik launch, fears of a missile gap, and the American political environment. These programs, culminating in the 1969 Moon landing, were motivated by the need to assert U.S. technological and ideological superiority.

Cold War Context and Sputnik's Impact

The Cold War, a global rivalry between the United States and the Soviet Union, framed space as a battleground for technological and ideological supremacy. The Soviet launch of Sputnik 1 on October 4, 1957, marked the first artificial satellite, shocking the U.S. and signaling significant Soviet advancements in rocketry. Sputnik 2, carrying the dog Laika (known as 'Muttnik' by the American Press), followed, amplifying fears that the Soviets could outpace the U.S. in space and military capabilities. These successes frightened American leaders, who viewed space as a measure of national prestige and scientific prowess.

Feared Missile Gap

Sputnik intensified concerns about a "missile gap," the perception that the Soviet Union had surpassed the U.S. in intercontinental ballistic missile (ICBM) development. The same rocket technology that launched Sputnik could deliver nuclear warheads, raising fears of Soviet military superiority. The 1957 Gaither Report, a classified U.S. study, warned of Soviet missile advancements, urging rapid development of U.S. rocketry. This fear drove the creation of NASA in 1958 and accelerated space programs to demonstrate missile parity through civilian achievements.

American Political Environment

The U.S. political landscape intensified the push for space programs. Sputnik ignited public panic and Congressional criticism of President Dwight D. Eisenhower's administration for falling behind in science and defense. Democrats, including Senator Lyndon B. Johnson, took advantage of the crisis to advocate for substantial space investment, framing it as a national security necessity. President John F. Kennedy's 1961 promise to land a man on the Moon by the end of the decade was a strategic effort to unify the nation and surpass Soviet achievements, such as Yuri Gagarin's orbital flight. Moon goal rallied bipartisan support for landing on the Moon.

Program-Specific Motivations

1. **Mercury** (1958–1963): Mercury aimed to place an American in space, countering the Soviet lead. Fueled by Sputnik and Gagarin's 1961 flight, Mercury's suborbital (Freedom 7, 1961) and orbital (Friendship 7, 1962) missions restored U.S. prestige

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What Drove Us to the Moon

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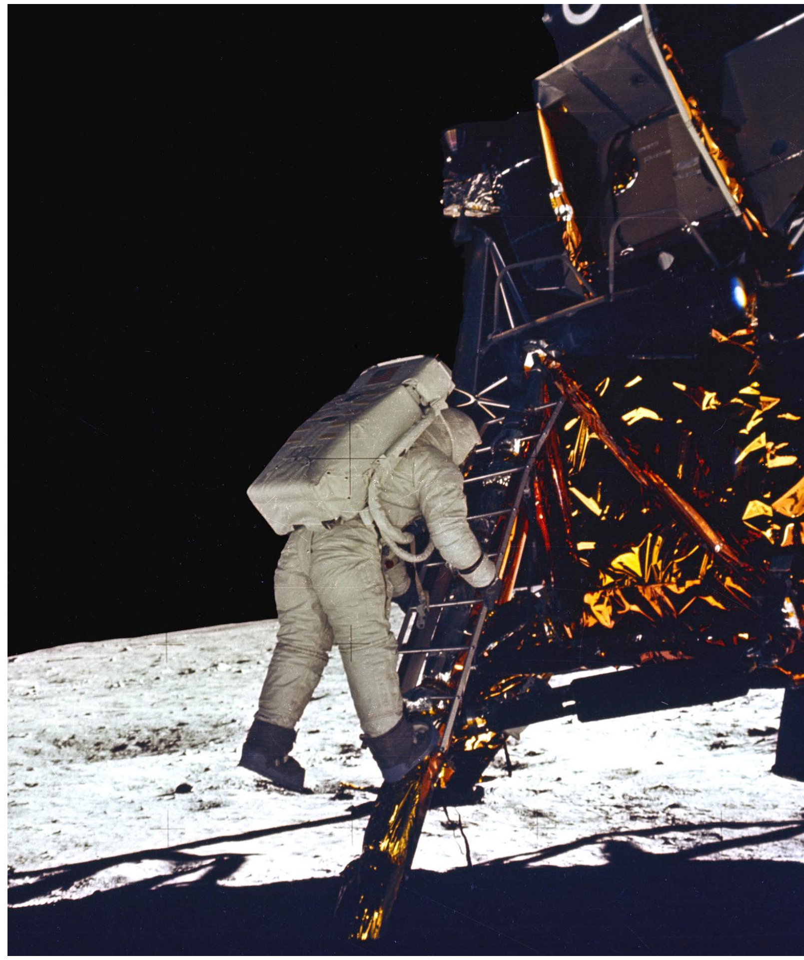
and demonstrated the viability of human spaceflight, alleviating fears regarding the missile gap by showcasing rocket reliability.

2. **Gemini** (1961–1966): Gemini was driven by the need to surpass Soviet spacewalk and endurance records. Its rendezvous, docking, and EVA successes (e.g., Gemini 4, 1965) demonstrated U.S. technical precision, reinforcing the credibility of missile technology and Cold War competitiveness.

3. **Apollo** (1961–1972): Apollo's lunar landing goal, set by Kennedy, was a direct response to Soviet milestones and domestic pressure for a defining victory. The Apollo 11 landing (1969) symbolized U.S. superiority, countering missile gap narratives with the Saturn V's power and fulfilling political promises.

Legacy

The Mercury, Gemini, and Apollo programs were fueled by Sputnik's wake-up call, missile gap anxieties, and Cold War rivalry, shaped by a political environment demanding action. These efforts not only achieved the Moon landing but also restored U.S. confidence, advanced technology, and redefined global perceptions of American capability.



The Rockets That Got Us There

BILL KOLB
MONDAY DOCENT

The Mercury-Redstone, Atlas, Titan II, and Saturn V rockets were central to NASA's Mercury, Gemini, and Apollo programs, each designed for distinct roles in the U.S. journey to the Moon from 1958 to 1972. These rockets varied in design, power, and mission scope, progressively enabling suborbital, orbital, and lunar flights. The Museum has both the Mercury-Redstone and Titan II rockets on display in the East Pavilion.

Mercury-Redstone Rocket

Design and Specifications: The Mercury-Redstone, adapted from the Army's Redstone missile, was a single-stage rocket, 83 feet tall and 5.8 feet in diameter. Its A-7 engine, using liquid oxygen and alcohol, produced 78,000 pounds of thrust, sufficient for suborbital flights up to 120 miles. It was simple and reliable for early human missions.

Use in Space Program: In Project Mercury, the Mercury-Redstone launched the first U.S. crewed flights: Alan Shepard's Freedom 7 and Gus Grissom's Liberty Bell 7. These 15-minute suborbital missions, carrying 4,000-pound Mercury capsules, tested astronaut performance and spacecraft systems, with Atlantic splashdowns proving the effectiveness of recovery methods. Its limited thrust restricted it to suborbital tasks.

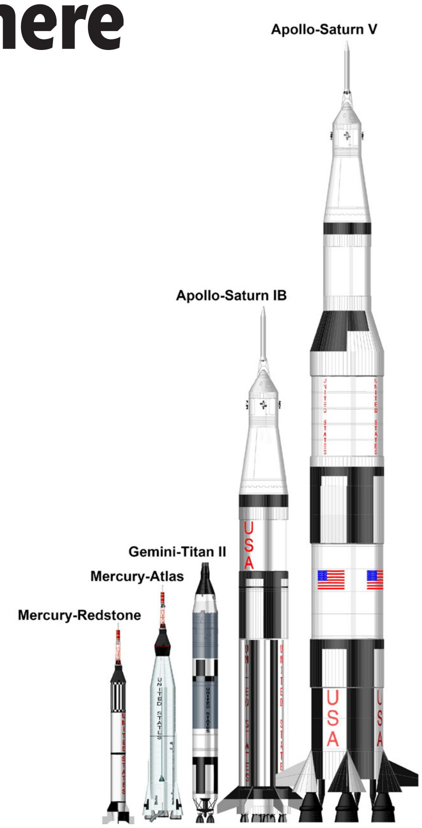
Atlas Rocket

Design and Specifications: The Atlas, an Air Force ICBM derivative, was a "stage-and-a-half" rocket, 75 feet tall and 10 feet in diameter. Its three engines used liquid oxygen and RP-1, generating 360,000 pounds of thrust. Its thin, pressurized structure demanded precision engineering.

Use in Space Program: Atlas powered Mercury's four orbital missions, including John Glenn's Friendship 7, the first U.S. orbital flight, and Gordon Cooper's 34-hour Faith 7. These flights tested endurance and orbital operations, with Atlas delivering Mercury capsules to orbits of 100–160 miles.
Its reliability overcame early test failures, ensuring mission success.

Titan II Rocket

Design and Specifications: The Titan II, an ICBM-based, two-stage rocket, stood 103 feet tall with a 10-foot diameter. Using hypergolic propellants, it produced 430,000 pounds (first stage) and 100,000 pounds (second stage) of thrust, lifting 7,700-pound payloads to Low Earth Orbit (LEO). Its storable fuels enhanced launch flexibility.



Use in Space Program: Titan II launched all 10 crewed Gemini missions, supporting two-person capsules for rendezvous, docking, and 14-day endurance flights. Its precision enabled orbits between 100 and 250 miles, critical for practicing lunar mission techniques. No launch failures underscored its dependability.

Saturn V Rocket

Design and Specifications: The Saturn V, a three-stage giant, was 363 feet tall with a 33-foot diameter. Its first stage, with five F-1 engines burning liquid oxygen and kerosene, delivered 7.5 million pounds of thrust. The second and third stages used liquid hydrogen and oxygen, lifting 310,000 pounds to LEO or 107,000 pounds to lunar orbit.

Use in Space Program: The Saturn V powered all Apollo crewed missions, six of which landed on the Moon. It also launched Skylab.

Bottom Line

Redstone ***started***, Atlas ***sustained***, Titan II ***refined***, and Saturn V ***achieved*** the Moon landing.

Project Mercury: America's First Step into Space

BILL KOLB
MONDAY DOCENT

Overview

Project Mercury (1958–1963), NASA's first human spaceflight program, marked the United States' entry into crewed space exploration during the Cold War space race, spurred by the Soviet Union's 1957 launch of Sputnik. As a precursor to the Gemini and Apollo programs, Mercury aimed to orbit a crewed spacecraft, study human performance in space, and ensure safe recovery. Its successes laid critical groundwork for the 1969 Moon landing.

Objectives

Mercury's goals were to place an American astronaut in orbit, evaluate human physiological and cognitive responses in microgravity, and safely recover both astronaut and capsule. Initiated under NASA in 1958, the program responded to President Eisenhower's call to counter Soviet space achievements. Mercury's achievements bolstered public confidence and technical expertise, aligning with President Kennedy's 1961 lunar ambition.

Key Milestones

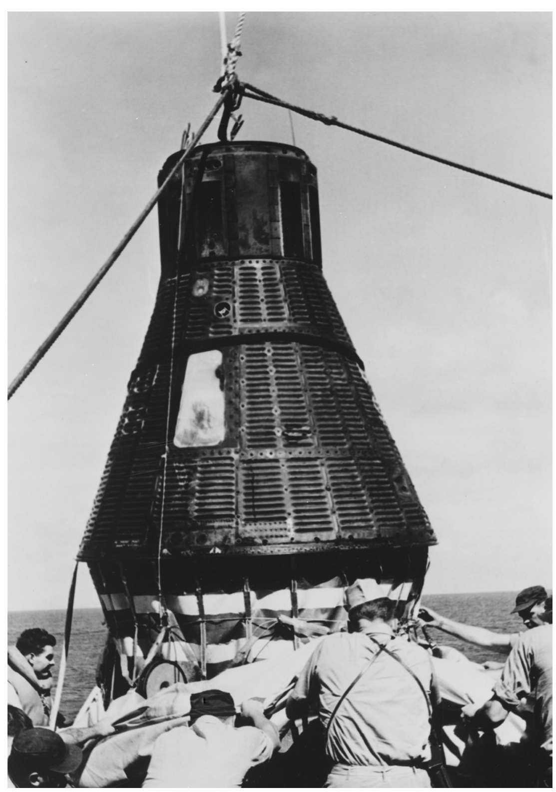
1. **First American in Space:** Alan Shepard's 15-minute suborbital flight on Freedom 7 (May 5, 1961) reached 116 miles on a Redstone rocket. Testing spacecraft systems and human response to weightlessness, Shepard's safe Atlantic splashdown validated recovery methods, which trailed Yuri Gagarin's orbital flight, but proved U.S. capability.
2. **First U.S. Orbital Flight:** John Glenn's Friendship 7 mission (February 20, 1962) saw him complete three orbits in five hours on an Atlas rocket. Despite a heat shield concern, Glenn's successful reentry confirmed spacecraft design and mission control, marking a key step toward lunar missions.
3. **Program Endurance:** Mercury's six crewed flights culminated in Gordon Cooper's 34-hour, 22-orbit Faith 7 mission (May 1963). These 54 total hours in space tested the reliability of both the astronaut and the spacecraft, building operational experience for longer lunar journeys.

Contributions to the Moon Landing

Mercury proved that humans could endure the physical demands of spaceflight, addressing unknowns about launch, weightlessness, and reentry. It developed essential technologies—heat shields, life support systems, and launch escape systems—later refined for use in Gemini and Apollo. Mission control and recovery protocols, honed through Mercury's flights, became templates for lunar missions.

Legacy

Mercury's six flights transformed the U.S. from space novices to serious contenders. Though modest compared to Gemini's rendezvous or Apollo's landings, Mercury's proof of concept and operational framework were vital. It paved the way for Gemini's advancements and Apollo's 1969 triumph, thereby cementing its role in the history of space exploration.



Project Gemini: Bridging Mercury to the Moon

BILL KOLB
MONDAY DOCENT

Overview

Project Gemini (1965–1966) was NASA's critical intermediate step between Mercury's basic spaceflight and Apollo's lunar landings. Focused on mastering techniques for the Moon mission, Gemini developed orbital rendezvous, docking, extravehicular activity (EVA), and long-duration flights. Its ten crewed missions provided the technical and operational foundation for Apollo's 1969 success.

Objectives and Context

Gemini was launched amid the U.S.-Soviet space race, following President Kennedy's 1961 Moon landing goal. Its objectives included perfecting spacecraft maneuvering, rendezvous and docking, EVAs, and extended missions to ensure astronaut endurance for lunar trips. Unlike Mercury's solo flights, Gemini's two-person capsules, launched on Titan II rockets, enabled complex operations with enhanced maneuverability and stability.

Key Achievements

1. **First U.S. Spacewalk:** During Gemini 4 (June 3, 1965), Ed White conducted the first American EVA, spending 23 minutes outside, tethered to the spacecraft. This validated EVA suits and procedures, proving that astronauts could work in space, which was essential for Apollo's lunar tasks.
2. **Orbital Rendezvous:** Gemini 6A and 7 (December 1965) achieved the first orbital rendezvous, with 6A maneuvering close to 7. This precision was vital for the Apollo Lunar Module's and Command Module's reconnection in lunar orbit, showcasing advanced navigation capabilities.
3. **First Docking:** Gemini 8 (March 1966), crewed by Neil Armstrong and David Scott, docked with an uncrewed Agena vehicle. Despite a thruster issue cutting the mission short, the docking confirmed techniques and hardware critical for Apollo's lunar profile.
4. **Long-Duration Flights:** Gemini 7's 14-day mission (December 1965) proved astronauts could endure the 10-day lunar round trip. Frank Borman and Jim Lovell tested life support and conducted experiments. Gemini 12's Buzz Aldrin logged over five hours of EVA, refining space work techniques.
5. **Operational Expertise:** Gemini's ten flights, involving 16 astronauts and over 970 hours in space, tested guidance computers, fuel cells, and reentry systems. Mission Control's real-time problem-solving, as in Gemini 8's emergency recovery, built confidence for Apollo's complexity.

Contributions to the Moon Landing

Gemini's advancements were indispensable for Apollo. Rendezvous and docking enabled the Lunar Module's return to the Command Module, while EVAs prepared astronauts for lunar surface tasks. Long-duration flights confirmed crew resilience, and Gemini's systems—guidance, propulsion, life support—shaped Apollo's designs. Astronauts like Armstrong and Aldrin applied the skills they learned in Gemini during Apollo 11. NASA's operational expertise, honed through the Gemini program, was critical for lunar mission management.

Legacy

Gemini transformed NASA's capabilities, turning Mercury's tentative steps into Apollo's bold strides. It's ten missions that mastered spaceflight's technical and human challenges, making the 1969 Moon landing feasible. Gemini's legacy as Apollo's proving ground remains a cornerstone of space exploration history.

Project Apollo: Humanity's Leap to the Moon

BILL KOLB
MONDAY DOCENT

Overview

Project Apollo (1961–1972) fulfilled President John F. Kennedy's 1961 goal of landing humans on the Moon by the end of the decade, marking a Cold War triumph over the Soviet Union. Building on the achievements of Mercury and Gemini, Apollo executed lunar landings, conducted scientific exploration, and ensured safe returns. Its six successful landings, notably Apollo 11, redefined space exploration.

Objectives and Context

Apollo aimed to land astronauts on the Moon, conduct surface exploration, and return them safely, showcasing U.S. technological prowess. It developed the Saturn V rocket and a spacecraft with Command, Service, and Lunar Modules (CM, SM, LM). Despite setbacks, Apollo's 11 crewed missions revolutionized spaceflight and lunar science.

Key Achievements

1. **First Lunar Orbit:** Apollo 8 (December 1968) sent Frank Borman, Jim Lovell, and William Anders on a mission to orbit the Moon ten times, testing deep-space navigation. Their Earthrise photo inspired environmental awareness, proving Apollo's capability 240,000 miles from Earth.
2. **First Moon Landing:** Apollo 11 (July 20, 1969) landed Neil Armstrong and Buzz Aldrin in the Sea of Tranquility. Armstrong's "one small step" became an iconic phrase. They spent 2.5 hours collecting 47.5 pounds of lunar material while Michael Collins orbited in the CM. This fulfilled Kennedy's vision.
3. **Advanced Exploration:** Apollo 12–17 (except Apollo 13, which was aborted due to an explosion) expanded the scope of exploration. Apollo 12 (1969) landed precisely near Surveyor 3. Apollo 15–17 (1971–1972) utilized the Lunar Roving Vehicle, covering distances of up to 4.7 miles and collecting 243 pounds of samples from sites such as Hadley Rille. These missions deployed seismometers and solar wind experiments.
4. **Scientific Legacy:** Apollo returned 842 pounds of lunar rocks, revealing the Moon's 4-billion-year history and volcanic origins. Experiments on seismic activity and solar particles have advanced planetary science, with the data still informing ongoing research.
5. **Operational Resilience:** Following the 1967 Apollo 1 fire, which claimed the lives of Gus Grissom, Edward White, and Roger Chaffee, NASA enhanced its safety protocols. The safe return of Apollo 13 (1970) after an oxygen tank explosion highlighted NASA's problem-solving capability. Apollo 11 flights logged 2,502 hours, proving operational maturity.

Contributions to Space Exploration

Apollo built on Mercury's human spaceflight achievements and Gemini's rendezvous and EVA skills. The Saturn V, lifting 48 tons, and the Lunar Module enabled landings. Astronauts like Armstrong and Aldrin applied their Gemini experience, while mission control managed complex operations. Apollo spurred innovations in computing and materials science.

Legacy

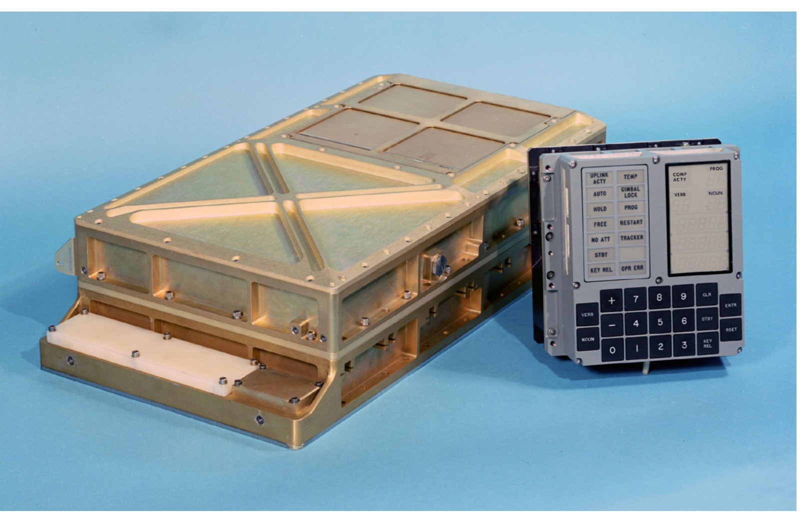
Apollo's six landings (1969–1972) remain humanity's only crewed missions to another body. Its scientific haul and cultural impact, via global broadcasts, reshaped views of human potential. Apollo's triumphs continue to inspire space exploration.

Technology that Changed the World: The Apollo Guidance Computer

BUD VARTY
WEDNESDAY CAPTAIN

When NASA began the challenge of landing men on the Moon, the first contract for that project was the development of a computer capable of the task. The contract was given to IBM in 1961. The computer had to accomplish many firsts. Among them were the first to use integrated circuits, the first to employ direct user interface technology, the first to prioritize tasks, and the first for which the performance and dependability of its systems would have human lives at stake.

Computers in the early 1960s were generally room-size behemoths. The Apollo computer was given one size requirement: a volume of one cubic foot. Everything involved in its development had daunting size and weight requirements.



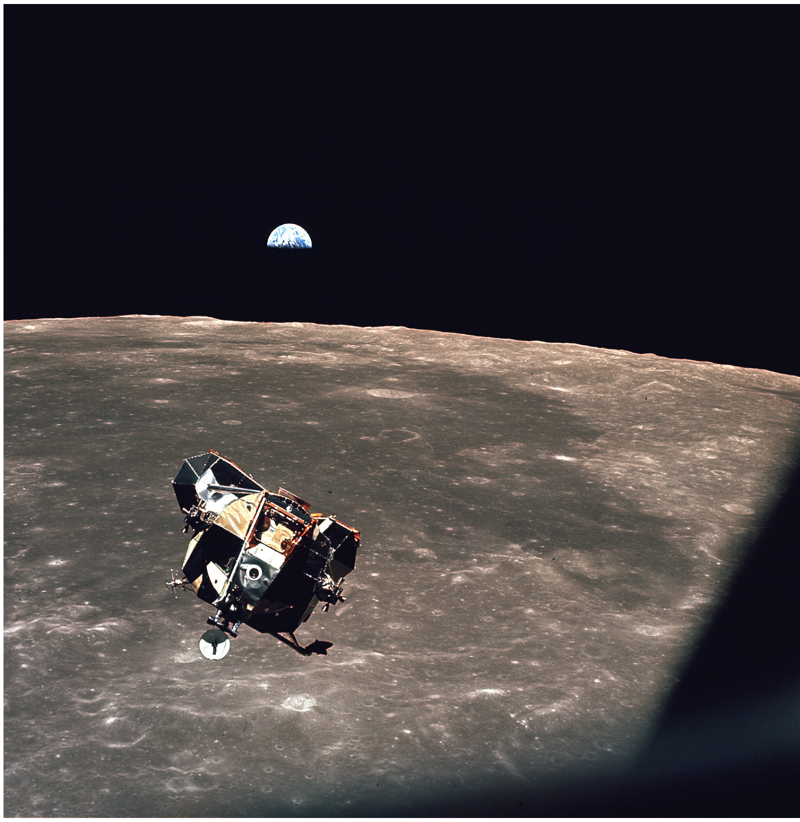
When completed, the computer boasted a memory of 2 kilobytes (2 KB) and a storage capacity of 36 kilobytes (36 KB). Today's smartphones have millions of times more of each. It was also programmed to be "crash-proof," meaning that one failed function would not shut the computer down. It would continue all the other tasks. Its revolutionary prioritizing feature meant that each task was assigned a number of relative importance. If the computer's capacity were maximized, tasks of lesser importance would be dropped in favor of more critical needs. During the Apollo 11 Moon landing, computer errors 1202 and 1201 were displayed on the Lunar Lander's computer. Both were indications of fewer jobs being dropped, and the landing continued successfully.

Computers on the ground did most of the flight calculations going to and from the Moon, relaying them to the Apollo computer. The Apollo computer's first use of direct user interface was developed to give the Apollo astronauts the ability to input commands, when necessary, such as when the spacecraft was behind the Moon and ground computers could not communicate with it. The system was known as the Disc Keyboard (DSK). Input was simplified to two codes: one representing a noun and the other a verb. A list of numbers was assigned to each programmed noun and verb, allowing the command module pilot to activate a function. For example, 12 might be a number for the verb "start," and 51 might mean the noun "engine." It was assumed that astronauts wouldn't input incorrect commands due to the system's simplicity. However, on Apollo 8's return strip to Earth, Command Pilot Jim Lovell input a command that told the computer that it was back on the Florida launching pad. Happily, he used celestial navigation to correct the problem.

Without the Apollo computer, going to the Moon at that time would have been impossible. Many doubted that a computer powerful enough and small enough to accomplish the vast number of technically complex tasks required for a Moon voyage could be created. But the IBM staff, with a combination of hard work and creativity, achieved near miracles. The principles and standards they created formed the groundwork that launched the personal computer. It changed our world forever.

Apollo 11 Manual Landing: A Triumph of Skill

BILL KOLB
MONDAY DOCENT



Overview
On July 20, 1969, Apollo 11 achieved humanity's first Moon landing, overcoming critical challenges during the Lunar Module Eagle's descent. Crewed by Neil Armstrong, Buzz Aldrin, and Michael Collins, the mission faced 1201 and 1202 computer alarms and a hazardous landing site, requiring Armstrong's manual intervention to ensure success.

Mission Context
Launched on July 16, 1969, via Saturn V, Apollo 11 aimed to fulfill President Kennedy's lunar landing goal. Armstrong and Aldrin piloted Eagle to the Sea of Tranquility, while Collins orbited in the Command Module Columbia. The powered descent began at 102 hours, 33 minutes, targeting a controlled touchdown.

The 1201 and 1202 Alarms
During descent, at about 6,000 feet, the Apollo Guidance Computer (AGC) triggered 1201 and 1202 alarms, indicating processing overload in its 74-kilobyte memory. The issue arose from the rendezvous radar, left active, flooding the AGC with extraneous data alongside navigation tasks. The 1201 alarm signaled an executive overflow, and 1202 indicated a priority display restart, which could risk guidance failure. Mission Control, led by Gene Kranz and advised by engineer Jack Garman, determined the alarms were manageable if the AGC prioritized critical functions. They radioed, "We're go," allowing descent to proceed amid intermittent alarms.

Manual Intervention
At 500 feet, Armstrong saw the AGC steering Eagle toward a boulder-filled crater. Using skills from Gemini, he took manual control, overriding the automatic system. Aldrin relayed altitude and velocity as Armstrong maneuvered laterally for a safe landing spot. With fuel down to 30–45 seconds, Eagle touched down at 102 hours, 45 minutes, 40 seconds. Armstrong announced, "Houston, Tranquility Base here. The Eagle has landed." The manual phase, which lasted roughly two to three minutes, required intense focus to navigate uneven terrain.

Aftermath and Legacy
Analysis revealed that the alarms originated from the AGC's limited capacity, a trade-off necessitated by weight constraints. Despite this, Armstrong and Aldrin's moonwalk collected 47.5 pounds of samples and deployed experiments, meeting scientific objectives. The landing's success, reliant on human adaptability, validated NASA's lunar program and highlighted the crew's skill under pressure. Apollo 11's triumph remains a landmark in the history of space exploration.

Apollo 13: Triumph Over Disaster

BILL KOLB
MONDAY DOCENT

Overview

Launched on April 11, 1970, Apollo 13 aimed to be NASA's third lunar landing, targeting the Fra Mauro highlands. Crewed by Jim Lovell, Fred Haise, and Jack Swigert, the mission became a dramatic fight for survival after an oxygen tank explosion two days in, 200,000 miles from Earth. The crew and Mission Control's ingenuity turned a potential tragedy into a "successful failure."

Mission Context

Following Apollo 11 and 12's lunar landings, Apollo 13 sought to explore the Moon's highlands and deploy experiments. Launched via Saturn V, the spacecraft included the Command Module Odyssey and the Lunar Module Aquarius. Led by Apollo 8 veteran Lovell, the crew was well-prepared, and the launch proceeded smoothly, setting a lunar trajectory.

The Explosion

On April 13, at 9:07 p.m. EDT, an oxygen tank in the Service Module ruptured, resulting in a catastrophic loss of power and oxygen. The crew's "Houston, we've had a problem" alert triggered urgent efforts to save the mission and ensure survival, notifying Mission Control of the emergency.

Key Problem-Solving

1. **Power Management:** With Odyssey's power nearly depleted, the crew shut down non-critical systems. Flight Director Gene Kranz's team set a 1,000-watt-hour budget, disabling heaters to conserve energy for reentry, despite near-freezing conditions inside the spacecraft.
2. **Aquarius as Lifeboat:** The undamaged Aquarius, meant for lunar landing, became a refuge. Initially designed for two, it was adapted for three, with the crew transferring life support and navigation systems under intense pressure.
3. **CO2 Solution:** Rising carbon dioxide levels strained Aquarius's scrubbers. Ground engineers devised a fix using spare materials—plastic bags, cardboard, and tape—to adapt a Command Module canister, creating a "mailbox" that restored breathable air.
4. **Course Correction:** The explosion altered the spacecraft's trajectory, risking an unsafe reentry angle. Mission Control planned a lunar flyby for a slingshot return, requiring a precise 34-second manual engine burn by the crew to achieve alignment within 0.1 degrees.
5. **Reentry Challenges:** Before reentry, the crew jettisoned Aquarius and reactivated Odyssey's systems from nearly drained batteries. Despite concerns about heat shield damage, it held, and Odyssey splashed down safely in the Pacific on April 17.

Legacy

Though Apollo 13 never reached the Moon, its safe return showcased NASA's problem-solving and teamwork. The mission's lessons improved spacecraft design and emergency procedures, enhancing safety for future flights. Its gripping story, broadcast worldwide, reinforced public support for space exploration and highlighted human resilience under extreme pressure.

Hughes's Round-the-World Flight - 1938

ALLYN VANNOY
WEDNESDAY COLLECTIONS, SUNDAY DOCENT

Prior to the flight, Hughes's Lockheed Model 14 Super Electra was loaded with 1,500 gallons of fuel and 150 gallons of oil, making for a dangerous take-off. The trip was to begin from Floyd Bennett Field in Brooklyn on July 10, 1938.

In 1937, Amelia Earhart had attempted to fly around the world in a Lockheed Electra 10E.

When Hughes and the members of his crew arrived at the airfield to begin the flight, they were met by Grover Whalen, head of the New York World's Fair. Whalen had christened Hughes's aircraft the "New York World's Fair 1939."

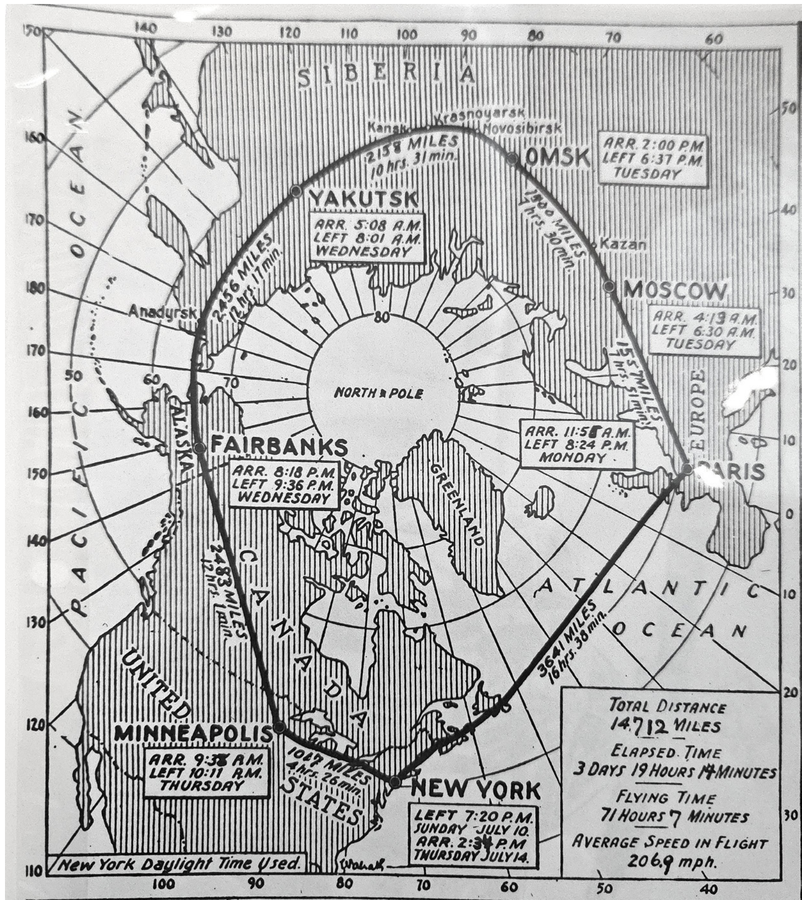
As the plane readied for takeoff, a crowd of thousands looked on. It was just after 7:19 pm. The plane strained under its load, but as it passed the end of the runway, it lifted off.

The flight across the Atlantic took longer than Hughes expected. Three hours into the flight, they encountered severe turbulence and 100 mph headwinds. Seven hours later, as they reached Ireland, a tailwind appeared.

After 16 hours and 38 minutes, they reached Le Bourget Airfield in Paris, the same field where Charles Lindbergh had landed eleven years earlier, cutting Lindbergh's time in half. But they discovered that the plane's rear strut had been seriously damaged during the New York take-off. It took eight hours to make the repairs.

The next leg took them over Germany, where Hitler had made it clear that they were not welcome. The Germans were concerned about the possibility of spying, having recently annexed Austria and part of Czechoslovakia. Approval was given when Hughes agreed to fly at 12,000 feet. The Luftwaffe tracked the Lockheed as it crossed the country.

Though they encountered a lightning storm, they reached Moscow the following morning at 11:15 am.



AROUND THE WORLD IN LESS THAN FOUR DAYS
After circling the top of the globe over three continents, Howard Hughes landed at his star[t] point yesterday, halving the previous record for the flight. The black line shows his cours[e]

The Russians greeted them with bowls of cornflakes and milk, and also resupplied them with food and water, including caviar from Stalin. Two hours and 16 minutes after landing, they were airborne again.

Crossing into Siberia, they next landed at Omsk.

Over forty-eight hours into the flight, the crew was displaying signs of fatigue—having slept little. Hughes refused to relinquish control of the plane to his co-pilot for any extended period. The area they were crossing was some of the most desolate in the world. Going down here would have likely meant death.

(CONTINUED NEXT PAGE)

Hughes's Round-the-World Flight - 1938

(CONTINUED FROM PREVIOUS PAGE)

Their next stop was Yakutsk—deep in Siberia. However, the fuel available there was not adequate for the aircraft's engines, but fortunately, they had brought along a quantity of ethyl to mix with the local gas.

Departing Yakutsk, navigating a mountain range in their path represented a challenge as the maps that had been made available to them from the U.S. Hydrographic Survey were of limited use. The range ahead of them was shown as reaching 6,500 feet, and though Hughes was flying at 7,000 feet, the mountains appeared as a wall before them.

As Hughes pulled the plane into a steep climb—the Electra slowly responded. They were able to skim a 9,700-foot crest, by what those aboard said was just 20 feet. The eight-hour delay in Paris now appeared to be a fortunate event; otherwise, they would have been approaching these mountains in the dark.

They landed at Fairbanks, Alaska, at 3:01 pm on July 13. Their next stop was to be Winnipeg, Manitoba, but when a storm kept them from landing there, they rerouted to Minneapolis. They quickly refueled and were back in the air in just 34 minutes.

A radio announcement heralded their return to New York. The crowd at Floyd Bennett Field was overwhelming as 1,000 police officers were called upon to provide control.

A flight lasting three days, nine hours, and 17 minutes trimmed more than four days off the previous circumnavigation. However, the international organization for flight records, the Fédération Aéronautique Internationale, requires that a circumnavigation crosses all meridians in one direction and is at least the length of the Tropic of Cancer, measuring 22,858.729 miles (36,787.559 kilometers). Howard Hughes' "around the world flight" circled the Northern Hemisphere and fell short by at least 8,058 miles (12,968 kilometers) of the required distance, meaning no official record was established.

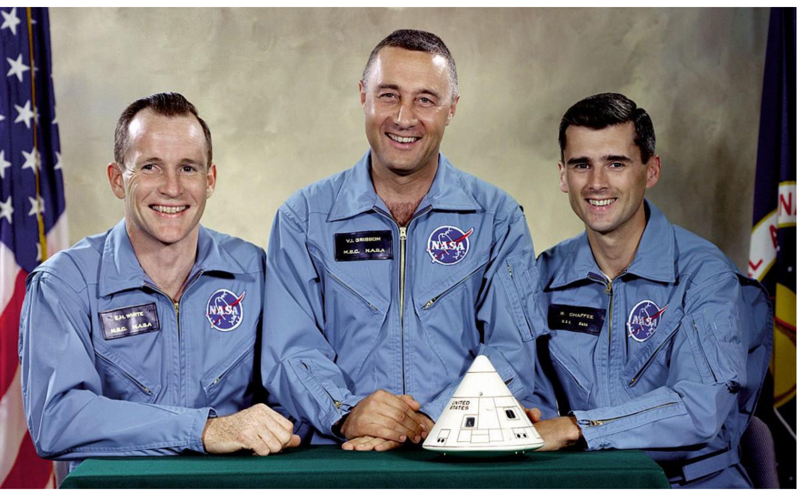
Despite the FAI's criteria, Hughes received several honors, including a Congressional Medal, the Harmon International Trophy, and a ticker-tape parade down Broadway. His trans-global flight marked the end of his record-setting days. In the years that followed, he concentrated on designing and manufacturing aircraft and exercising control over Trans World Airlines as its principal stockholder.

The Apollo 1 Fire

BILL KOLB
MONDAY DOCENT

Editor's Note: *We view space travel as routine and safe; however, it is neither. We experienced the loss of two Space Shuttles: Challenger (STS-51-L) in 1986 and Columbia (STS-107) in 2003. Both missions included a crew of seven astronauts. An additional five astronauts lost their lives in plane crashes. The point is that space travel is extremely hazardous and unforgiving.*

What follows is the story of three brave men whose job was to ride that fine line between benign and abject chaos, each hoping to cheat death just one more time.



Apollo 1, designated initially AS-204, was the first crewed mission of NASA's Apollo program, which aimed to land humans on the Moon. The mission was set to occur on February 21, 1967, to test the Apollo Command Module in low Earth orbit. The crew included Virgil "Gus" Grissom, Edward H. White II, and Roger B. Chaffee. Tragically, a cabin fire during a pre-launch test on January 27, 1967, claimed the lives of all three astronauts and halted the Apollo program, leading to significant safety reforms.

The fire occurred during a "plugs-out" test at Cape Kennedy Air Force Station's Launch Complex 34. This test simulated launch conditions with the spacecraft operating on internal power. To mimic space conditions, the Command Module was pressurized with pure oxygen at 16.7 psi, higher than normal atmospheric pressure. At 6:31 p.m. EST, a spark—likely from frayed wiring—ignited flammable materials inside the cabin, including nylon netting and Velcro. The pure oxygen environment caused the fire to spread rapidly, creating intense heat and pressure.

The crew faced insurmountable challenges. The Command Module's inward-opening hatch, designed for structural integrity, was sealed shut by the cabin's internal pressure, estimated at over 29 psi during the fire. Despite attempts to open it, the hatch trapped the astronauts inside. Grissom, White, and Chaffee succumbed to asphyxiation from toxic gases, primarily carbon monoxide, within 30 seconds, though burns also contributed to their deaths. The fire consumed the cabin in less than a minute.

Post-fire investigations revealed multiple design and procedural flaws. Pure oxygen, while standard for spaceflight, was deemed excessively risky for ground tests. Flammable materials were abundant in the cabin, and electrical systems lacked adequate insulation. The hatch design prevented rapid egress, and no emergency protocols were in place for such a scenario. The Apollo 204 Review Board, established by NASA, recommended sweeping changes, including a nitrogen-oxygen mix for ground tests, fire-resistant materials, a quick-release hatch, and improved crew training.

The tragedy delayed Apollo's first crewed flight by 18 months, but the reforms enhanced safety. Apollo 7, launched in October 1968, successfully tested the redesigned Command Module. The Apollo 1 crew's sacrifice spurred NASA to prioritize astronaut safety, contributing to the program's eventual success with Apollo 11's Moon landing in 1969. Memorials at Kennedy Space Center and Arlington National Cemetery honor Grissom, White, and Chaffee, whose loss reshaped space exploration.

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**

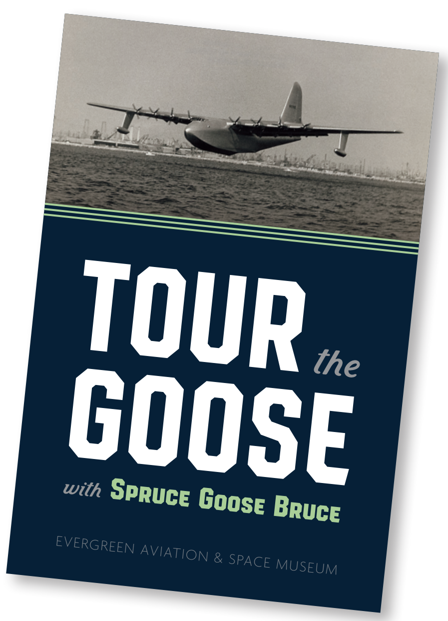
JOHN BURLESON
COLLECTIONS & SUNDAY DOCENT

JULY 3

The speaker for July 3rd is **Bruce Bothwell,** AKA **Spruce Goose Bruce.** A long-time Evergreen Docent and retired U.S. Air Force Lt. Colonel, he has written a book titled *Tour the Goose with Spruce Goose Bruce* that is in its third printing, available for purchase in the Museum Store.

AUGUST 7

The August meeting will commemorate the **80th Anniversary of V-E Day**, marking the end of World War II in Europe. Discussions will include the ramifications of the Asia-Pacific War, the decision to drop the "Bombs," and the demise of colonialism.



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.

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