The North American Aerospace Museum Aircraft Collection



Nov. 2026

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LOCATION: H

Bede BD-5B

Love-I (BD-2)

MAXIMUM SPEED	232 mph
CRUISING SPEED	118 mph
SERVICE CEILING	12,000 feet
ENGINE	Honda Civic 70 hp.
RANGE (Bede's estimate)	1,000 miles
CAPACITY	One



James Bede is the man responsible for the creation of the famous *BD* series of aircraft. It was his idea to design a plane that would be fun to fly and also be affordable for the public.

He developed a single-engine, single-seat model that could be purchased from his company in kit form and be built by anyone with mechanical ability. This home-built theory is probably the main reason for its 90% crash record. There was just no way to prevent an inexperienced hobbyist from building this high-performance aircraft then flying it and having a serious, sometimes fatal, accident. Most of these crashes were the direct result of builders who found a way to keep out of sight of the FAA.

Yet, it really is a well-designed craft, and in the hands of qualified people, fun to build and fly. It has a wingspan of 21 feet 6 inches, is 13 feet, 4 inch in length and weighs 535 pounds empty. Jim Bede first flew the BD-5 prototype on September 12, 1971. The selling price back then was $4,400.00. Some more hawkish buyers saw this as an excellent investment and would actually buy several kits for later higher returns, and higher they were.

There were several versions of the BD series, from the prototype, BD-1 up to BD-15, including the BD-5BJ which was the 007 jet version featured in the James Bond movie, "Octopussy". Among Bede's many customers were the US Air Force, which acquired a limited quantity for evaluation.

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LOCATION: H

Beech D17A

Staggerwing

MAXIMUM SPEED	198 mph
CRUISING SPEED	170 mph
SERVICE CEILING	25,000 feet
ENGINE	Wright R-760 420 hp.
RANGE	500 miles
CAPACITY	Five



The Model 17, commonly called the *Staggerwing,* was the first aircraft produced by Walter Beech and his company.

Launched in 1932, the venture was somewhat dubious because this was in the middle of the Great Depression. Yet more than 780 Beech -17s were produced in eight different series over the next seventeen years. Production of the *Staggerwing* ended in 1948. The US Army Air Force designated it as the UC-43 *Traveler.*

The model's name, *Staggerwing,* derives from the unusual placement of the upper wing. On most biplanes the upper wing is located further forward, but on the *Staggerwing* its placement is just the opposite. The Model 17s unusual wing configuration and unique shape resulted in a design that maximized the pilot's visibility while minimizing the aircraft's tendency to stall.

The fabric-covered fuselage was paired with wood formers and stringers placed over a welded, steel tube frame. The construction of the plane was complex and took many man-hours to complete.

The *Staggerwing's* lightweight, retractable conventional landing gear - uncommon at that time - combined with streamlining and its use of powerful radial engines helped it perform significantly better than other biplane designs.

The D17 set the standard for private passenger airplanes for many years. It was considered during its time to be the premier executive aircraft flying, much as the Gulfstream executive jets are considered in contemporary times.

The lightweight V-tail Beechcraft *Bonanza* soon replaced the venerable *Staggerwing* in the Beech product line, at about one-third the price. The *Bonanza* was a much smaller aircraft with much less horsepower but carried four people with almost the same speed as the D17.

HISTORY OF THE MUSEUM'S AIRCRAFT

Many *Staggerwings* served with the Army Air Force and the US Navy during World War II. Many of the -17s were leased to the services carrying the designation UC-43F; this aircraft was the one and only D17A model to serve. It was used as a personnel transport stateside from May 1942 until it was delivered to the Civil Aeronautics Administration in 1943. It later flew with Alamo Airline Service out of San Antonio, Texas. Mr. William Woods of Boise, Idaho purchased this airplane in 1946. Winston Churchill is rumored to have flown in it during an Idaho fishing trip.

The aircraft changed hands many times until 1989 when Alan and Rebecca DeBoer of Ashland, Oregon acquired it. With many different paint schemes, Mr. DeBoer chose this one with the forty-eight-star U.S. flag. He donated it to the Museum in 2001. This aircraft is the last known survivor of the D17A models.

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LOCATION: NL

Beech Model 1

Starship 2000A

MAXIMUM SPEED	385 mph
CRUISING SPEED	373 mph (at 22,000 feet)
SERVICE CEILING	35,800 feet
ENGINES (2)	Pratt & Whitney PT6A-67A turbine engines 1,200 shp each
RANGE	1,350 nautical miles (at 25,000 feet)
CAPACITY	1 pilot, 7 passengers



One of the most visually striking aircraft of the 20th century, the Beechcraft *Starship 2000* was designed as a replacement for the Beech *King Air* family of business turbo-prop aircraft.

In 1979, legendary aircraft designer Bill Lear was poised to enter the market with a revolutionary twin-engine design built entirely of composite materials - the *Lear Fan 2100*. To protect its share of the business aviation market, Beech began to design an all-composite turboprop of its own. In 1982, to help refine the new design, Beech hired the leading company in composite material aircraft, Burt Rutan's Scaled Composites.

The *Starship* was notable for several reasons. First was its all-graphite composite airframe, using high-tech materials instead of aluminum. Second was its canard design, with the lifting surface aft of the horizontal stabilizer. The aircraft lacks a conventional centrally placed rudder, with yaw control instead provided by small rudders on the wingtips. Third was its use of a pusher design, in which the turboprop engines were mounted facing the rear and pushed, rather than pulled, the aircraft forward. The pusher design offers a quieter ride.

Although the first full-size *Starship* flew on February 15, 1986, problems with production of the full-scale aircraft began in 1984. Subcontractors were unable to produce many of the highly advanced components needed, forcing Beech to make these parts in-house. Plus, the FAA had never certified an all-composite aircraft before. To satisfy the FAA's concerns, Beech conducted nearly twice as much computer and wind tunnel testing as normally required. The *Starship* was finally certified in 1988, three years beyond Beech's goal.

The combination of delayed entry into the market, relatively poor fuel efficiency and a high purchase price (a result of Beech's development costs which were estimated at between $500 and $800 million), proved to be disastrous to the *Starship* program. The aircraft's $4,000,000 price tag was comparable to better performing entry-level jet-powered business aircraft. Beech produced only fifty-three *Starships*, including three prototypes.

HISTORY OF THE MUSEUM'S AIRCRAFT

This Beech *Starship*, NC-27 was completed on December 2, 1992. Individual *Starships* are usually referred to by their individual NC (New Concept) number.

The Raytheon Company, which purchased Beechcraft in 1980, owned NC-27 for much of the aircraft's service life. Raytheon leased NC-27 to the railroad support company Progress Rail Services from April 1994 to late 1997. Tripifoods Inc., a grocery supply company headquartered in New York, purchased the aircraft from Raytheon in December 1997.

Raytheon reclaimed ownership of NC-27 in October 2003 and flew it to the Evergreen Air Center in Marana, Arizona for storage. Raytheon donated the aircraft to the Museum in November 2003.

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LOCATION: NL

Beech Model 18 / C-45

Twin Beech / Expeditor

(IN RESTORATION)

GENERAL CHARACTERISTICS:		PERFORMANCE:	
CREW	Two pilots	**MAXIMUM SPEED**	225 mph
CAPACITY	6 passengers	**RANGE**	1,200 miles @ 160 mph
LENGTH	34 ft. 2 in.	**SERVICE CEILING**	26,000 ft.
WINGSPAN	47 ft. 8 in.	**RATE OF CLIMB**	1,850 ft./min.
HEIGHT	9 ft. 8 in.		
WING AREA	349 sq. ft.		
EMPTY WEIGHT	6,175 lbs.		
LOADED WEIGHT	7,500 lbs.		
MAX. TAKEOFF WEIGHT	8,727 lbs.		
POWERPLANT	2 x Pratt & Whitney R-985-AN-1 Wasp Juniors		



The Beechcraft Model 18 or *Twin Beech,* as it is also known, is a six to 11 seat twin-engine, low wing, tail wheeled light aircraft manufactured by the Beech Aircraft Corporation of Wichita, Kansas.

In military use, the Model 18 served as a trainer and utility aircraft. It was produced from 1937 to 1970. Several services flew the C-45 version, nicknamed the “Bug Smasher,” including the U.S. Army and Navy, the Royal Air Force and the Royal Canadian Air Force. Over 9,000 were manufacture

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LOCATION: H

Beech Model 35

Bonanza

MAXIMUM SPEED	184 mph
CRUISING SPEED	175 mph
SERVICE CEILING	18,000 feet
ENGINE	Continental E185-1 185 hp.
RANGE	750 miles
CAPACITY	Four



It seems this airplane was destined to be an incredible success from the very start. The Beech Company chose the name *Bonanza,* which means, “a rich source of profit or gain, or an unusual value.” Beechcraft’s revolutionary private plane could be considered both. Developed just after World War II, the new Model *35 Bonanza* was loaded with modern design features and equipment. The aircraft had retractable tricycle landing gear, a controllable pitch propeller and instruments for foul weather and night flying.

The *Bonanza’s* most recognizable feature is its unique “V” tail. The V shape requires that the control surfaces work together as both rudders and elevators. The tail was designed to reduce drag making the aircraft lighter, faster and more fuel-efficient. The Model 35 remains popular and practical, with ever-updated versions selling into the 2lst century.

When Walter Beech was designing the *Bonanza,* he listened to the comments of some dissatisfied private plane owners. “I drive to the airport in my spacious, comfortable, quiet car with all types of amenities,” the pilots said, “Then I climb into my airplane (which costs three times as much) and it is loud, cramped and miserable!” The *Bonanza‘s* cabin noise faded to a quiet hum at cruising speed, and passengers were pampered with padded seats, surrounded with all-wool fabrics and wall-to-wall carpet. Beech set a new standard for private planes.

The *Bonanza* was used for several historic flights. Probably the best known of these occurred in the “Waikiki Beech.” On January 12, 1949, Capt. William P. "Bill" Odom established a record for light-plane travel from Hawaii to the continental United States. The *Bonanza* was the first light plane to make this flight, a great circle distance of 2,406.9 miles, though Odom actually flew 2,900 miles. Severe weather over Nevada forced him to abandon his goal of flying the entire continent and he had to return to Oakland 22 hours and 6 minutes after takeoff from Hawaii.

HISTORY OF THE MUSEUM’S AIRCRAFT

This *Bonanza* was one of the first made, called a “Straight *35”,* and built in 1947. These first *Bonanzas* cost $7,975.00 brand new and many were delivered from the Beech factory in simple bare metal - paint was an option that cost extra. Most of the shiny silver airplanes quickly received paint jobs because the glare off the bare wings was nearly intolerable.

The airplane’s first owner was Preston M. Clark, who logged many hours traveling all the Mid-Western states for a pet supply company. After years of flying, this classic airplane was formally acquired and restored by Joe Koller, Jr. Converted back to its original and flying condition, the complete rebuild included new paint and a vintage interior. He donated his prized aircraft to the Museum in 2000. Production of the Bonanza was discontinued in 2025 after a 78 year run.

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LOCATION: H

Beech T-34B

Mentor

MAXIMUM SPEED	191 mph
CRUISE SPEED	150 mph
RANGE	814 miles
SERVICE CEILING	20,000 feet
ENGINE	Continental 0-470-13 225 hp.
CAPACITY	Two



The T-34 was designed as a pilot trainer to replace the T-6/SNJ *Texan*.

The original *Mentor*, a Beechcraft Model 45, derived from the famous Beechcraft *Bonanza*, was first flown in December 1948 and became operational as the T-34 with the US Air Force in 1953 and with the US Navy, as a T34B, in 1954. Over 2300 were built. It also served with the Japanese and Philippine air forces. It is still in use today by civilian stunt pilots.

Beech replaced the *Bonanza's* fuselage and four-passenger cabin with a narrower fuselage incorporating a two-seater tandem cockpit and bubble canopy. This provided greater visibility for the trainee pilot and flight instructor.

Structurally, the Model 45 was much stronger than the *Bonanza*. An accident provided a dramatic demonstration of its in-built Beechcraft toughness. At full cruising speed of 189 mph, a YT-34 was inadvertently flown into contact with an aerial cable stretched across a canyon. The cable did not break, but almost stopped the *Mentor* and spun it around in mid-air, 350 feet above the canyon floor. Through skillful handling, the pilot righted the airplane, regained flying speed and flew back to the base for a normal landing. Inspection showed that damage was confined to superficial contusions and abrasions of the right wing leading edge, which bore the imprint of the cable.

The *Mentor* remained the standard USAF primary trainer until the introduction of the Cessna T-37 jet trainer in the late 1950s. As they were replaced by T-37s, many T-34s were turned over to base aero clubs.

In 2002 the Navy began a gradual phasing out of the T-34, replacing it with the T-6A *Texan II*, a joint primary trainer for use by both the Navy and Air Force.

HISTORY OF THE MUSEUM'S AIRCRAFT

Constructed in 1956, the Museum's *Mentor* flew with Navy Training Squadron VT-1 out of Saufley Field, Florida. It was restored by the Evergreen Volunteer Restoration Team and painted back into the colors of VT-1. This aircraft is on loan from the National Museum of Naval Aviation.

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LOCATION: HO

Bell 206B

Jet Ranger

AIRCRAFT TYPE	Helicopter
SERVICE TIMEFRAME	1967–2010
ROTOR SPAN	33.33 ft
CRUISING SPEED	127 mph
TOP SPEED	150 mph
SERVICE CEILING	20,000 ft
ENGINE	One Allison Model 250 turboshaft



THE MODEL

The Bell 206B JetRanger originated from a 1960s U.S. Army competition to produce a new light observation helicopter. Bell Helicopter submitted the YOH-4, a compact and agile design that ultimately lost the contract to the Hughes OH-6. Undeterred, Bell reworked the helicopter's fuselage to improve its aesthetic appeal and comfort for the civilian market, rebranding it as the Bell 206A JetRanger. The redesign proved highly successful, launching in 1967 to immediate commercial acclaim. Its balance of reliability, simplicity, and performance made it a trusted platform for both public and private sectors. The 206B, an upgraded variant, followed shortly after and became one of the most recognizable helicopters in the world.

The JetRanger has served in a wide range of roles across dozens of countries. Law enforcement agencies used it for patrol and surveillance, while media outlets employed it for airborne reporting. It became a staple in executive transport, tourism, and training programs due to its dependable performance and ease of maintenance. Militaries adapted it for liaison duties, light utility tasks, and even pilot instruction under various designations. The helicopter's adaptability and affordability helped it carve a unique place in aviation history, making it a go-to platform for missions requiring maneuverability, visibility, and consistent operational reliability.

HISTORY OF THIS AIRCRAFT

This Bell 206B helicopter is displayed in the former livery of Evergreen Helicopters. The Alaska state flag honors the aircraft's many years of service in the region, where it supported vital missions including petroleum operations, wildfire response, mail delivery to remote communities, and scientific research.

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LOCATION: H

Bell AH-1F

Cobra

SERVICE TIMEFRAME	1967–2020
ROTOR SPAN	44 ft
TOP SPEED	171 mph
SERVICE CEILING	11,400 ft
ENGINE	Lycoming T53-L-703 turboshaft



THE MODEL

The helicopter had proven to be an indispensable mode of transport during the Korean War, but in Vietnam the helicopter became master of the battlefield. Much of this was because of the Bell AH-1 Cobra, the first helicopter designed from the start as a flying gun platform.

First flown in 1965, the Cobra was designed to provide fast, mobile, close air support for troops in combat and to provide an escort for troop-carrying helicopters. It utilized components from the UH-1 Iroquois (Huey), including the engine, transmission, rotor and tail, which helped speed its development and entry into service. Based on combat experience, the Cobra design was updated with armored glass, a higher performance engine and all-weather capabilities. Later, Cobras such as this AH-1F were equipped with TOW missiles for anti-tank operations.

Although retired from U.S. Army service, the AH-1F remains operational in several other countries and civilian applications, such as aerial firefighting. As of 2024, the AH-1Z Viper variant is still in service with the U.S. Marine Corps. The Cobra's innovative design and robust performance have cemented its legacy as a trailblazer in the evolution of attack helicopters, influencing designs for decades to come.

NOTABLE PEOPLE

LAWRENCE "LARRY" BELL

As the founder of Bell Aircraft Corporation (later Bell Helicopter), Bell's leadership laid the foundation for the company's innovation in rotorcraft design, including the development of the AH-1 series. His vision for pioneering aviation technology made Bell Helicopter a leader in military rotorcraft.

COLONEL JAY D. VANDERPOOL

Known as the "Father of the Modern Attack Helicopter," Vanderpool was a strong advocate for the development of armed helicopters for the U.S. Army. His early work and advocacy for attack helicopter programs significantly influenced the creation of the AH-1 Cobra series, including the AH-1F variant.

HISTORY OF THIS AIRCRAFT

This aircraft was built as an AH-1G for the U.S. Army and saw combat in Vietnam during 1971 with A-Troop, 7th Squadron of the 1st Air Cavalry—nicknamed "The Apaches," it carried the name "96 Tears." Operating mostly in the 44th Special Tactical Zone near the Cambodian border, the unit was tasked with interdicting supplies and North Vietnamese troops coming into South Vietnam. Postwar, it was returned to the United States and updated to the AH-1S standard with an armored canopy and the capability of launching TOW missiles. It was later modified to AH-1F standard with "heads up" displays and a laser rangefinder, as it appears here.

This AH-1 Cobra is on loan from the U.S. Army Tank-automotive and Armaments Command (TACOM).

On loan from the U.S. Army Tank-automotive and Armaments Command (TACOM). 2006.013.001

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LOCATION: T

Bell HTL-3

Bell 47

SERVICE TIMEFRAME	1947–1950s





THE MODEL

The Bell HTL series originated as the military designation of the Bell 47, the world's first helicopter certified for civilian use. Introduced in 1946, the Bell 47 quickly proved its value in observation, training, and light utility roles, leading the U.S. military to adopt it under the HTL designation. The aircraft's simple steel-tube frame, bubble canopy, and reliable Franklin and Lycoming piston engines made it rugged and versatile, ideally suited for the Army, Navy, and Marine Corps' growing interest in helicopters after World War II. Over time, the HTL series expanded into multiple sub-variants, each refining performance and capability to match specific training and operational needs.

The HTL-3 represented one of the early training-focused versions of this helicopter. It featured a more powerful Franklin O-335-5 piston engine and retained the iconic bubble canopy design, giving both the instructor and trainee excellent visibility. Built primarily for training duties, the HTL-3 was an essential step in standardizing helicopter instruction within U.S. military services. Its simplicity and forgiving flight characteristics made it a reliable platform for teaching the fundamentals of rotary-wing flight to new pilots. The Bell HTL-3 entered service in 1947 and remained in use into the early 1950s.

NOTABLE PEOPLE

DORA JEAN DOUGHERTY STROTHER

After serving as a pioneering Woman Airforce Service Pilot (WASP) flying B-29s during WWII, Dora Jean Dougherty Strother became a human factors engineer and helicopter test pilot at Bell Aircraft. She helped refine flight evaluation protocols and cockpit design on Bell models including the Bell 47, which led to the HTL-3. Strother later earned the first PhD in Aviation Science from New York University and was honored with the Amelia Earhart Award and induction into aviation halls of fame.

HISTORY OF THIS AIRCRAFT

One of only nine produced for the U.S. Navy, this helicopter initially served with Navy Helicopter Utility Squadron 2 (HU-2). On February 4, 1951 the helicopter was assigned to an observation squadron, VMO-6, which was operating in Korea as part of Marine Air Group 12. This HLT-3 completed 149 combat flight hours and helped to spot enemy troop movements, direct artillery fire and conduct search and rescue missions. VMO-6 evacuated a record 77 casualties during one day

in April 1951 from the “Punchbowl,” a valley located in the rugged mountains around the Kwachon Reservoir.

After serving in Korea, this HTL-3 was stricken from the U.S. Navy records in 1956 and handed over to Glendale College, Glendale, California. The college used it as an aviation school vocational training aid for the next 37 years. Jack Lenhardt, a well-known aircraft and helicopter collector from Hubbard, Oregon, purchased and completed his extensive restoration of the helicopter in 1996 and today it carries the same markings it carried while serving with VMO-6 during the Korean War.

Transferred to the Museum’s Permanent Collection. 2015.056.011

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LOCATION: H

Bell OH-13E

Sioux (Model 47)

SERVICE TIMEFRAME	1946–1970s



THE MODEL

The military version of the Bell Model 47, the OH-13 was a rugged, general purpose observation and utility helicopter that was also quickly pressed into service as a flying ambulance. The OH-13 featured a distinctive bubble canopy that provided exceptional visibility for occupants, an essential feature for medevac and reconnaissance operations. Its open-frame tail boom and skid-type landing gear contributed to its lightweight and rugged design, making it suitable for missions in harsh, remote environments.

Coming into widespread use in Korea in January 1951, just a few months after the outbreak of the war, its skid-type landing gear proved a good platform for stretchers, although the doors had to be removed for that use. Subsequent models used a “cut-out” on the door to permit opening the door with the stretchers in place. The use of external stretchers mounted on the skids allowed the OH-13E to evacuate injured personnel directly from the battlefield—a capability that was crucial during the Korean War. This model became famous due to its regular appearance on the television show M*A*S*H.

Before production ended, the OH-13 and Model 47 served in the military forces of 42 different countries and all branches of the U.S. military, as well as a significant number of civilian users. Because of the demand for these light helicopters, Bell licensed production to Westland in Great Britain and Agusta in Italy.

NOTABLE PEOPLE

ARTHUR M. YOUNG

Born in 1905, Young studied mathematics and engineering at Princeton University, but his true passion lay in solving the challenges of vertical flight. In the 1920s and 1930s, he conducted independent research on rotary-wing aircraft, building small-scale models to test rotor designs. His relentless experimentation led him to develop a deep understanding of helicopter stability and control, which would later revolutionize rotary-wing aviation.

Young’s most significant achievement was his role in developing the Bell 47, the first helicopter certified for civilian use. In 1941, he took his research to Bell Aircraft, where he refined his early concepts into a full-scale, practical helicopter design. Young’s innovative two-bladed, stabilizer-bar rotor system greatly improved stability and control, making the helicopter viable for widespread use.

HISTORY OF THIS AIRCRAFT

Acquired from Jack Lenhardt of Hubbard, Oregon, this aircraft was previously a civilian helicopter used for spraying in Alabama. It was restored in Army colors by Lenhardt.

Transferred to the Museum’s Permanent Collection. 2015.056.012

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LOCATION: H

Bell UH-1H

Huey (Iroquois)

MAXIMUM SPEED	127 mph
SERVICE CEILING	12,600 feet
ENGINE	Lycoming T53-L-13, 1,400 shp (derated to 1,100 shp)
RANGE	318 miles
ROTOR DIAMETER	48 feet
LENGTH	57 feet 9 inches (rotors turning)
CREW	One to four
CAPACITY	11 to 14 troops or six stretchers
SERVICE TIMEFRAME	1959–2020





THE MODEL

The UH-1H Iroquois, commonly known as the “Huey,” is one of the most iconic helicopters in aviation history. Developed by Bell Helicopter and introduced in the early 1960s, it played a pivotal role in military operations, particularly during the Vietnam War, where it became a symbol of American air mobility. The UH-1H was a versatile platform for troop transport, medical evacuation, and cargo hauling, and its reliability and adaptability cemented its legacy as one of the most widely used helicopters in history.

The UH-1H was powered by a single robust Lycoming T53-L-13 turboshaft engine, producing 1,400 horsepower. The aircraft’s spacious cabin could accommodate up to 13 passengers or six stretchers for medevac missions. The design also allowed for external sling loads, enhancing its utility in logistics and supply operations. Its ability to operate in rugged terrain and under harsh conditions made it indispensable in combat and humanitarian missions.

During the Vietnam War, the UH-1H was used extensively in air assault and medevac missions, earning the nickname “the workhorse of Vietnam.” It was often armed with door-mounted machine guns and rocket launchers, providing close air support to ground troops. The Huey also revolutionized battlefield tactics by enabling rapid troop deployment and extraction, reducing the response time in critical situations. Its iconic rotor sound became synonymous with hope for soldiers awaiting rescue or reinforcements.

Even after its heyday in Vietnam, the Huey continues to serve in militaries and civilian roles around the world. It has been employed in firefighting, search-and-rescue, and disaster relief operations. Many nations still maintain active fleets of modernized UH-1H helicopters. Its enduring presence highlights the exceptional engineering and versatility of this legendary aircraft.

NOTABLE PEOPLE

GENERAL HAMILTON H. HOWZE

A pioneering figure in the development of modern military aviation, Howze was a West Point graduate and served with distinction during World War II and the Korean War. Howze is best known for his role in advancing the concept of air mobility, leading the U.S. Army’s adoption of helicopters for troop transport and battlefield support.

HISTORY OF THIS AIRCRAFT

This helicopter, serial number 64-13502, provided years of service toward fulfilling the mission of the Oregon Army National Guard. After being overhauled from crash damage in 1967, it served in Corpus Christi, Texas and Phoenix, Arizona, before going to the Oregon Army National Guard in 1986. It was retired from service in September 1994, and is on loan from the U.S. Army Tank-automotive and Armaments Command (TACOM).

RELATED PANEL: U.S. ARMY DUSTOFF PILOTS AND CREWS

Honored with Congressional Gold Medal in November 2024!

QUICK FACTS

- Dustoff pilots and crew members flew medical evacuation missions in the Vietnam War and are credited with over 900,000 extractions of American, South Vietnamese and Allied troops, often under direct fire, in any weather and on almost any terrain.
- The term “Dustoff” was believed to have originated during the Vietnam War and was the call sign for the first aeromedical helicopter evacuation unit, the 57th Medical Detachment.
- Using helicopters to evacuate the wounded was a continuation of the practices first established in the Korean war and is still used today.
- Dustoff missions were exceedingly dangerous and the Dustoff crews suffered a high rate of casualties.
- Evergreen Aviation & Space Museum would like to honor Docent Captain Barry Brown – our very own Dustoff Pilot that served in Vietnam, Kosovo and Iraq.

On loan from the U.S. Army Tank-automotive and Armaments Command (TACOM). 2002.004.001

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LOCATION: R

Bell UH-1P

Huey (Iroquois)

MAXIMUM SPEED	140 mph
CRUISE SPEED	115 mph
SERVICE CEILING	24,830 feet
ENGINE	General Electric T58, 1,290 shp
RANGE	330 miles
ROTOR DIAMETER	48 feet
LENGTH	57 feet 1 inch
SERVICE TIMEFRAME	1967—1972



The Bell UH-1P Huey occupies a distinct niche in Cold War military aviation history. While the Army relied heavily on standard Lycoming-powered UH-1s throughout the Vietnam War, the United States Air Force fielded a heavily modified, specialized variant tailored specifically for covert warfare and propaganda operations.

Key Characteristics & Engineering Differences

Unlike mainstream Army Hueys, the UH-1P was built on the compact Bell Model 204 short-cabin airframe. Its defining mechanical departure was its powerplant: the USAF equipped the airframe with a **General Electric T58-GE-3 turboshaft engine** producing up to 1,290 shaft horsepower, driving a 48-foot main rotor system.

To survive intense low-level combat, the UH-1P received extensive modifications:

- **Armament Suite:** Upgraded into a dedicated gunship platform equipped with side-mounted 7.62 mm GAU-2/A miniguns, 2.75-inch folding-fin aerial rocket pods, and flexible door-mounted M60 machine guns.
- **Protection:** Integrated armor plating was added to protect the flight crew and critical components from ground fire.
- **Specialized Systems:** Select airframes were outfitted with high-powered loudspeaker arrays and interior leaflet dispensers for tactical psychological operations.

Production Numbers and Conversions

No UH-1P helicopters were produced new from the factory line. Instead, the Air Force converted approximately **20 existing UH-1F airframes** into the UH-1P configuration to rapidly fulfill an urgent requirement for specialized armed support platforms in Southeast Asia.

Operational Roles in Southeast Asia

The UH-1P served two primary tactical missions during the Vietnam Conflict:

1. **Special Operations Support:** Operating most famously with the **20th Special Operations Squadron "Green Hornets,"** UH-1Ps provided armed escort, fire support, and emergency extraction for covert MACV-SOG reconnaissance teams operating behind enemy lines along the Ho Chi Minh Trail in Laos and Cambodia.
2. **Psychological Operations (PSYOPS):** Modified variants flew low-altitude missions broadcasting propaganda messages and dropping leaflets across enemy-controlled territory to encourage defectors.

Through these conversions, the small fleet of UH-1Ps provided the Air Force with a highly effective, specialized rotary-wing gunship tailored for unconventional warfare.

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LOCATION: T

Bensen B-8M

Gyro-Copter

MAXIMUM SPEED	85 mph
CRUISING SPEED	60 mph
SERVICE CEILING	12,500 feet
ENGINE	McCulloch 4318, 72 hp
RANGE	100 miles
ROTOR DIAMETER	20 ft
LENGTH	11 ft 4 in
EMPTY WEIGHT	247 lbs
GROSS WEIGHT	500 lbs
CAPACITY	One



Nicknamed the “flying lawn chair,” the Bensen B-8M Gyro-Copter is a single-seat autogyro. Its unpowered rotor is spun by the air flowing through it as the aircraft moves forward, while an engine-driven propeller provides thrust. Unlike a helicopter, it cannot hover or take off vertically, but it can make very steep, nearly vertical descents.

Dr. Igor Bensen, a Russian immigrant who had been chief research engineer at Kaman Aircraft, founded Bensen Aircraft Corporation in Raleigh, North Carolina, in 1953 to build light rotary-wing aircraft for private owners. His first design was the B-8 Gyro-Glider, an unpowered rotor kite towed behind a car. Adding an engine produced the B-8M, which first flew on December 6, 1955.

The B-8M was designed for home building and is small enough to be assembled in a garage. It has a lightweight tubular aluminum frame and a two-blade laminated plywood rotor, and is flown with a single control stick, a twist-grip throttle and foot pedals. It was typically powered by a McCulloch 4318 engine mounted on the mast behind the pilot, driving a pusher propeller. Thousands of sets of plans were sold over about thirty years, and Bensen kit production continued until 1987.

A B-8M named Spirit of Kitty Hawk set twelve world and national autogyro records in 1967 and 1968, more than any other nonmilitary rotary-wing aircraft. On the 60th anniversary of the Wright brothers’ first flight, the same machine duplicated that flight. It is now in the Smithsonian’s collection. In 1968 the U.S. Air Force evaluated Bensen gyrocopters as the X-25 to give pilots who ejected from combat aircraft some control over where they landed; the program ended with the Vietnam War.

HISTORY OF THE MUSEUM’S AIRCRAFT

This aircraft was donated to the Museum by T. Preedy, and reassembled by CAP Cadets.

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LOCATION: H

Boeing 707 Landing Gear



In July 1954, Boeing introduced its prototype 707, model 367-80, soon known as the -80. As the forerunner of more than 14,000 Boeing jetliners, the prototype served 18 years as a flying laboratory before joining historic aircraft at the Smithsonian's National Air and Space Museum.

This display of landing gear demonstrates Boeing's original designs for the 707 and most of its future aircraft. This right main gear is part of a retractable tricycle type with hydraulic actuation utilized by most manufacturers over the last 50 years. With a 44-foot wheelbase and excellent weight distribution the 707 landing gear proved to work extremely well on landings in areas where the surface was not solid.

This specific unit features one of the main gears that retract inward into the underside of the second wing root and fuselage of the aircraft. Designed to carry the weight of a fully loaded 707, 240,000 pounds, and mounted off the rear spar, this single strut, four wheeled bogie unit will withstand numerous landings over several years.

Restored by Museum Volunteers during 2005-2006, this landing gear came to the Museum as a gift from the Evergreen Air Center.

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LOCATION: HO

Boeing 747-200

Jumbo Jet

MAXIMUM MACH	0.92
CRUISE SPEED	602 mph
SERVICE CEILING	45,100 feet
MAXIMUM WEIGHT	785,800 lbs.
ENGINES (4)	Pratt & Whitney JT9D-7R4G2 or Rolls-Royce plc RB211-524D4 or General Electric CF6-50E2
RANGE	7,891 miles
FLIGHT CREW	Three
PASSENGERS	397 (3 classes) or 452 (2 classes)



The Boeing 747-200 is the improved version of the Boeing 747-100 primarily designed to carry more payload with more powerful engines and higher maximum takeoff weight, allowing the aircraft to fly farther than its predecessor. Its first flight came on October 11, 1970. Nearly 200 of the -200 version were built; the last left the production factory in 1991.

At the time the 747 was designed, it was widely thought that eventually the aircraft would be superseded by Supersonic Transport. Boeing therefore designed the 747 in such a way that it could easily be adapted to serve as a freighter aircraft and it would remain in operation after sales for the passenger version decreased. The aircraft's cockpit was therefore placed on the upper deck to allow for a nose loading door, thus creating the characteristic 747 bulge.

Developments of the -200 included the 747-200F freighter, the SR (short range) optimized for high cycle short sector operations, and the C (Combi) with a large side-cargo door installed on the main deck. The US Air Force uses a -200 as the E-4 Advanced Airborne Command Post. The USAF has a total of six -200s.

In the 1980s the -200 was succeeded by the Boeing 747-300. A few -200s have been converted into -300s.

The last 747-200, the VC-25A, tail number 29000, used to fly the President of the United States, was delivered to the Air Force in December 1990. Although the VC-25's (there are two, the other is 28000) were delivered in 1990, by which time the 744 was in production, they're actually based on the 747-200 – albeit with considerable modification.

HISTORY OF THE MUSEUM'S AIRCRAFT

The Museum's 747 was built for Delta Airlines in 1970 and later flown by China Airlines and Pam Am before being purchased by Evergreen International Airlines and converted into a cargo freighter. This aircraft is owned by McMinnville Properties, LLC, which also owns the Museum campus.

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LOCATION: T

Boeing A160T

Hummingbird

MAXIMUM SPEED	160 mph
SERVICE CEILING	20,000 to 30,000 feet (projected)
ENGINE	Pratt & Whitney Canada PW207D turboshaft
ENDURANCE	18.7 hours demonstrated (20+ projected)
ROTOR DIAMETER	36 feet
LENGTH	35 feet
CREW	None (unmanned)
SERVICE TIMEFRAME	2002–2012
ACCESSION	2013.062.001



THE MODEL

The Boeing A160T Hummingbird is an advanced unmanned aerial vehicle (UAV) designed for long-endurance, high-altitude reconnaissance, and cargo delivery missions.

The development program for the A160 began in 1998 when the Defense Advanced Research Projects Agency (DARPA) awarded a 30-month technology demonstration contract to Frontier Systems, owned by UAV pioneer Abe Karem (see below).

The A160T features a unique variable rotor speed system that allows more efficient operation at different altitudes, reducing fuel consumption and increasing endurance, making it an ideal platform for intelligence, surveillance, and reconnaissance (ISR) operations over long periods.

In 2008, the A160T demonstrated its un-refueled endurance capabilities with an 18.7-hour flight, landing with over 90 minutes of fuel still on board. This was recognized as the longest un-refueled flight of any rotorcraft, and the Fédération Aéronautique Internationale (FAI) awarded Boeing an official endurance record in the 500 kg to 2,500 kg autonomously controlled UAV class. Additionally, the A160T set speed and Hover-Out-of-Ground-Effect (HOGE) milestones that surpassed most conventional rotorcraft abilities at the time.

The A160T is also a cargo-carrying drone, tested to carry payloads of up to 1,000 pounds, which allows for supply delivery to troops in difficult-to-reach areas or during disaster relief operations. The helicopter's autonomous system allows it to be pre-programmed for delivery missions, landing in tight spaces or contested zones where human pilots might be at risk.

Despite the program's eventual cancellation, the A160T remains a benchmark in the development of autonomous aerial systems, influencing the design of future UAVs.

NOTABLE PEOPLE

ABRAHAM KAREM

Born in Baghdad, Iraq, and raised in Israel with a passion for aeronautics, Karem is regarded as the founding "Dronefather" of unmanned aerial vehicle (drone) technology. He built his first drone for the Israeli Air Force during the Yom Kippur War in 1973. After immigrating to the United States in the 1970s, Karem designed and manufactured his first drones in his home garage. Karem's Amber

drone evolved into the General Atomics MQ-1 Predator and MQ-9 Reaper drones used by the C.I.A and U.S. military.

HISTORY OF THIS AIRCRAFT

This Boeing A160T Hummingbird S/N A010 is believed to be the only surviving example of four originally built by Frontier Systems. This aircraft was acquired from the Federal Surplus Personal Property Donation Program and transferred to the Museum’s permanent collection in 2013.

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LOCATION: T

Boeing GBU-57 MOP

Massive Ordnance Penetrator

LENGTH	20.5 ft
DIAMETER	31.5 in
WEIGHT	30,000 lbs
WARHEAD	5,300–5,700 lbs high explosives
SERVICE TIMEFRAME	2011–Present



The GBU-57 “Bunker Buster” was developed in the early 2000s to address a problem that had grown steadily since the Cold War: critical military facilities were being buried ever deeper underground. Hardened command centers, weapons storage sites, and nuclear infrastructure were designed to survive conventional air attack. Earlier bunker-busting weapons lacked the size, weight, and penetration capability to reliably defeat these targets. The MOP—at roughly 30,000 pounds—was conceived as a precision tool that could reach deeply buried structures without relying on nuclear weapons, reflecting a strategic shift toward conventional means of holding hardened targets at risk.

Today, the GBU-57 represents the most powerful non-nuclear penetrator in the U.S. arsenal. It is designed to be carried by stealth bombers, originally the B-2 Spirit and in the future the B-21 Raider, allowing it to reach heavily defended airspace. Rather than relying on blast alone, the weapon uses immense mass, hardened construction, and precise guidance to penetrate layers of rock and reinforced concrete before detonating. While its operational details remain classified, its primary role is widely understood as deterrence—signaling that even the most deeply buried facilities are vulnerable.

Looking ahead, the future of the MOP is closely tied to advances in stealth aircraft, sensors, and precision guidance. As underground facilities continue to evolve, so too may the weapons designed to counter them, potentially incorporating improved materials, smarter fuzes, or alternative effects. At the same time, the existence of the GBU-57 underscores a broader theme in modern military history: the effort to replace nuclear solutions with highly specialized conventional systems.

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 to Iran exceeding 30 hours, supported by more than 125 refueling tankers, electronic warfare, fighter aircraft and 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.

ABOUT THIS TECHNICAL SPECIMEN

The Museum’s GBU-57 was constructed by CMR-D, a Department of Defense manufacturer, and is the only example on museum display worldwide. A full-scale inert version of the bomb, Technical

Specimens are used for training and educational purposes by the U.S. Air Force. This exhibit was made possible by private donors, Museum volunteers, and the Laney Family Foundation.

LOCATION: NL

Boeing HK36

Super Diamond

MAXIMUM CRUISE SPEED	68 mph
MANEUVERING SPEED	98 mph
ENGINE	Electric Brushless DC Motor 45 kWe Peak
RANGE	20 miles
CAPACITY	Two
LOADED WEIGHT	1,896 lbs.
EMPTY WEIGHT	1,739 lbs.



Boeing announced on April 3, 2008, that it has, for the first time in aviation history, flown a manned airplane powered by hydrogen fuel cells.

The Boeing HK36 hydrogen powered test plane successfully demonstrated the first straight-level manned flight that was powered solely by a hydrogen fuel cell system. This two seat Diamond Super Dimona motor glider was modified to include a proton exchange membrane (PEM) fuel cell lithium–ion battery system. During take-off and climb, the aircraft drew from the combined power of the lithium-ion batteries and the fuel cell. The fuel cell then provided all power for the cruise phase of flight at 60 mph for 20 minutes.

During the test flights south of Madrid, the pilot of the 53.5 foot-wingspan plane climbed to an altitude of 3,200 feet above sea level using a combination of battery power and hydrogen fuel cell power. The pilot then disconnected the battery and flew at a cruising speed of 60 mph for 20 minutes solely on energy produced from the cells.

Hydrogen fuel cells are electrochemical devices that convert hydrogen into electricity and heat without producing carbon dioxide or other greenhouse gases. Their only exhaust is heat and water.

According to Boeing researchers, PEM fuel cell technology potentially could power small manned and unmanned air vehicles. Over the longer term, solid oxide fuel cells could be applied to secondary power-generating systems, such as auxiliary power units for large commercial airplanes. Boeing does not envision that fuel cells will ever provide primary power for large passenger airplanes, but the company will continue to investigate their potential, as well as other sustainable alternative fuel and energy sources that improve environmental performance.

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LOCATION: H

Cassutt III

Air Racer

WEIGHT EMPTY	575 pounds
WEIGHT LOADED	850 pounds
POWERPLANT	Continental O-200 100 hp.
MAXIMUM SPEED	248 mph
CRUISE SPEED	180 mph
RANGE	450 miles
RATE OF CLIMB	1,500 fpm



In the 1930s, air racing took on a status much like NASCAR racing has today. People followed every race with anticipation of new records being set.

In 1946, the National Aeronautics Association created several new categories for racing, including Formula 1 for “midget racers.” In this category airplanes could not have engines larger than 190 cubic inches (raised to 200 cubic inches in the 1960s) and a minimum wing area of 66 square feet, plus fixed gear, and a fixed pitch propeller. Interest in the class was heightened when Goodyear Aircraft Corporation offered $25,000 prizes at the 1947 National Air Races in Cleveland, Ohio.

In 1954 at a race in Dansville, New York, TWA airline Captain Tom Cassutt debuted an aircraft specifically to race in the Formula 1 category. Cassutt was to gain widespread fame when he used the little plane to win the 1958 National Championship Midget Air Races. The design has continued to be popular and mini racers compete at the National Championship Air Races in Reno, Nevada every September.

Besides being a racer, the Cassutt is also fully aerobatic and its simple construction of wood, steel tubing, fabric and fiberglass made it an easy and inexpensive aircraft for the home builder. Plans for the Cassutt III are available from the National Aeronautics Company.

HISTORY OF THE MUSEUM’S AIRCRAFT

Evergreen’s Cassutt racer was named “Crown Jewel” and is somewhat unique in having been built to fit pilots over 6 feet tall.

It was acquired by Evergreen Aviation & Space Museum board member Greg Jaspers and flown in the 2008 Reno Air Races; placing 16th overall with a top speed of 203.46 miles per hour. Sadly, Jaspers died in an aircraft accident several weeks later, and his widow sold the aircraft to the Captain Michael King Smith foundation for display at the Museum. It was restored by Museum volunteers and repainted to its current scheme and 2012. This aircraft is on loan from McMinnville Properties, LLC.

Cessna O-2

Skymaster / Oscar-Duce

MAXIMUM SPEED	199 mph
CRUISE SPEED	144 mph
SERVICE CEILING	19,300 feet
ENGINES (2)	Lycoming IO-360 210 hp. each
RANGE	1,325 miles
ARMAMENT	SUU-11A Minigun pod, SUU-14A bomblet dispenser, 4 x MAU-3A bomb racks, LAU-59/MA-2 rocket launcher
CREW	Two



In 1966 the US Air Force commissioned Cessna to build a military variant of the Cessna 337 *Super Skymaster* to replace its O-1 *Bird Dog*. The result was the Cessna O-2 *Skymaster*. It was flown by the U.S. military between 1967 and 2010.

O-2s were a low-cost, twin-engine, piston-powered aircraft with one engine in the nose of the aircraft and a second engine in the rear of the fuselage. The push-pull configuration meant a simpler single-engine operating procedure and also allowed for a high wing, providing clear observation below and behind the aircraft.

The USAF took delivery of the O-2 in March 1967 and the O-2A (from USAF stock) entered the U.S. Army's inventory during that same year. By 1970, a total of 532 O-2s had been built. A third were lost in the Vietnam War where they were used primarily in forward air control (FAC) and psychological operations (PSYOPS).

The version designed for use in forward air control missions featured extra radios and underwing ordnance hard points to hold rockets, gun pods or flares. The O-2B PSYOPS version was equipped with loudspeakers and a leaflet dispenser, but otherwise carried no weapons.

HISTORY OF THE MUSEUM'S AIRCRAFT

This aircraft was used during the recovery of Lt. Col. "Gene" Hambleton —portrayed in the 1988 movie, "Bat 21."

On April 2, 1972, Lt. Col. Hambleton's Douglas EB-66 *Destroyer* was hit by a North Vietnamese SA-2 surface to air missile. He was the only crew member able to eject from the aircraft. Several rescue attempts resulted in American fatalities during the recovery efforts, forcing LTC Hambleton to move constantly behind North Vietnamese lines for 12 days to avoid capture.

His rescue was the "largest, longest, and most complex search-and-rescue" operation during the Vietnam War.

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LOCATION: H

Cockpit Familiarization Trainer

with McDonnell Douglas ACES II Ejection Seat System



The cockpit familiarization trainer utilizing the McDonnell Douglas ACES II ejection seat system is a critical tool for pilot training, designed to simulate real-world cockpit conditions in a safe and controlled environment. This trainer allows pilots to become acquainted with the layout, controls, and emergency procedures of their aircraft before ever taking flight. One of its key components is the ACES II ejection seat, which provides hands-on experience in ejection protocols, helping pilots develop muscle memory for emergency scenarios. The trainer also features interactive displays, simulated instrumentation, and sometimes full-motion capabilities, offering a realistic representation of flight conditions.

These trainers are widely used across the U.S. Air Force and allied air forces, providing pilots with essential pre-flight preparation and emergency response training. By practicing egress procedures, ejection seat operation, and aircraft system management, pilots gain confidence and proficiency before stepping into an actual cockpit. The inclusion of the ACES II system ensures that pilots fully understand the sequence and mechanics of an ejection, reinforcing safety protocols that can mean the difference between life and death in a real emergency.

AIRCRAFT USING THE ACES II EJECTION SEAT SYSTEM

- Fairchild Republic A-10 Thunderbolt II
- McDonnell Douglas F-15 Eagle
- General Dynamics F-16 Fighting Falcon
- Lockheed Martin F-22 Raptor
- Lockheed F-117 Nighthawk
- Rockwell B-1 Lancer
- Northrop Grumman B-2 Spirit

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LOCATION: H

Consolidated PBY-5A

Catalina

MAXIMUM SPEED	196 mph
CRUISE SPEED	125 mph
SERVICE CEILING	15,800 feet
ENGINES (2)	Pratt & Whitney R-1830-92 Twin Wasp 1,200 hp. ea.
RANGE	2,520 miles
MAXIMUM WEIGHT	35,420 lbs.
ARMAMENT	Machine guns + 4,000 lbs. bombs, depth charges, torpedoes
CREW	Eight





The designation PBY followed the standard Navy nomenclature of the time: P for patrol, B for bomber, and Y the designator of the Consolidated Aircraft Corporation. Originally a water-only flying boat, but later an amphibious aircraft, the “Cat” was one of the most famous and most numerous of its type in WW II. PBYs were used in anti-submarine warfare, bombing and strafing missions, convoy escort duties, search, and rescue missions, for mining of harbors, and cargo transport.

An estimated 4,051 *Catalinas* of all versions were produced between 1937 and 1945 for the U.S. Navy, the U.S. Army Air Forces, the U.S. Coast Guard, Allied nations - including Russia, and civilian customers. It served in all theaters of operations in WW II.

The PBY was the first production airplane with fuel storage in the wings. It had a remarkable range. The prototype had its maiden flight on 19 May 1936 and during test and demonstration set a record for non-stop flight of 3,443 miles.

The most numerous version was the PBY-5A. It had hydraulically actuated retractable tricycle landing gear for amphibious operation. It also introduced a tail gun position, replaced the bow single gun position with a turret equipped with twin .30 machine guns, incorporated improved armor, and added self-sealing fuel tanks.

Four bomb racks were installed on the wing just outboard of the engines. The PBY-5A could carry 4,000 pounds of ordnance — bombs, depth charges and torpedoes. There was a crew of eight: pilot, co-pilot, bow turret gunner /bombardier, flight mechanic, radioman, navigator and two waist gunners.

Because of their worldwide popularity, there was scarcely a maritime battle in WW II in which they were not involved. For instance, *Catalinas* spotted the German battleship Bismarck as well as the Japanese fleets at the Battle of Midway.

In March 1943, dedicated Emergency Rescue Squadrons were established by the U.S. Army Air Force. ERS PBYs were manned by and flown by Army personnel, giving the Army its own navy. Thousands of Allied sailors and airmen were saved by these "Dumbo" units. The last active military PBYs were not retired from service until the 1980s.

THE MUSEUM’S PBY

Evergreen Aviation and Space Museum’s PBY-5A was built by Consolidated Canadian Vickers in Montreal as one of 129 Canso Model A /2Fs. It entered service with the Royal Canadian Air Force in June of 1943 and served with the that organization until 1961.

For a good portion of the 1960s it was used for wildland firefighting in France after being purchased from the Canadian government. In 1969, it was sold to Norcanair of Prince Albert, Sask., which was handling firefighting operations for the province. The Saskatchewan government bought it in 1980. In May 1997, new owners had it flown to Nanaimo, BC where it sat, deteriorating, for the next 10 years. It was permanently withdrawn from service in 2004.

It is painted to represent the aircraft that first spotted the Japanese fleet in the Battle of Midway, June 4-6, 1942. Boat 4 of VPB-44, the “Golden Pelicans”, was the first American aircraft to discover the approach of the Japanese when they found the invasion fleet heading for Midway just before noon on June 3rd. This aircraft is on loan from McMinnville Properties, LLC.

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LOCATION: HO

Convair F-102A

Delta Dagger

MAXIMUM SPEED	825 mph (Mach 1.25)
CRUISING SPEED	600 mph
SERVICE CEILING	53,400 feet
ENGINE	Pratt & Whitney J57-P-23 turbojet 16,000 lbs. thrust w/afterburning
RANGE	1,000 miles
ARMAMENT	6 x air to air missiles: AIM -4A , -C or -4E Falcons
CREW	One



The Convair F-102 *Delta Dagger* fighter was part of the backbone of North America's air defenses in the late 1950s. Entering service in 1956, its main purpose was to intercept invading Soviet bomber fleets. But the aircraft's development was long and troubled. The F-102's official name, "Delta Dagger", was never used in common parlance, with the aircraft being universally known as the "Deuce."

In June of 1950, the US Air Force took a new approach in its request for an operational interceptor, considering both the aircraft and armament together in what became known as a "weapons system". Convair won the competition, but the first prototype aircraft could not meet speed requirements. The salvation of the project turned out to be in the "area rule" formulated by scientist Richard Whitcomb. It required that the fuselage be narrowed down in the region where the wing roots were attached, then broadened back out again when the wing trailing edge was reached. This gave the aircraft fuselage a characteristic wasp-waist or Coke-bottle shape.

The production F-102A had a Hughes MG fire control system. It had a three-segment internal weapons bay under the fuselage for air-to-air missiles. Initial armament was three pairs of GAR-1 *Falcon* missiles in a mix of infrared and semi-active radar homing. The doors of the two forward bays each had tubes for 24 x 2.75-inch rockets. The F-102 was later upgraded to carry the GAR-11 *Nuclear Falcon* missile in the center bay.

The first delivery to an operational Air Defense Command (ADC) unit took place on May 1, 1956, three years later than originally expected. By the end of 1958, 26 ADC squadrons were flying F-102As, and it had replaced the North American F-86D *Sabre* as the most numerous interceptors within the command. There were 627 F-102As in service or about half of the total number of interceptors operated by the ADC. At the height of its service, 32 ADC units flew the F-102A. The last of 873 *Delta Daggers* were delivered in September of 1958.

During the early 1960s, the F-102A was gradually replaced in the ADC by the McDonnell F-101B *Voodoo* and the Convair F-106 *Delta Dart*. The last F-102A left Air National Guard service in October of 1976. Most of the retired F-102As ended up in the boneyards at the Davis-Monthan AFB storage facility. Many were subsequently converted into remote-controlled drone aircraft.

HISTORY OF THE MUSEUM'S AIRCRAFT

In May of 1960, this F-102 left the cold climate of Greenland behind and touched down at Tyndall Air Force base near Panama City, Florida. The aircraft later was based in Alabama and Massachusetts.

In February of 1963, it was transferred to the 337th Fighter Group based at Portland International Airport. Nearly three years later, the plane flew with the 142nd Fighter Group of the Air National

Guard, still based in Portland. In 1971, the plane was retired and transferred into the Air Force's Museum Loan Program.

In 1998, it was brought to the Evergreen Museum from the Oregon Museum of Science and Industry in Portland. Today, the canopy rails carry the names of two people, one on each side. Major Bill Avolio, a retired Air National Guard pilot, flew numerous types of military aircraft, including this F-102. He has donated much of his time maintaining many of the aircraft in the Museum's collection. The name on the opposite side is Brigadier General Patrick O'Grady, the commander of the Oregon Air National Guard from August of 1962 to May of 1978. O'Grady piloted 107 different types of aircraft, including many hours in the Convair F-102. This aircraft is on loan from the National Museum of the United States Air Force.

Convair F-106

Delta Dart

MAXIMUM SPEED	Mach 2.3 (1,525 mph)
CRUISING SPEED	650 mph
SERVICE CEILING	57,000 feet
ENGINE	Pratt & Whitney J75-17 24,500 lbs. thrust
RANGE	1,800 miles
ARMAMENT	2 x AIM 4-F Falcon + 2 x AIM-4G Falcon missiles, 1 x AIR-2A nuclear rocket
CREW	One



Originally dubbed the F-102B, the F-106 was developed in 1955 as a replacement for the F-102 *Delta Dagger*. Since it had so many modifications from the F-102, it was redesignated the F-106 in 1956. A total of 342 were built.

Capable of flying at Mach 2, the “Six” was designed as an all-weather, nuclear-armed interceptor to shoot down bombers. It served in US Air Force and Air National Guard air defense units until 1988. It still holds the world’s record, set on December 15, 1959, for the fastest single-engine jet aircraft: 1,525.95 mph at 40,000 feet (Mach 2.39).

The F-106 was designed without a gun or provision for carrying bombs. For clean supersonic flight it carried its missiles in an internal weapons bay. It was armed with four Hughes AIM-4 *Falcon* air-to-air missiles, along with a single GAR-11/AIM-26A *Falcon* nuclear-tipped semi-active radar homing missile or a 1.5 kiloton-warhead AIR-2 (MB-2) *Genie* air-to-air rocket intended to be fired into enemy bomber formations.

To support its role, the F-106 was equipped with an integrated fire-control system which could be linked to the Semi-Automatic Ground Environment (SAGE) network for ground control interception missions, allowing the aircraft to be steered by controllers. One of those SAGE centers was located at Adair Air Force Station located about 40 miles south of the Museum.

All told, the SAGE system is estimated to have cost around $10 billion dollars in 1954, or about $89.7 billion in 2017 dollars — or about three times what the U.S. spent on the Manhattan Project during World War II. SAGE remained in continuous operation between 1963 and 1984.

The “Six” retired from active service in 1988. In 1986, many were converted into the QF-106 drone configuration and used for target practice.

HISTORY OF THIE MUSEUM’S AIRCRAFT

This F-106 is on loan from the National Museum of the United States Air Force and was restored at the Evergreen Air Center. The aircraft is painted in the colors of the last unit to fly it, the 49th Fighter Interceptor Squadron flying out of Griffiss Air Force Base, New York.

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LOCATION: H

Runway Marker Light

Silent Witness to History: Crouse-Hinds



BACKGROUND

This rugged airport boundary light once lined the coral-paved runways of North Field on the remote Pacific island of Tinian. Built by U.S. Navy Seabees in 1944–1945, North Field quickly grew into the largest, busiest aerodrome in the world, featuring four massive 8,500-foot runways designed to support hundreds of Boeing B-29 Superfortresses conducting strategic bombing operations against mainland Japan.

In late July 1945, the heavy cruiser USS Indianapolis (CA-35) steamed into Tinian on a top-secret, record-breaking dash across the Pacific. The Indianapolis delivered the enriched uranium core and crucial trigger components for “Little Boy,” the world’s first operational atomic weapon. Just days after completing the covert delivery, a Japanese submarine torpedoed and sank the Indianapolis in the Philippine Sea, resulting in the catastrophic loss of nearly 900 sailors and Marines—the greatest single-ship loss of life in U.S. naval history.

In the early morning hours of August 6, 1945, this boundary marker—and dozens like it—cast an amber glow across Runway A as a modified B-29 dubbed the Enola Gay taxied into position. Piloted by Colonel Paul W. Tibbets Jr. and carrying the assembled atomic bomb, the heavily laden bomber roared down the runway toward the open ocean, bound for Hiroshima. The mission, followed days later by the flight of Bockscar to Nagasaki, ushered humanity into the Atomic Age and brought World War II to a swift, fateful conclusion.

Cast in durable aluminum and glass by the Syracuse-based Crouse-Hinds Company, fixtures like this withstood the harsh equatorial sun and salt air. Today, this artifact stands as a silent sentinel to the technological mobilization of wartime industry, the tragic sacrifice of the USS Indianapolis, and the dawn of nuclear warfare.

ABOUT THIS ARTIFACT

This item was recovered from North Field at Tinian in 1963, and donated to the Museum in 2026.

LOCATION: H

Curtiss J-1

Robin B

MAXIMUM SPEED	120 mph
CRUISING SPEED	90 mph
SERVICE CEILING	12,500 feet
ENGINE	Continental R-670 220 hp.
RANGE	500 miles (30 gal. tank)
CAPACITY	Three



Introduced shortly after Charles Lindbergh's famous 1927 flight, the Curtiss *Robin* quickly became the most popular American general aviation aircraft of its time.

Designed to use up World War I surplus 90-hp Curtiss OX-5 engines, the *Robin* was an inexpensive aircraft within the same class as the numerous open-cockpit biplanes of its time, but with the comfort and simplicity of an enclosed monoplane.

Using the same standards employed by the military, the *Robin* was probably the most engineered private aircraft flying. The seating capacity was three; two passengers sat in the back, side by side, with the pilot up front in the middle. A distinctive feature was the side cockpit windows that ran almost to the floor.

Featuring simple, yet strong steel tube and wood frame construction, the *Robin* easily outsold all other competing American civil aircraft. Curtiss produced a total of 769 of them.

Several pilots flew *Robins* on highly publicized endurance flights:

Brothers Fred and Algene Key took off from Meridian, Mississippi on June 4, 1935, and landed 27 days later. There to greet the exhausted fliers on the evening of July 1 were 35,000 wildly cheering spectators. The Key brothers' total flight time was 653 hours and 34 minutes. Among the dangers they had faced were severe thunderstorms and an electrical fire. During the flight, Fred and Al took turns manning the controls and sleeping on the extra fuel tank behind them in the cabin.

They received food, fuel, and supplies 432 times through a sliding roof hatch from another *Robin*. A metal catwalk made in-flight maintenance and lubrication of the engine possible. Their estimated ground track was 52,320 miles, or more than twice the circumference of the earth.

Another of these flights was Douglas "Wrong-Way" Corrigan's journey from New York City to Ireland in 1938. Denied official permission to fly the Atlantic, Corrigan had declared his in-tention to fly to California, but instead turned east and crossed the Atlantic claiming he accidentally read his compass backward.

HISTORY OF THE MUSEUM'S AIRCRAFT

C.R. Putman of Pontiac, Michigan took delivery of this *Robin* in late July 1929. Putman operated a flight school and offered flight instruction and sightseeing rides for as little as $2.50.

As originally completed, a 90-hp Curtiss OX-5 in-line engine powered this aircraft. A later owner converted the aircraft to utilize a 185 horsepower Curtiss *Challenger* radial engine. Keith Aakre of Seattle, Washington, purchased the aircraft in the 1990s and fitted it with a Continental R-670 radial rated at 220 horsepower. Mr. Aakre donated the aircraft to the Museum in 2004.

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LOCATION: H

Curtiss JN-4A (replica)

Jenny (Canuck)

MAXIMUM SPEED	75 mph
CRUISING SPEED	65 mph
SERVICE CEILING	6,500 feet
ENGINE	Curtiss OX-5 90 hp.
ENDURANCE	2 hours 18 minutes
CAPACITY	Two



If any airplane can be singled out as having made the greatest over-all contribution to early aviation, it probably would the Curtiss JN-4 *Jenny*. Although designed and built as a military trainer for American pilots during the First World War. The J*enny* distinguished itself even more during the post-war years. It was the plane that introduced flying to the American public and popularized aviation. It was the Model T-Ford of the air.

During World War I more than 90-percent of American pilots received their primary instruction on the *Jenny*. After the war, thousands of these aircraft were sold at surplus prices on the civilian market. The plane's slow speed and stability made it ideal for stunt flying and aerobatic displays. The *Jenny* would be the principal aerial mounts for those gypsy fliers called barnstormers. A total of 6,070 were built.

The Curtiss *JN* series began in 1914 as a hybrid design built around the Curtiss OX-5 engine. The series incorporated the better features of the Model N designed in America by Glenn Curtiss and the Model J designed in England by B. Douglas Thomas. The designation officially became the JN-2. The factory ultimately produced *Jenny*s at the rate of 100 per month. It was the first aircraft to go into mass production in Canada.

Canadian-built *Jenny*s incorporated certain features requested by Canadian authorities. These included a control stick instead of a wheel, a revised tail as well as strut-connected ailerons on both wings. This model, which first flew in January 1917, became known as the JN-4 (Can), or more popularly, the *Canuck*.

HISTORY OF THE MUSEUM'S AIRCRAFT

Built by Century Aviation of Wenatchee, Washington, this replica *Canuck* has many original parts, including an original Curtiss OX-5 engine. It has been left uncovered to show the structure of the wings and fuselage. Normally they would have been covered in cloth, stretched tight, and then painted with dope, a plasticized lacquer that is applied to fabric-covered aircraft. It tightens and stiffens fabric stretched over airframes, which renders them airtight and weatherproof. However, dope from this era was highly flammable resulting in many aircraft catching on fire during combat.

LOCATION: H

Curtiss Model D (replica)

Headless

MAXIMUM SPEED	50 mph
ENGINE	Curtiss OX-5 90 hp.
ENDURANCE	2 hours 30 minutes
EMPTY WEIGHT	700 pounds
GROSS WEIGHT	1,300 pounds
CAPACITY	One



The achievement of the Wright Brothers in 1903 encouraged others to develop their own flying machine for commercial sale. The most successful of these early Wright competitors was Glenn Curtiss.

A famed motorcycle racer and engine manufacturer, Curtiss was a member of New England's Aerial Experiment Association. Headed by Alexander Graham Bell, the group's purpose was to construct a working airplane.

In 1909, the G.H. Curtiss Manufacturing Company delivered the firm's first airplane, called the *Golden Flyer*—a pusher design with elevators in the front—to the New York Aeronautical Society. The basic Curtiss design was very adaptable and the basis for the first seaplane. Both the US Army and US Navy purchased Curtiss aircraft for their flight training programs. Perhaps most importantly, Curtiss products helped to refine the method of flight control found on nearly all airplanes of today.

Like the Wright's 1903 *Flyer*, Curtiss' early designs were "pushers" with the engine mounted between the wings and behind the pilot's seat, pushing the aircraft forward. However, unlike the Wright's airplane, Curtiss aircraft utilized a French innovation—ailerons—mounted between the two wings to control the roll of the aircraft. Curtiss used ailerons for aerodynamic reasons and to avoid the Wright's patents on maneuvering aircraft through wing "warping", although the two companies' lawyers were in court nearly constantly arguing cases of patent infringement.

Elevator control on the Model D worked normally, where one would pull the control column back for nose up and push it forward for nose down; turning the steering wheel controlled the rudder. To make a turn in the air though, an aircraft must bank. Curtiss set up his banking control using the side-seat rails which the pilot pushed against with his hips, to "lean into" the turn.

In 1909, The Curtiss Pusher was the world's first aircraft to takeoff from and to make the first landing aboard a ship.

By 1911, Curtiss was able to produce and sell his designs to both private owners and the military. The Army purchased four single and two seat Curtiss airplanes between 1911 and 1912. A Curtiss 1911 Model E seaplane became the first aircraft purchased by the Navy, which took delivery of eight Curtiss aircraft by 1913. However, despite their relative commercial success, their poor safety record in military service and aeronautical advancements in Europe on the eve of World War I quickly made the Curtiss pusher obsolete.

HISTORY OF THE MUSEUM'S AIRCRAFT

Unlike most Curtiss pusher aircraft produced between 1909 and 1912, this example does not have a forward elevator mounted ahead of the pilot's position. Therefore, it is known as a Curtiss *Headless* pusher. Lincoln Beachey, a Curtiss exhibit pilot, discovered in 1910 that a Curtiss pusher would fly quite well without a forward elevator. Beachey, Navy pilots and other Curtiss owners removed the forward elevators from their aircraft.

Mr. Dale Crites, of Waukesha, Wisconsin built this replica of a Curtiss Model D *Headless* in 1990. Fitted with a Curtiss OX-5 engine, this replica has flown on a number of occasions. Mr. and Mrs. Stanley Hiller purchased it in the early 1990s. This aircraft is on loan to the Museum from the Hiller Aviation Museum in San Carlos, California.

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LOCATION: H

Curtiss N2C

Fledgling

MAXIMUM SPEED	109 mph
CRUISING SPEED	95 mph
SERVICE CEILING	15,100 feet
ENGINE	Wright R-790-8 220 hp.
RANGE	366 miles
CAPACITY	Two



The Fledgling was originally designed by Curtiss in 1927 to meet a US Navy requirement for a new trainer to teach “fledgling” aviators the basics of fight; an acute need since many were still training on the Curtiss N-9, which was a naval version of the World War I *Jenny*. Beating out 14 other competing designs, the N2C, as the *Fledgling* was known to the Navy, was put into mass production with more than 50 being built. Its first flight was in 1927. It was a bi-wing design with tandem seating for a pilot and instructor and could be fitted with floats for seaplane training. Its construction was of a steel-tube frame, an aluminum frame tail with wood frame wings, which was not much different from the *Jenny* it replaced.

It was manufactured for civilian use as the Curtiss Model 51. Approximately 160 were built of which 54 were for the Navy. The *Fledgling* proved to be a successful venture for Curtiss. It was used primarily at the company’s many training schools scattered across the U.S. Over time, it became a much-loved trainer and was considered docile and perfectly suited to the role it was designed to fill.

On September 5, 1931, Marshall Boggs used a Curtiss *Fledgling J-1 Special* at College Park, Maryland to complete the first blind landing with James L. Kinney as check pilot. While accuracy was improving, the system was very sensitive and was only effective with no wind, no turbulent air, and no radio static - the opposite of when instruments were needed.

By the late 1930s, surviving N2Cs were modified with tricycle landing gear and turned into radio-controlled drones used as targets for anti-aircraft gunners. One drone was used to execute an attack on a target ship, a precursor of today's anti-ship missiles.

HISTORY OF THE MUSEUM’S AIRCRAFT

This 1929 *Fledgling* was donated by Gladys Burrill and family of Medford, Oregon. Gene Burrill acquired this aircraft in the 1960's. He restored and flew the aircraft for many years. Between 2009 to 2010, the Evergreen Restoration Team cleaned and touched the aircraft up before placing it in the Museum.

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LOCATION: H

Curtiss-Wright CW-15

Sedan



HISTORY OF THE MODEL

The Curtiss Wright CW-15 *Sedan* was a four-seat utility aircraft produced in small numbers in the United States in the early 1930s. It was a braced high-wing monoplane with conventional tail wheel landing gear with a fully enclosed cabin, superficially resembling the Travel Air 10. At the time of the CW-15's design, Travel Air had recently been acquired by Curtiss-Wright.

SPECIFICATIONS

GENERAL CHARACTERISTICS:		PERFORMANCE:	
CREW	One pilot	**MAXIMUM SPEED**	115 mph.
CAPACITY	3 passengers	**CRUISE SPEED**	97 mph.
LENGTH	30 ft. 5 in.	**RANGE**	525 miles
WINGSPAN	43 ft. 5 in.	**SERVICE CEILING**	12,000 ft.
HEIGHT	8 ft. 10 in.	**RATE OF CLIMB**	600 ft./min.
WING AREA	240 sq. ft.		
EMPTY WEIGHT	2,083 lbs.		
GROSS WEIGHT	3,281 lbs.		
POWERPLANT	1 x Curtiss Challenger w/185 hp.		

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LOCATION: H

de Havilland DH-112

Venom

MAXIMUM SPEED	640 mph
CRUISING SPEED	Unspecified
SERVICE CEILING	39,400
ENGINE	De Havilland Ghost 103 Turbojet 4,850 lb Thrust
RANGE	1080 miles
CAPACITY	1



The de Havilland DH 112 Venom is a British post-war single-engine jet aircraft developed and manufactured by the de Havilland Aircraft Company of England. Much of its design was derived from the de Havilland Vampire, the firm's first jet-powered combat aircraft.

Although generally similar in appearance to the preceding Vampire, sharing the distinctive twin-boom tail and composite wood/metal structure, the Venom was a completely new design. As originally designed, it was powered by the de Havilland Ghost 103 turbojet engine, which could generate 4,850lb of thrust, considerably more powerful than the earlier de Havilland Goblin that had been used on the Vampire.

The Venom adopted a wing de-signed with a leading-edge sweepback of 17.6 degrees, a minimized thickness/chord ratio reduced from 14 per cent to 10 per cent, while the trailing edge was straight; a pair of optionally fitted wing tip tanks were also designed to be fitted without any negative impact on the aircraft's over-all combat maneuvering capability.

The Venom proved to be popular on the export market, being sold in substantial numbers to Iraq, New Zealand, Sweden, Switzerland, and Venezuela. The Swiss Air Force was the last active military operator of the Venom, retiring their last examples during 1983.

HISTORY OF THE MUSEUM'S AIRCRAFT

Our restoration section is in the process of restoring a de Havilland DH 112 Venom. We acquired this aircraft as part of a trade when its predecessor, a de Havilland Vampire, was re-claimed by its donor. This aircraft was a basket case, coming to us in pieces and in need of major work.[1]

Contributed by Gary Sohn, EASM Docent, January 2021 Flight Plan Newsletter

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LOCATION: H

de Havilland DH-4

Liberty

MAXIMUM SPEED	128 mph (at sea level)
CRUISING SPEED	90 mph (at 2,500 feet)
SERVICE CEILING	19,600 feet
ENGINE	1,649 cu. in. 400 hp. Liberty
RANGE	330 miles
CAPACITY	Two



When the United States entered World War I it did not possess any combat-worthy aircraft. The British DH-4 was selected for American flyers because of its comparatively simple construction and its adaptability to mass production. It was also well suited to the new American 1,649 cubic inch, 400-horsepower *Liberty* V-12 engine. The engine was a modular design where four or six cylinders could be used in one or two banks, with the cylinders designed as individual units, each with their own water jacket.

Modeled from a combat-tested British De Havilland design, the DH-4 was the only U.S. built aircraft to see combat during World War I. By war's end, thirteen Army Air Service squadrons, five of them bomber squadrons, were equipped with the Liberty Plane.

With inadequate funding to buy new aircraft, the newly created U.S. Army Air Service continued to use the DH-4 in several roles during the lean years following the war. By the time it was finally retired from service in 1932, the DH-4 had been developed into over 60 variants.

But American-built DH-4s had some initial problems. The pilot and observer found themselves separated by the 67-gallon main fuel tank. This dangerous feature not only made communication between the crew-members difficult, but it was hazardous in a crash.

The much-touted *Liberty* engine was also a cause for concern at first. But once the problems were resolved the *Liberty*-powered DH-4 with a maximum speed of 128 mph was able to match or even surpass the speed of most of the fighters of the time.

Dubbed the "Liberty Plane," production contracts were placed for the DH-4 in October 1917. By the end of the war, three U.S. manufacturers were building them: The Dayton-Wright Airplane Company of Dayton, Ohio, built 3,106; The Fisher Body Division of General Motors Corporation of Cleveland, Ohio, produced 1,600 aircraft and the Standard Aircraft Corporation of Patterson, New Jersey, built 140 machines. Plans were under way to produce an additional 7,502 DH-4s, but orders were cancelled after the armistice.

HISTORY OF THE MUSEUM'S AIRCRAFT

Not much is known of the early history of this airplane which was manufactured in 1916. It probably did not see any combat duty in World War I. It is known that this is one of the very few airplanes that were converted at Boeing's historic "Red Barn" in 1923 to the DH-4M model; the "M" denoting "modernized" and not "metalized" as many people believe.

The first civil registration record of any kind for this aircraft shows an Application for Identification dated October 6, 1927 in the name of the rebuilder, Mr. Claire K. Vance. The airplane was then sold and re-sold eventually ending up at Paramount Pictures in 1938.

Hollywood stunt pilot Paul Mantz flew this aircraft in several films including "Men with Wings", "Task Force", "Court Martial of Billy Mitchell", and "The Spirit of St. Louis". Following Mantz's death, the

airplane was purchased by Rosen-Novak Aviation, which owned it until 1968. It was then sold to the Aeroflex Foundation.

The foundation began a renovation process to return the DH-4 to its original WWI bomber configuration. The renovation was completed in 1972 when the airplane was transferred to the Naval and Marine Corps Air Museum in Pensacola, Florida.

In 1977 the airplane was purchased by Mr. Dolph O. Overton who resold it to Norton Aero, Ltd. in 1981. Norton began a total restoration program in 1982, which returned the *Liberty* back into the "mail plane" configuration, as it is seen today. After the restoration was completed, Norton Aero, Ltd. displayed the airplane at its Silverwood Aviation Museum until it was purchased by Evergreen in 1990.

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LOCATION: T

De Lackner DH-4 Heli-Vector

HZ-1 Aerocycle

MAXIMUM SPEED	75 mph
SERVICE CEILING	5,000 feet
ENGINE	Mercury Marine 20H outboard motor, 40 hp
RANGE	15 miles (about 50 miles with auxiliary tank)
ROTOR DIAMETER	Two contra-rotating, 15 feet each
HEIGHT	7 feet
EMPTY WEIGHT	172 pounds
CREW	One
TESTING TIMEFRAME	1954–1958
ACCESSION	2012.109.001



THE MODEL

The De Lackner DH-4 Heli-Vector was an experimental one-person flying platform developed in the mid-1950s for the U.S. Army. Later redesignated as the HZ-1 Aerocycle, it was conceived as a lightweight reconnaissance and transport device featuring a pair of contra-rotating rotors beneath a small standing platform, with the pilot controlling flight through body weight shifts and a twist-throttle handlebar similar to a motorcycle. Intended for short-range scouting, rapid personnel transport, or even combat support, the Heli-Vector/Aerocycle reflected Cold War-era efforts to explore novel forms of personal aerial mobility.

Despite its futuristic appeal, the craft proved difficult to master and offered little protection to its operator, making it impractical for military service. The Army tested several prototypes at Fort Eustis, Virginia, between 1954 and 1958, but the exposed position of the pilot and safety risks led to cancellation of the program. Though never produced, the Heli-Vector/Aerocycle remains a striking example of mid-century experimentation with unconventional rotorcraft designs.

NOTABLE PEOPLE

COLONEL SELMER SUNDBY

A U.S. Army test pilot, Sundby was one of the primary evaluators of the De Lackner Heli-Vector during its trials at Fort Eustis in the mid-1950s. Standing just feet above the contra-rotating rotors, he flew numerous test flights that revealed both the craft's simplicity and its hazards—debris thrown up at the pilot, and wooden rotor blades that sometimes flexed, struck each other, and shattered, causing loss of lift and control. Amazingly, Sundby survived two crashes before the Army terminated the program. He was awarded the Distinguished Flying Cross for his work testing the Heli-Vector/Aerocycle.

HISTORY OF THIS AIRCRAFT

In 2012, Mr. Robert Cummins of New York City offered the Museum a De Lackner helicopter that had been found in an old building once owned by De Lackner Engineering. At the time, only one HZ-1 Aerocycle was known to exist, housed at the U.S. Army Transportation Museum at Ft. Eustis, Virginia, so acquiring this rare craft was especially exciting. The discovery became even more

significant when it was identified as the DH-4 Heli-Vector prototype. Though missing a number of original parts, the Museum’s dedicated Restoration volunteers have returned the aircraft to its present condition.

Douglas A-26C

Invader

MAXIMUM SPEED	355 mph
CRUISING SPEED	284 mph
SERVICE CEILING	22,100 feet
ENGINES (2)	Pratt & Whitney R-2800 2,000 hp. each
RANGE	1,400 miles
ARMAMENT	Up to 14 x .50-caliber machine guns or 6,000 lbs. bomb load
CREW	Three





In the fall of 1940, the US Army Air Corps directed the Douglas Aircraft Company to focus on the development of a twin-engine light bomber that would replace the Douglas A-20 *Havoc*, then in front line service. This new bomber was to be capable of fast and devastating low-level attacks as well as precision bombing from medium altitudes. Douglas's legendary engineer, Ed Heinemann, did much of the early design work on what became the A-26 *Invader*.

Douglas constructed three prototypes in three different configurations: a standard bomber (XA-26), a night fighter (XA-26A) and a low-level attack plane fitted with a 75mm cannon in the nose (XA-26B). The XA-26 bomber made its inaugural flight on July 10, 1942, but the company decided to produce the XA-26B low-level attack variant first after flight-testing the prototypes and reviewing combat reports from American tactical air units.

Douglas placed the XA-26 bomber into production as the A-26C. Fitted with a transparent Plexiglas "bombardier" nose, the A-26C saw service in the Pacific theater during the final months of World War II. Following the war, while the North American B-25 *Mitchell* and Martin B-26 *Marauder* were retired, hundreds of Douglas A-26s remained in service with the US Army Air Force. However, in 1948, the newly independent Air Force changed its aircraft designation system and dropped the "attack" identifier; the Douglas *Invader* became the **B**-26.

In the Korean War, the *Invader* performed night harassment missions. Armed with up to fourteen .50-caliber guns (8 in the nose, 6 in the wings) along with its bombs and rockets, the Invader began tearing up enemy vehicles, trains and positions, often at night. It was the last aircraft to bomb North Korea, dropping its ordinance load just 3 minutes before the cease-fire was signed.

Several A-26s were supplied to Cuban revolutionaries during the Bay of Pigs attack. In the mid-1960s, during the Viet Nam War, the USAF updated forty B-26s for service in Thailand. However, from 1966 to 1969, and at the request of the Thai government, the USAF B-26K *Counter Invader*s stationed in Thailand were once again given the World War II era designation of A-26A.

HISTORY OF THE MUSEUM'S AIRCRAFT

The Douglas Aircraft Factory plant in Tulsa, Oklahoma manufactured this A-26C (S/N 44-35439) and delivered it to the USAAF in the spring of 1945. Following World War II, it was loaned to France, which employed it in Indochina against Viet Minh insurgents. The French returned the plane to the USAF in September 1954. Either the Air Force or the French converted this A-26 from a "C" model to a "B" model at some point during its military career.

Lynch Flying Service of Montana acquired the aircraft from the USAF and converted it into a water bomber for forest fire suppression. Evergreen Ventures purchased the aircraft in 1989 and placed it in storage. Evergreen Aviation Museum volunteers spent more than 6,000 hours completely restoring the aircraft to its wartime configuration.

Historical note: The original “Margie” was a Martin B-26C assigned to the 552nd Squadron.

Douglas A-4E

Skyhawk

MAXIMUM SPEED	673 mph
CRUISING SPEED	498 mph
SERVICE CEILING	42,250 feet
ENGINE	Pratt & Whitney J52-P-6A turbojet 8,500 lbs. thrust
RANGE	1,160 miles
ARMAMENT	2 x 20-mm cannon + up to 8,500 lbs. of ordnance
CREW	One



In 1952, The US Navy asked Edward Heinemann to apply his “less is more” design philosophy to a new attack aircraft. Heinemann’s team focused on keeping this new product simple and lightweight. By deleting many of the heavy, complex, secondary systems found on a lot of military aircraft, they managed to deliver the A-4 *Skyhawk* to the Navy at a gross weight of just 15,000 pounds – half of what the Navy had expected.

The A-4 first took to the air on June 22, 1954, and entered service in September 1955. Its small size made it very easy to move around on a crowded aircraft carrier flight deck and the *Skyhawk’s* wingspan was short enough that there was no need for it to be able to fold its wings.

With nearly 3,000 aircraft produced between 1954 and 1979, the A-4 enjoyed one the longest production runs of any tactical aircraft in history and remained in service in the U.S. into the mid-1990s. Nicknamed variously as, “Heinemann’s Hot-Rod,” “Scooter” or “Tinkertoy,” the *Skyhawk* is one of the most famous attack aircraft ever designed.

Its simplicity and performance made the aircraft attractive to several air forces around the world, even as more modern aircraft became available. Throughout the conflict in Vietnam, it was noted for its unusual accuracy in attacking ground targets.

All models have two internally mounted 20mm cannons and can deliver conventional and nuclear weapons under day and night visual meteorological conditions.

The US Navy’s flight demonstration team, the Blue Angels, chose the A-4 in the early '70s, replacing the thundering F-4 *Phantom II* until transitioning to the F/A-18 *Hornet* in the 1980s. By adopting the *Skyhawk*, the team had an aircraft that was much more aerobatic than the F-4. This allowed for a tighter display that kept much more of the performance in front of the audience.

HISTORY OF THE MUSEUM’S AIRCRAFT

This A-4E (B/N 152070) joined the Navy on September 30, 1965, and remained in service for nearly 30 years. The aircraft served with a number of attack squadrons, including a tour of duty aboard the aircraft carrier USS Intrepid in 1967-1968 with VA-106.

From December 1968 through August 1974, this aircraft flew with Marine Attack Squadron VMA-311 while stationed in Japan and South Vietnam. Later in its career, this A-4E returned to the Navy and flew as an “aggressor” aircraft for VF-45. When the Navy retired it in 1994, it had accumulated 7,589 flight hours.

The Museum acquired it in 2004. It wears the unique markings of the *Skyhawk* flown by -then Lt. Commander John McCain in the summer of 1967 with VA-46 “The Clansmen”. On the morning of July 29, 1967, while waiting to launch from the aircraft carrier USS Forrestal on a strike mission into

North Vietnam, a rocket from another aircraft accidentally triggered an inferno on the flight deck, destroying McCain's A-4E and killing over 130 sailors. He would ultimately be shot down over Vietnam while flying another *Skyhawk*.

LOCATION: H

Douglas AD-5N Skyraider

MAXIMUM SPEED	343 mph at 20,000 ft.
CRUISING SPEED	198 mph
SERVICE CEILING	25,400 ft.
ENGINE	Wright R3350-26W 2,700 hp.
RANGE	1,300 miles
ARMAMENT	4 x 20-mm cannon and 15 external hardpoints to carry a total of 8,000 lbs.
CREW	1 pilot. In the A-1E (AD-5), 3 more seats were available for ECM techs
GROSS WEIGHT	25,000 lbs.



Designed as a high-performance dive/torpedo bomber, the Douglas AD *Skyraider* series of aircraft was too late to see service in World War II but served with distinction in both the Korean and Vietnam Wars.

Initially placed into service with the US Navy, it served in the US Marine Corps, the US Air Force, the Vietnamese Air Force, the French Air Force, the Air Arm of the British Royal Navy, the Kingdom of Cambodia, Chad, and the Central African Republic.

Able to carry a bomb load equal to that of a four-engine B-17 *Flying Fortress*, the AD (re-designated A-1 in the 1960s; the AD-5s became A-1Es.) specialized in close-in support of troops on the ground.

Despite being an anachronism in the jet age, the *Skyraider* proved invaluable during search and rescue operations, as its lower speed and longer endurance meant it could circle over a downed airman or escort helicopters where a jet could not. Aircrews appreciated the airplane's inherent ruggedness that brought them back despite heavy damage from enemy fire.

First flown in 1945, *Skyraiders* entered fleet service the following year. Later nicknamed “Spad” for its old school approach to design and appearance that was reminiscent of the World War I aircraft, the AD earned its reputation in the skies over Korea as one of the finest attack aircraft ever built. All told, 3,180 *Skyraiders* rolled off the Douglas Aircraft Company assembly line.

Missions varied: attacking heavily defended industrial and infrastructure targets, knocking out the Hwachon Dam with aerial torpedoes, and earning the affection of many a grunt with its close air support capabilities. Some, like the Museum’s, were also modified to conduct electronic countermeasures and night attack missions.

A-1s were part of the first attacks against North Vietnam following the Tonkin Gulf Incident and in June 1965, a pair of *Skyraiders* shot down a North Vietnamese MiG-17. In 1968, when increasingly sophisticated antiaircraft defenses proved too hazardous for the slow Spads, Navy A-1s ceased flying attack missions, though they continued to operate in the electronic countermeasures role until 1972.

In 1962 the USAF acquired 150 A-1Es (AD-5) and A-1Js (AD-7) for their own use. These aircraft proved invaluable as escorts for the famed *Jolly Green Giant* H-53 helicopters that engaged in numerous rescues of downed aircrews. In addition to its fire suppression role, the A-1s were often called on to aid in the defense of threatened outposts.

Because of its ability to go in low and slow, a dangerous maneuver requiring cast iron courage from the aircrews, the A-1 was unequalled at the tasks to which it was assigned.

HISTORY OF THE MUSEUM’S AIRCRAFT

The Museum's aircraft, an AD-5N, is the last *Skyraider* flown on an attack mission, its last combat flight occurring over the jungles of North Vietnam. It features a wide fuselage with side-by-side seating and room for additional crew members behind the pilots. This resulted in a very versatile combat aircraft since there was room for system operators for several missions, including electronic countermeasures and early warning.

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LOCATION: H

Douglas C-47 / RD4 (US Navy)

Skytrain, Gooney Bird (U.K.: Dakota)

MAXIMUM SPEED	224 mph
CRUISING SPEED	160 mph
SERVICE CEILING	26,400 feet
ENGINES (2)	Pratt & Whitney R-1830 1,200 hp ea.
RANGE	1,600 miles
USEFUL LOAD	28 troops or 3 tons of cargo
CREW	Three or four



Few aircraft are as well-known or were so widely used for so long as the C-47. The aircraft was adapted from the DC-3 commercial airliner, which first appeared in 1936. A reinforced fuselage floor, the addition of a large cargo door, the fitting of cargo hooks beneath the center wing section and the removal of the tail cone to mount a hook for towing gliders were the major differences between the two.

The first C-47 was ordered by the military in 1940 and by war's end, 9,348 had been procured. They carried personnel and cargo, towed troop-carrying gliders and dropped parachute troops. The British Royal Air Force used C-47s which they nicknamed, *Dakotas* (a clever acronym composed of the letters DACoTA for Douglas Aircraft Company Transport Aircraft). The US Navy version was designated R4D.

The wartime C–47 transports could handle thirty-two passengers or twenty-seven troops in combat gear. Hospital transport conversions carried up to twenty-four stretcher cases. The big cargo door on the left side facilitated handling of military equipment and shipments.

After WWII, many C-47s remained in service with the US Army Air Force, participating in the Berlin Airlift and other peacetime functions. In 1947, a group of Navy R4Ds supported a U.S. Antarctic expedition called "Operation Deep Freeze". On October 31, 1956, a Navy R4D, "Que Sera Sera", became the first aircraft to land at the South Pole.

C-47s were used extensively in the Korean and the Vietnam wars. In Southeast Asia some were armed and designated as AD-47D *Spooky* gunship ground attack aircraft employing three 7.62-mm miniguns firing through the fuselage door and windows.

HISTORY OF THE MUSEUM'S AIRCRAFT

Evergreen's C-47 (43-155-12) flew airborne assaults on Normandy, Southern France, Holland, and Germany. It flew relief to Bastogne during the Battle of the Bulge and carried personnel and supplies throughout World War II. After the war, it flew nearly five million miles as a passenger plane with West Coast Airlines until retiring in 1963. The Oregon Museum of Science and Industry (OMSI) received 43-155-12 from West Coast and displayed it at their Portland Zoo site. In August 1998, OMSI gifted the C-47 to The Captain Michael King Smith Evergreen Aviation Educational Institute.

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LOCATION: H

Douglas DC-3A

Skytrain

TOP SPEED	230 mph
CRUISE SPEED	207 mph
SERVICE CEILING	23,200 feet
ENGINES (2)	Pratt & Whitney Twin Wasp R-1830 1200 hp. ea.
RANGE	2,125 miles
CAPACITY	32 passengers max.
FLIGHT CREW	Two + cabin attendant



“DC” stands for “Douglas Commercial.”

First flown in airline service in 1936 and produced by Douglas until 1954, many DC-3s (and their military counterparts) are still employed in money-making ventures today.

The DC-3 was developed as the DST (Douglas Sleeper Transport), a larger, improved 14-bed sleeper version of the Douglas DC-2. The DC-3 design instantly made every other aircraft in passenger service outdated. It was ultra-modern, big, and fast.

Smooth as a bullet, to the average air traveler the DC-3 made the earlier Fords and Fokkers look like boxy, strut and wire-infested relics. The DC-3s sleek design and more powerful engines paid off with improved performance. It could fly 100 mph faster and four times as far as a 1920s Ford *Tri-Motor*.

The DC-3 normally seated 21 passengers and used two pilots but could carry up to 32 passengers.

It has many of the features of the modern airliner: retractable landing gear, cowled (covered) engines, riveted aluminum skin, and, except for the control surfaces, all-metal construction.

In July 1936 President Franklin D. Roosevelt presented Donald W. Douglas, head of Douglas Aircraft, with the Collier Trophy, recognizing the DC-3 as an outstanding twin-engine commercial plane.

By 1938, a startling 95-percent of the people flying on scheduled airlines in the U.S. were travelling in DC-3s; worldwide, the number was 90-percent.

When the U.S. entered WW II many civilian DC-3 were “drafted” into service to carry troops and cargo. Meanwhile, Douglas made a military version of the plane, designated as the C-47, which had a stronger floor and double loading doors on the left side.

Over 16,000 DC-3s were manufactured — primarily as military transport planes (5,400 of these were built in the U.S.S.R. and Japan). Today some of these planes have more than 90,000 hours (over 10 years) of flight time.

After the war, the “drafted” planes returned to airline service. While larger planes flew the premier routs, it was still the trusty DC-3 that crisscrossed the country.

HISTORY OF THE MUSEUM’S AIRCRAFT

This is the second oldest surviving Douglas DC-3A. It was the first delivered to United Air Lines on November 25, 1936. Named the *Mainliner Reno*, it was also the first to be fitted with Pratt & Whitney supercharged engines.

The *Mainliner Reno* pioneered many of United’s routes from coast to coast. Except for a brief time when it was leased to Eastern Air Lines, the *Reno* flew with United throughout WW II and up until September 29, 1953. It then flew with Continental Air Lines, logging many more years of service.

Discovered “out to pasture” in Dayton, Ohio, it was acquired by the Ray Corporation. Its historical importance was unrecognized and it remained in storage throughout the 1970s.

A letter written by Douglas historian Harry Gann in the early 1980s urged that the historically significant *Mainliner Reno* be saved and returned to its former splendor. After restoration was completed in 1987, the plane was flown in many air shows throughout the U.S. It came to Evergreen in May of 1990.

An estimated 8 million gallons of gasoline and 131,000 gallons of oil were consumed in its many years of travel. It has flown more than 15 million passenger miles and has used 153 engines. This aircraft is on loan from McMinnville Properties, LLC.

LOCATION: NL

Douglas F5D-1

Skylancer

MAXIMUM SPEED	990 mph
CRUISING SPEED	637 mph
SERVICE CEILING	57,500 feet
POWERPLANT	Pratt & Whitney J57-P-8 turbojet, 16,000 lb. thrust w/afterburning
INITIAL CLIMB RATE	20,790 feet per minute
COMBAT RANGE	1,335 miles
MAXIMUM WEIGHT	25,000 pounds
CREW	One



The F5D-1 *Skylancer* made its first flight in April of 1956. The Douglas Aircraft Company envisioned it as an all-weather fighter interceptor for the US Navy but it never made it into production even though its performance proved to be excellent; it easily exceeded the speed of sound on its first flight.

Douglas was already building a very large proportion of the Navy's planes and giving them the F5D contract would have made it even closer to a monopoly. Plus, the performance of the F5D was a little better than that of the Chance Vought F8U-1 which was on the point of entering service. However, four experimental aircraft were used in evaluation trials. The project test pilot was Lt. Cmdr. Alan B. Shepard Jr., the first American into space.

The F5D-1 had the same general configuration as the F4D-1 *Skyray* and could be easily confused with it at a casual glance but featured a substantial fuselage stretch, 35-percent more internal fuel capacity, thinner wings, a taller tailfin, and more engine power to give it true transonic performance.

Eventually, the four prototype *Skylancers* were delivered to NASA, where they contributed to the development of a variety of products, including the Gemini escape system and the space shuttle. NASA's Flight Research Center at Edwards AFB obtained two F5D-1s in 1961. They were later numbered NASA 708 and NASA 802.

The F5D-1 *Skylancer* had a wing planform similar to that projected for Dyna-Soar, a boost-glider design that was to have been lofted into orbit by a Titan III booster. NASA pilot Neil Armstrong, the first man on the moon, recognized that the *Skylancer* could be used to study Dyna-Soar abort procedures. How to save the pilot and spacecraft in the event of a launch-pad booster explosion was a problem of great concern to the Dyna-Soar team.

In testing the abort maneuver, Armstrong would fly the *Skylancer* about 200 feet above the desert floor at a speed of 500 knots, then pull the airplane into a 5g vertical climb to 7,000-8,000 feet altitude, where he would pull the plane over on its back, roll the craft upright and then, setting up a low lift-to-drag-ratio approach, would touch down on a part of Rogers Dry Lake that was marked like a landing strip at Cape Canaveral.

HISTORY OF THE MUSEUM'S AIRCRAFT

This is a very rare F5D-1; one of only two remaining *Skylancers* (the other being at the Neil Armstrong Air and Space Museum).

After the Dyna-Soar program was canceled in December 1963 #708 went to Ames Research Center, installed with an ogival wing for an evaluation for a Concorde Supersonic Transport wing study program. It was retired in 1968.

It was still in NASA markings when it was part of Merle Maine's private collection in Ontario, Oregon until 2014. When the Museum received it from the previous owner, it was his responsibility to prepare it for shipment. He sawed off the wings with no thought of reattachment. This aircraft is on loan from Skylancer Aviation.

LOCATION: H

Fairchild PT-19

Cornell

MAXIMUM SPEED	124 mph
CRUISING SPEED	106 mph
SERVICE CEILING	16,000 feet
ENGINE	Ranger L-440 175 hp.
RANGE	480 miles
CAPACITY	Two



The PT-19 is a Fairchild Aircraft monoplane that was a critical part of the primary flight training program run by the US Army Air Forces, US Navy, and several Allied nations during World War II. It was one of the most widely produced American training aircraft. By the end of 1944, more Allied airman received their primary training in a Fairchild than in any other military trainer.

Fairchild developed the PT-19 in 1938 to satisfy a military requirement for a rugged monoplane primary trainer; it went into quantity production in 1940. As with other USAAF trainers of the period, the PT-19 had multiple designations based on the powerplant installed.

It was a contemporary of the Stearman *Kaydet* biplane trainer and was used as the pre-solo phase trainer for introducing new pilots to flying before passing them on to the more agile *Kaydet*.

Its fabric-covered steel-tube frame construction with plywood covered wings made the PT-19 inexpensive, rugged, reliable and easy to maintain. It was closer to the types of planes that students would fly in combat, yet it had wide landing gear for easy touch downs and performance that had very few vices in flight.

Compared to the earlier biplane trainers, the Fairchild PT-19 provided a more advanced type of aircraft. Speeds were higher and wing loading more closely approximated that of combat aircraft, with flight characteristics demanding more precision and care.

During the war, a shortage of the Ranger engines that powered the PT-19 forced Fairchild to build a version using a 220 horsepower Continental R-670-5 radial engine and dubbed it the PT-23 as well as designing the PT-26 with 200 horsepower Ranger L-440-3 engines and an enclosed cockpit for Canadian users.

Altogether the USAAF accepted 7,742 *Cornells*, of which 4,889 were PT-19s. In addition to those manufactured by Fairchild, the Aeronca, Howard and St. Louis Aircraft Corporations produced *Cornells*. Fleet Aircraft Ltd. produced them in Canada.

These planes were delivered to various bases all over the country by WASPs (Women's Airforce Service Pilots) between 1942-1944. Even after their retirement in the late 1940s, a substantial number found their way onto the United States and other civil registers, being flown by private pilot owners.

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LOCATION: H

Fairchild Republic A-10

Thunderbolt II / Warthog

CRUISING SPEED	450 mph
SERVICE CEILING	45,000 feet
ENGINES (2)	GE TF34-GE-100 turbofans 9,065 pounds thrust each
RANGE	2,580 miles
ARMAMENT	1 x 30-mm GAU-8/A cannon and up to 16,000 lbs. of mixed ordnance
CREW	One





30mm vs .50 BMG

The Fairchild Republic A-10 *Thunderbolt II* is a single-seat, twin turbofan engine, straight wing jet aircraft developed by Fairchild-Republic for the US Air Force. Commonly referred to by its nicknames, *Warthog* or *Hog*, its official name comes from the Republic P-47 *Thunderbolt*, a World War II fighter that was effective at attacking ground targets.

The A-10 was designed around the 30-mm GAU-8 *Avenger* rotary cannon capable of firing 3,900 rounds per minute. It is used for close air support (CAS) of ground troops, engaging armored vehicles and tanks, and providing quick-action support against enemy ground forces. Its combination of large and varied ordnance loads, long loiter time, accurate weapons delivery, austere field capability, and survivability has proven invaluable to the United States and its allies.

It entered service in 1976 and is the only production-built aircraft that has served in the USAF that was designed solely for CAS. Its secondary mission is to provide forward air controller–airborne (FAC-A) support, by directing other aircraft in attacks on ground targets. The aircraft used primarily in this role are designated OA-10.

Its airframe was designed for durability, with 1,200 pounds of titanium armor to protect the pilot, cockpit, and aircraft systems, enabling it to absorb a significant amount of damage and continue flying. The aircraft can survive direct hits from armor-piercing and high explosive projectiles up to 23-mm. The A-10's self-sealing fuel cells are protected by internal and external foam. Manual systems back up the redundant hydraulic flight-control systems enabling pilots to fly and land when hydraulic power is lost.

The *Thunderbolt II* has excellent maneuverability at low air speeds and altitude and is a highly accurate and survivable weapons-delivery platform. The aircraft can loiter near battle areas for extended periods of time and operate in low ceiling and visibility conditions. The wide combat radius and short takeoff and landing capability permit operations in and out of locations near front lines and its simple design enables maintenance with minimal facilities. A large bubble canopy provides pilots with all-around vision and using night vision goggles, A-10 pilots can conduct their missions during darkness.

HISTORY OF THIS AIRCRAFT

The Museum's *Warthog*, S/N 80-0186, is a Gulf War veteran. During operation Desert Storm our A-10, piloted by Col. D.E. Sawyer, was struck in the tail by an Iraqi surface to air missile and sustained

over 300 shrapnel holes on most of its tail surfaces. The aircraft was offline for 11 days and after 139 hours spent on repairs it re-joined air operations.

It was last flown by the Defense Advanced Research Projects Agency for avionics research and then retired and spent time on static display outside the Raytheon Company facility at the Tucson Municipal Airport. It was acquired and arrived at the Museum on October 30, 2016.

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LOCATION: HO

Fisher FP-404

Kit aircraft

CRUISE SPEED	72 mph
SERVICE CEILING	10,000 feet
ENGINE	Rotax 447 40-hp.
RANGE	200 miles
LENGTH	14 feet, 6 inches
HEIGHT	5 feet, 5 inches
EMPTY WEIGHT	275 pounds
WINGSPAN	18 feet



This bi-plane is a throw-back to seat-of-the-pants flying, complete with minimal instruments and bare-necessity controls.

Advertised as the sports car of light planes, “the Fisher Flying Products” FP-404 is a simple single-seat light aircraft. Sold as a kit, FP-404 owners can assemble it using only household tools and a minimum of mechanical skills.

The FP-404 features full span ailerons and a semi symmetrical airfoil, making the aircraft both very responsive and easy to handle. Cruise speed is an invigorating 70 mph, with exceptional stability for hands-off flight capability.

Wood construction and additional bracing make it much stronger than other aircraft of its class. The Fisher FP-404 can climb more than 800 feet-per-minute, as long as the pilot does not exceed the maximum weight limit of 200 lb.

When introduced, the FP-404 kit required owners to complete the bulk of the construction of the aircraft. Today's -404 builders simply epoxy pre-cut, shaved and slotted wooden pieces together over full-sized plans, seal the wood with polyurethane varnish, then cover it with heat shrinkable aircraft fabric. The fabric is then sealed and painted to provide a durable and long-lasting airframe. The average builder can assemble a Fisher FP-404 kit in roughly 350 to 500 hours at a cost of about $10,000.

HISTORY OF THE MUSEUM’S AIRCRAFT

Dewart “Dude” Sattem of Stayton, Oregon purchased this FP-404 as a kit in 1990. Sattem barnstormed in a Waco 10 biplane as a teenager in the 1930s. Taught to fly by his brother Grant, himself a self-taught pilot, Sattem did not officially receive his pilot's license until 1967.

Sattem’s FP-404 kit consisted of little more than blueprints and raw lumber. Constructing the little aircraft took him approximately 1,200-man hours and cost roughly $5,000. Sattem completed the taxi test in the FP-404 but never flew it. The Fisher FP-404 was the 11th and final aircraft Sattem constructed in his long aviation career. He donated the aircraft to the Museum in 2002.

LOCATION: H

Focke-Wulf Fw 190 (composite)

Würger (in English: Shrike)

MAXIMUM SPEED	426 mph
CRUISING SPEED	280 mph
SERVICE CEILING	40,000 feet
RANGE	520 miles
ENGINE	BMW 801 D-2 engine, 2,100 hp.
ARMAMENT	2 x 20-mm MG 151 cannons in wings and 2 x 13-mm MG 131 machine guns in nose
CREW	One



The Focke-Wulf Fw 190 was a German single-seat, single-engine fighter aircraft designed by Kurt Tank in the late 1930s and widely used during World War II.

One of Germany's best fighter airplanes of World War II, the Fw 190 made its first flight on June 1, 1939. It appeared in action over northwestern France in September 1941 and rapidly proved its superiority over the Mark V *Spitfire*, Britain's best fighter of that time. The Fw 190 participated on every major combat front where the Luftwaffe operated after 1941 and did so with success in a variety of roles.

Along with its well-known counterpart, the Messerschmitt Bf-109, the Fw 190 became the backbone of the Luftwaffe's Jagdwaffe (Fighter Force). The twin-row BMW 801 radial engine, that powered most operational versions, enabled the Fw 190 to lift larger loads than the Bf 109, allowing its use as a day fighter, fighter-bomber, ground-attack aircraft and, to a lesser degree, night fighter.

One of its main features was its wide-tracked, inwards-retracting landing gear. This produced better ground handling characteristics. The Fw 190 suffered fewer ground accidents than the Bf-109.

Tank believed that service use would prove that electrically powered systems were more reliable and more rugged than hydraulics; electric lines being much less prone to damage from enemy fire. The Fw’s undercarriage was operated by push buttons controlling electric motors in the wings and was kept in position by electric up and down-locks. The armament was also loaded and fired electrically.

Luftwaffe pilots who flew both the Fw 190 and the Bf-109 generally felt that, with the exception of high-altitude capability, the Fw 190 was superior.

Most Fw 190s were the "A" series, powered by a BMW radial engine. Late in 1943, however, the more capable "D" (*Dora*) series appeared in action against U.S. bombers, driven by the more powerful Jumo 213 inline, liquid-cooled engine. Because the larger engine lengthened its nose, a 20-inch section had to be added to the Fw 190D-9's fuselage just forward of the tail. During its lifetime, more than 20,000 Fw 190s of all types were built. This composite aircraft is on loan from McMinnville Properties, LLC.

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LOCATION: H

Belly Tank Racer

1951 Fornaciari-Adams Lakester

BUILT	1951–1952



HISTORY

Belly tank racers emerged in the years immediately following World War II, when returning servicemen and hot rod enthusiasts began repurposing surplus military equipment for speed racing. The streamlined auxiliary fuel tanks—known as “drop tanks” or “belly tanks”—originally mounted beneath fighter aircraft such as the North American P-51 Mustang and Lockheed P-38 Lightning proved ideal for land speed racing because of their lightweight aluminum construction and aerodynamic shape. Builders mounted small automobile engines, axles, and wheels inside the tanks to create compact racers designed for the dry lake beds of Southern California and later the Bonneville Salt Flats. These homemade machines became symbols of postwar ingenuity and helped shape the emerging hot rod culture of the late 1940s and 1950s.

ABOUT THIS RACER

The 1951 Fornaciari-Adams Lakester was a classic postwar belly tank racer built for high-speed competition at El Mirage Dry Lake, California during the golden age of American hot rodding. Constructed from a streamlined surplus aircraft drop tank, it embodied the ingenuity of racers who transformed military aviation technology into land speed machines. Its narrow body and lightweight construction minimized aerodynamic drag, allowing impressive performance from relatively modest engine power. The Fornaciari-Adams Lakester reflected the experimental spirit of the early 1950s, when builders relied on creativity, mechanical skill, and surplus parts to push the limits of speed.

This vehicle is on loan to the Museum by owner Ed Godshalk.

General Dynamics F-111 Aardvark

Crew Module Escape System

AIRCRAFT SERVICE TIMEFRAME	1967–1998
CREW	Two, side by side
ROCKET THRUST	Up to 27,000 lb (main) plus 7,000 lb (auxiliary)
RECOVERY PARACHUTE	70 feet in diameter
ACCESSION	2022.004.001



The General Dynamics F-111 was a groundbreaking variable-sweep wing aircraft developed in the 1960s for the U.S. Air Force. Designed as a multi-role tactical fighter-bomber, it excelled in high-speed, low-altitude penetration missions. The F-111's variable-geometry wings allowed it to adapt to various speeds and mission profiles, offering exceptional performance from subsonic to supersonic speeds.

Powered by two Pratt & Whitney TF30 engines, the aircraft could reach speeds exceeding Mach 2. Its versatile design made it suitable for a range of missions, including precision strikes, electronic warfare, and reconnaissance. The F-111's advanced avionics, terrain-following radar, and long range enabled it to operate in diverse environments, making it a vital asset during the Vietnam War and beyond.

CREW MODULE

One of the F-111's most innovative features was its crew escape module. Unlike traditional ejection seats, the aircraft's entire cockpit functioned as an escape capsule. In an emergency, the module would separate from the rest of the aircraft, shielding the crew from high-speed airflow and intense G-forces.

Equipped with its own environmental control systems, flotation devices, and parachutes, the escape module ensured the survival of the two-person crew even in extreme conditions. This system significantly enhanced safety compared to conventional ejection methods, especially during high-speed or low-altitude operations. The escape module underscored the F-111's commitment to crew survivability in a highly demanding operational environment.

HOW THE ESCAPE SEQUENCE WORKS

Pulling the ejection handle fired an explosive train that cinched both crewmen into their seats and started a 10-minute emergency oxygen supply. Guillotines cut the cables and lines connecting the cockpit to the fuselage, and after a short delay a rocket motor fired the module clear of the aircraft. A stabilization-brake chute slowed and steadied the module, and a 70-foot recovery parachute opened once it had slowed enough and descended below 15,000 feet. Impact attenuation bags inflated beneath the module to cushion the landing, and self-righting bags on top kept it upright if it came down on water. If the rocket failed, a severance handle could still free the module from the aircraft in flight or after a water landing.

NOTABLE EVENTS

The first operational use came in 1967, when two General Dynamics test pilots abandoned an F-111A over Texas after a complete hydraulic failure. They ejected the module at 28,000 feet and 280

knots and landed unhurt. In March 1968, during the F-111’s combat debut in Southeast Asia, a crew ejected at about 10,000 feet over Thailand after a control failure and also survived.

LOCATION: HO

Glasair SHA-2RG

Homebuilt (1986)

MAXIMUM SPEED	265 mph (sea level)
CRUISING SPEED	250 mph (at 8,000 feet)
MANEUVERING SPEED	180 mph
SERVICE CEILING	21,000 feet
ENGINE	Lycoming IO-360, 215 hp
FUEL	100LL, 42 gallons (about 10 gallons per hour)
RANGE	1,000 miles
EMPTY WEIGHT	1,225 lbs
GROSS WEIGHT	2,100 lbs
WINGSPAN	23 ft 3 in
LENGTH	19 ft



The Glasair is a fiberglass, kit-built, single-engine homebuilt aircraft. This one, built from kit number 306 and completed in 1986, was designed around a 150-hp Lycoming engine.

After a few test flights, its builder moved up to a 180-hp Lycoming IO-360-A1A, but ended up with a 200-hp IO-360. The extra power required modifications to the cowl and a bigger air intake for the engine.

Retractable landing gear was added for speed. It also suited the plans for the aircraft, which was to fly over water, where ditching with the gear down is something to avoid.

Later, a Hatfield roller-cam conversion brought the engine up to 215 hp. In a ditching, the fiberglass airframe will float like a boat.

HISTORY OF THE MUSEUM'S AIRCRAFT

This aircraft was donated to the Museum by F. Siglar.

Granville Brothers (Gee Bee) (replica)

E Sportster

MAXIMUM SPEED	160 mph
CRUISING SPEED	140 mph
ENGINE	Warner Super Scarab 145 hp.
RANGE	450 miles
CAPACITY	One



The small, flashy Granville Brothers Aircraft *E Sportster* embodies the spirit of sport aviation in the early 1930s.

Over a period of just four years the five innovative Granville brothers of Springfield, Massachusetts, led by chief designer and oldest brother, Zanford, went from building simple biplanes to producing highly advanced race planes that set world records.

In the middle of this remarkable journey, the Gee Bee (as Granville Brothers products were commonly known) *Sportster*s laid the foundation for the more famous Gee Bee Z, R-1 and R-2 *Super Sportste*r racers that thrilled spectators and often frightened their pilots.

The brothers began to conceive and build their own aircraft in 1928. With the help of aeronautical engineer Bob Hall, the Granvilles designed a single seat, low-wing monoplane, and commercially licensed sport aircraft: the Gee Bee *X Sportster*.

They entered it in the 1930 American Cirrus Engine-sponsored “All American Flying Derby. This was to be the longest air race held in the world at the time - a 5,541-mile course that took the contestants from Detroit to Texas, west to California, and back to Detroit. Piloted by Lowell Bayles, the Gee Bee *X Sportster* finished in second position. Unfortunately, the Great Depression sapped away nearly the entire market for sport aircraft during the early 1930s. To remain in business, the brothers turned their energies to designing a pure race plane.

Much of the design of their most famous aircraft, the distinctive Gee Bee *Z* and later *R-1* and *R-2 Super Sportster* racers, came from their earlier D and E *Sportster*s. The *E Sportster* utilized Warner radial engines, while the *D Sportster* was fitted with a Menasco in-line engine. While the *Z* and *R Super Sportster*s proved to be very fast, they earned a reputation for being dangerous to fly. Pilot Jimmy Doolittle not only flew the R-1 to victory in the Thompson Race on September 5, 1932, but he also lapped his competitors in the process by averaging 252.67 mph.

HISTORY OF THE MUSEUM’S AIRCRAFT

Scott Crosby of Antelope, California built this exacting Gee Bee *E Sportster* replica. He consulted with the American Air Racing Society and the small community of other Gee Bee replica builders for assistance. He received copies of the Granville Brother’s original construction drawings from the National Air and Space Museum and started building it in 1987.

Famed air show pilot Delmar Benjamin test flew the aircraft in January 1995. Following a minor landing accident, Crosby sold the *E Sportster* to aircraft collector Jim Teel in 1996.

In 1997, while flying this aircraft, Teel experienced a complete engine failure and managed to crash land it. Crosby rebuilt it for Teel and after displaying it in many air shows Jim Teel donated this replica to the Museum in 2004.

LOCATION: T

Grumman F-14D

Super Tomcat

MAXIMUM SPEED	1,544 mph (Mach 2)
CRUISING SPEED	590 mph
SERVICE CEILING	53,000+ feet
ENGINES (2)	F-110 GE-400 turbofans 27,000 lbs. thrust each
RANGE	2,000 miles (with auxiliary tanks)
ARMAMENT	1 x 20-mm cannon + a combination of missiles, air-to-ground weapons
CREW	Two



Designed to replace the F-4 *Phantom II* fighter, the F-14 is the most powerful and lethal fighter-interceptor aircraft to ever serve in the US Navy. It was originally envisioned as a fleet defense fighter, employing the very long-range *Phoenix* missile to knock down Soviet anti-shipping bombers and their cruise missiles. Each *Tomcat* cost more than $40 million, making this aircraft also one of the most expensive in the service.

The F-14 first flew on December 21, 1970, just 22 months after the contract was awarded. It became operational in 1973.

Designed to improve on the *Phantom's* air combat performance, the *Tomcat's* canopy offered the crew excellent visibility. The plane features variable geometry wings that sweep automatically during flight. For high-speed intercept, they are swept back; they swing forward to allow the F-14 to turn sharply and dogfight.

Its first combat victories came on August 19, 1981, in what is known as the Gulf of Sidra Incident: two Libyan Su-22 *Fitters* engaged two F-14s from VF-41 “Black Aces”. The F-14s evaded the Libyans’ short-range heat seeking AA-2 *Atoll* missiles and returned fire, downing both Libyan aircraft.

The F-14D *Super Tomcat* featured a more advanced radar system which gave the pilot and radar intercept officer the ability to track 24 enemy targets and guide six AIM-54 *Phoenix* missiles to six targets simultaneously at ranges of more than 100 miles. The F-14D also featured upgraded digital avionics, an under-nose pod video camera set that could visually lock onto targets dozens of miles away and an infrared search and track system. It also met the Navy's alert requirement that the aircraft should be able to taxi with functioning systems within five minutes of a cold engine start.

It was retired from the Navy fleet on September 22, 2006, having been replaced by the F/A-18E/F *Super Hornet*.

HISTORY OF THE MUSEUM’S AIRCRAFT

The Museum’s F-14D, B/N 164343, was the fourth of the last 18 produced. It began service with the Navy in July 1991. The aircraft was assigned to VF-31 in October 2001, participating in three cruises and the war in Iraq. Retired in September 2006 and on loan from the National Museum of Naval Aviation, this *Super Tomcat* is a combat-proven aircraft—having dropped a JDAM bomb in Iraq on October 19, 2005.

Grumman G-21

Goose

CRUISE SPEED	191 mph
SERVICE CEILING	21,300 feet
ENGINES (2)	Pratt & Whitney R-985 400 hp. each
RANGE	640 miles
LOADED WEIGHT	7,955 pounds
ARMAMENT	2 x 325 lb. depth charges or 2 x 250 lb. bombs
CAPACITY	Three



As America was coming out of the Great Depression and people were beginning to accumulate wealth again, a group of Long Island businessmen approached Grumman Aircraft Company to build them an aircraft that could carry them to work in New York City in speed and comfort. The result was the Model G-21 *Goose*.

Initially designed as a flying yacht to carry two to three passengers, the earliest versions of the *Goose* included such amenities as a bar and a small toilet, but the true key to its success was the versatility designed into it. The fact that it was an amphibian meant it could operate from both land and water. Its twin-engine design meant it had greater safety and reliability and the mostly all metal construction made it rugged.

By 1938 the versatile *Goose* was quickly adopted for military missions by the US Army Air Corps as the OA-9 and the US Navy and Coast Guard as the JRF. They were used for patrol work, anti-submarine missions, search and rescue and as a small transport that could go just about anywhere.

When World War II broke out the need for the *Goose* rose dramatically and they were used all over the world by all branches of the U.S. military, as well as Canada and Great Britain. After the war, the air forces and navies of 11 other countries, including one former enemy, Japan, put the *Goose* to work as a utility seaplane.

When the U.S. military downsized in the wake of World War II, many *Gooses* (never *Geese*) were sold into the civilian market where the very qualities that helped them in war, such as rugged construction and the ability to go anywhere, made the *Goose* indispensable for small airlines in Alaska, the Caribbean and California. For over three decades, from 1953 to 1989, several airlines operated them on regular passenger service from Los Angeles to Catalina Island.

Beginning in 1958, McKinnon Enterprises of Sandy, Oregon, started modifying the *Goose* with a variety of options that included new wings featuring retractable floats, turboprop engines, a lengthened nose, a wrap-around windshield, and larger “tourist” windows. Today, approximately 30 *Gooses* are still flying, including one owned by musician/pilot Jimmy Buffett.

HISTORY OF THE MUSEUM’S AIRCRAFT

This Goose was built in 1945 for the United States Navy as a JRF-5 and after World War II, was transferred to the state of Alaska Department of Fish and Game. Upon its retirement from government service, it was acquired by Peninsula Airways where it was based out of Anchorage, Alaska and served the islands in the Aleutians.

It was heavily damaged in a 2006 flip-over accident, and after it was determined to be beyond economic repair, it was sold to the Museum.

Museum volunteers restored the *Goose*, including a change of wings from the modern McKinnon wings, back to the original 1944-style wings. It is painted in the markings of a JRF-2 *Goose* that served with the Coast Guard Air Station Port Angeles, Washington during the 1930s.

↑ Index

LOCATION: H

Grumman OV-1D

Mohawk

MAXIMUM SPEED	305 mph
CRUISING SPEED	242 mph
SERVICE CEILING	30,000 feet
ENGINES (2)	Avco Lycoming T 53-L-701 1,400 shaft hp. each
RANGE	875 miles
CREW	Two



The Grumman *Mohawk* became the first turboprop-powered aircraft to enter operational service in the US Army. Its primary role was as a photo, observation, and electronic reconnaissance airplane. It can perform its mission in daylight, darkness, or bad weather, supplying Army field commanders with information about the strength and activity of enemy forces.

The *Mohawk* prototype AO-1A's first flight was April 14th, 1959. The AO-1 was re-designated as the OV-1 in 1962. It was built as a joint US Army and Marine Corps project. The Marine Corps pulled out of the project before their prototype could be built, but the Army began placing its orders late in 1959 for the OV-1A and OV-1B.

Its most noticeable features include three vertical fins and rudders, and the bulging cockpit glass - designed to maximize visual observation capabilities. While the airplane was slow, its huge triple finned tail and engines mounted on top of the wings gave the *Mohawk* great maneuverability. To protect against small arms fire, the cockpit was armored with an aluminum-alloy floor, flak curtains and bullet-resistant windows. The twin turbine engines were very quiet.

The aircraft's thick, straight wings were designed to provide maximum lift rather than speed, with a wingspan longer than the fuselage. This lift capability was needed to carry enough fuel for the missions that often lasted six hours.

Loaded with electronics and surveillance cameras, *Mohawks* saw extensive service during the Vietnam War beginning in September 1962. They often flew armed with a mix of rockets, bombs and guns proving the aircraft's effective attack potential.

The US Army's operation of armed fixed-wing aircraft was controversial, as some considered that this ventured into the operational realm of the US Air Force. The controversy peaked with a 1965 directive prohibiting the Army from operating armed fixed-wing aircraft.

The “D” model was developed with three internal cameras and given either a Side Looking Airborne Radar (SLAR) or an infrared mapping sensor. With these and other upgraded systems, the OV-1D combined the visual, photographic, radar and infrared reconnaissance capabilities of all three previous models.

As an observation aircraft, the OV-1 has also served in Europe, Korea, Central and South America, Southeast Asia, Alaska and Desert Storm. A total of 375 *Mohawks* in various models were built.

HISTORY OF THE MUSEUM’S AIRCRAFT

Delivered into military service in February of 1968, this *Mohawk* flew until November of 1991, when it was retired from service. This D model, serial number 67-18902, was converted from a “C” model. In the 1970s it was stationed with the Army's Company A, 3rd Military Intelligence Battalion in Korea. It then served with the Oregon Army National Guard, 641st Military Intelligence Battalion (Aerial Exploitation), headquartered in Salem, Oregon.

Using their high-tech electronics and photo observation capabilities, the Guard's *Mohawks* worked with local law enforcement agencies, as well with the Border Patrol, Coast Guard, Customs, and the Navy. Additionally, these aircraft were used in drug interdiction operations, wildland firefighting and searching for pollution hotspots in the Columbia River. *Mohawks* also performed infrared, radar and photographic surveys relating to the volcanic eruptions of Mount St. Helens in Washington.

Arriving in May of 2002, this Mohawk came to the Museum by air, but not under its own power. It was transported from Salem, Oregon slung under a Oregon Army National Guard Boeing Vertol CH-47 *Chinook* helicopter. The aircraft is on loan from the U.S. Army Tank-automotive and Armaments Command (TACOM).

↑ Index

LOCATION: NL

Grumman TF-9J

Cougar

MAXIMUM SPEED	654 mph
CRUISE SPEED	541 mph
SERVICE CEILING	44,500 feet
POWERPLANT	Pratt & Whitney J48-P-8A turbojet 7,250 lbf. thrust
RANGE	932 miles (no tanks)
MAXIMUM WEIGHT	21,000 pounds
ARMAMENT	4 × 20-mm AN/M3 cannon + missiles or bombs
CREW	Two



The *Cougar* was introduced in 1953 as the US Navy's swept-swing successor to the Grumman F9F *Panther.* Since the *Panther* was such a robust aircraft, Grumman retained the basic layout, sweeping the wings, adding an "all flying" stabilizer and upgrading the engine for higher performance. The Navy considered the *Cougar* an updated version of the *Panther*, despite having a different official name, and thus designations for the *Cougars* started off from F9F-6 upward. The F9F-6 was highly maneuverable and easy to fly.

It was intended for combat over Korea but arrived too late for that war. The *Cougar* saw its sole combat in Vietnam, where four two-seat training versions served briefly as forward air control aircraft.

The first flight of the two-seat trainer version of the F9F-8 *Cougar*, designated the TF-9J, was made on April 4, 1956.

The *Cougar* was also the first swept wing airplane flown by the Navy's Blue Angels flight demonstration team. In 1954, the team replaced their six *Panthers* with *Cougars* and used them until 1957. One two-seater was retained for press and VIP flights.

The Navy used the *Cougar* to set a transcontinental crossing record on April 1, 1954. Three pilots from squadron VF-21 completed the 2,438-mile flight in under four hours; the quickest time being 3 hours 45 minutes and 30 seconds—the first time the distance had been covered in under four hours. The aircraft were refueled using an experimental refueling probe mounted on the nose.

Nearly 2,000 *Cougars* were produced for the Navy and Marine Corps, serving as fighter, ground attack, photo reconnaissance, and training aircraft.

HISTORY OF THE MUSEUM'S AIRCRAFT

TF-9J number 144275 is on loan from the National Museum of Naval Aviation and is painted to represent the narrator's aircraft for the U.S. Navy Blue Angels precision flight demonstration team from their 1955-1956 seasons.

LOCATION: NL

Gulfstream II

NASA Shuttle Training Aircraft (STA)

CRUISE SPEED	483 mph
SERVICE CEILING	45,000 feet
ENGINES (2)	Rolls-Royce Spey 511-8 turbofan 11,400 lbf each
RANGE	4,123 miles
GROSS WEIGHT	65,500 lbs.



NASA Gulfstream II Shuttle Training Aircraft Shuttle Training Aircraft cockpit

The Shuttle Training Aircraft (STA) was a Gulfstream II NASA training vehicle that duplicated the Space Shuttle's approach profile and handling qualities, allowing Space Shuttle pilots to simulate Shuttle landings under controlled conditions before attempting the task on board the orbiter. There were four STAs, twinjet swept wing corporate transports powered by two Rolls-Royce *Spey* turbofan engines.

The aircraft's exterior was modified to withstand the high aerodynamic forces incurred during training sorties. A redesigned cockpit provided a high-fidelity simulation of the Shuttle Orbiter's controls and pilot vantage point; even the seats were fitted in the same position as those in the Space Shuttle.

The STA was primarily flown by astronauts practicing landings at the Shuttle Landing Facility at Cape Canaveral and White Sands Space Harbor as well as to assess weather conditions prior to Space Shuttle launches and landings.

It was particularly critical for Shuttle pilots in training because the Orbiter lacked atmospheric engines that would allow the craft to "go around" after a poor approach. After re-entry, the Shuttle was a very heavy glider (sometimes referred to as a 'flying brick') and as such had only one chance to land.

In order to match the descent rate and drag profile of the real Shuttle, at 37,000 feet the STA’s main landing gear was lowered (the nose gear stayed retracted due to wind load constraints) and engine thrust was reversed. Its flaps could deflect upwards to decrease lift as well as downwards to increase lift.

Covers were placed on the left-hand cockpit windows to provide the same view as from a Shuttle cockpit, and the left-hand pilot's seat was fitted with the same controls as a Shuttle. The STA's normal flight controls were moved to the right, where the instructor sat. Both seat positions had a head up display.

A sophisticated computer system installed on board the STA simulated the flight dynamics of the orbiter with nearly perfect accuracy. The STA's highly realistic simulation of the Orbiter was not limited to handling characteristics, but also implemented the shuttle control interfaces for the pilot.

An onboard computer called the Advanced Digital Avionics System (ADAS) controlled the Direct Lift Control (DLC) and the in-flight reverse thrust during Simulation Mode. Every shuttle commander practiced at least 1,000 landings in this manner, as had each mission's shuttle pilot.

In a normal exercise, the pilot descended to 20,000 feet at an airspeed of 280 knots, 15 miles from the landing target. The pilot then rolled the STA at 12,000 feet, 7 miles from landing. The nose of the aircraft was then dropped to increase speed to 300 knots, descending at a 20-degree angle.

At 2,000 feet the guidance system changed to pre-flare and shortly after, at 1,700 feet, the pilot started the flare maneuver to gradually reduce the descent angle and transition to the inner glide slope. The shuttle landing gear release was simulated 300 feet above the ground since the STA main gear remained down for the whole simulation. The nose gear of the STA was lowered at 150 ft. AGL in case of an inadvertent touchdown with the runway surface.

If the speed was correct, a green light on the instrument panel simulated shuttle landing when the pilot's eyes were 32 feet above the runway. This was the exact position that the pilot's head would be in during an actual landing. In the exercise, the STA was still flying 20 feet above the ground. The instructor pilot deselected the simulation mode, stowed the thrust reversers, and the instructor executed a go-around, never actually landing (on training approaches).

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LOCATION: H

Handley

Raven

MAX CLIMB RATE	4000+ feet/minute
STALL SPEED	60 mph
BRAKE RELEASE TO 100 MPH	8 seconds
ENGINE	Lycoming AIO540 300 hp.
FUEL CAPACITY	54 gallons
FUEL FLOW	15 gallons/hour
ROLL RATE	380 degrees/second
EMPTY WEIGHT	1,350 pounds



Wayne Handley is a former naval aviator, ag pilot, aerobatic champion, and preeminent airshow performer. Since beginning his aviation career in 1957, he has amassed over 29,000 hours of flight time with little of it spent straight, level, and upright.

In his first contest, with the extraordinary metric of 15,000 hours in his logbook, he placed only 19th out of 21 competitors. The following year, however, he won the California state point series in the Intermediate category. Then, in an unprecedented move, Wayne skipped the Advanced category altogether and surprised the aerobatic community by winning the Unlimited point series in 1985 and thus the title of California Unlimited Aerobatic Champion. After pocketing this title two more times, he left competition and chose to fly air shows full time.

In 1989, he became the world record holder for inverted flat spins by completing 67 consecutive turns and then, shortly thereafter, broke his own record with 78 consecutive turns.

In 1990, Hadley started his aerobatic career flying a Pitts *Special* in competition and airshows and then transitioned to the *Raven,* a beautiful and exciting monoplane that proved itself to be a crowd favorite. In 1998, he began flying airshows in the Oracle *Turbo Raven*. Powered by a 750-hp Pratt & Whitney PT6A-25C, it was the first airshow airplane to have a positive thrust-to-weight ratio. The *Turbo Raven* could climb straight up, stop in the vertical line, and then accelerate straight up again.

On January 20, 1999, Hadley established a world record for all propeller-driven airplanes by going from brake release to 3,000 meters in one minute and nine seconds. During the EAA convention in Oshkosh on July 30, 1999, he established a new time-to-climb record to 6,000 meters in the Oracle *Turbo Raven* in only three minutes and six seconds.

Designed and built of welded tube and graphite skin by Wayne, the spectacular *Raven* is a stirring and exhilarating monoplane that dazzled air show crowds every time she took to the sky. With a wingspan of 24-and-a-half feet, a length of 21 feet and a height of just six feet, the *Raven* is stressed to withstand plus or minus 16 Gs! Handley flew the *Raven* one last time on August 20, 2005, at the McMinnville airport for the Northwest Antique Aircraft Air Show. Following the event, Handley donated the *Raven* to the Museum.

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LOCATION: T

Hiller Model 1031

Flying Platform (replica)

SERVICE TIMEFRAME	Mid-1950s (first free flight January 27, 1955)
FAN DIAMETER	7 ft each (two counter-rotating coaxial fans)
PLATFORM DIAMETER	8 ft 4 in
HEIGHT	7 ft
EMPTY WEIGHT	370 lb
ENGINES (2)	Nelson H-59 two-cycle piston, 40–44 hp each
TOP SPEED	~16 mph
CAPACITY	1 (pilot stands)



THE MODEL

The Hiller Model 1031 was a one-man, experimental vertical takeoff and landing (VTOL) flying platform developed in the mid-1950s by Hiller Aircraft for the U.S. Army and the Office of Naval Research.

KEY DESIGN & MECHANICS

Kinesthetic control: The pilot steers the craft simply by leaning in the desired direction of flight, relying on natural balancing reflexes (a concept developed by Charles H. Zimmerman).

Ducted fan technology: It features two counter-rotating coaxial propellers inside a circular fiberglass-and-aluminum duct. Roughly 40% of the lift comes from the Bernoulli principle over the duct rim and 60% from the propeller thrust.

Anti-tumbling feature: If the pilot leans too far, the platform automatically pitches up and slows down, making accidental tumbling physically difficult.

HISTORY OF THE MODEL

First flight: The initial prototype achieved its first free flight on January 27, 1955, marking an early milestone in man-carrying ducted-fan VTOL flight.

Retirement: The program was abandoned because the platforms were slow, limited in windy conditions, and impractical for combat deployment.

HISTORY OF THIS AIRCRAFT

This aircraft is a replica.

↑ Index

LOCATION: H

Hiller OH-23B

Raven

SERVICE TIMEFRAME	1953–1970s
ROTOR SPAN	25 ft 3 in
TOP SPEED	84 mph
SERVICE CEILING	13,200 ft
ENGINE	Lycoming HIO-360-D14, air-cooled piston engine



THE MODEL

The Hiller OH-23 Raven was a light observation and utility helicopter developed in the early 1950s, derived from the Hiller Model 360. Entering U.S. Army service in 1953, the OH-23 quickly proved itself in roles such as reconnaissance, liaison, and training. Its simple construction, reliable performance, and adaptability made it an important transitional helicopter during a period when rotary-wing aviation was expanding into more specialized roles within the military.

The OH-23B, one of the early production variants, was powered by a Franklin O-335 engine and equipped with an enclosed cabin, offering improved comfort and protection for its crew. During the Vietnam War, OH-23B Ravens were pressed into service as scout helicopters, performing low-level reconnaissance and target-marking missions ahead of attack aircraft. Although lightly armed and vulnerable to enemy fire, their agility and ability to operate close to the battlefield made them valuable assets in the early years of the conflict, before being replaced by more advanced observation helicopters like the OH-6 Cayuse in early 1968.

HISTORY OF THIS AIRCRAFT

This Hiller Raven was purchased from aircraft collector Jack Lenhardt and became part of the Museum’s collection in 2003.

Transferred to the Museum’s Permanent Collection. 2015.056.013

↑ Index

LOCATION: H

Hiller UH-12E

Raven

MAXIMUM SPEED	96 mph
CRUISE SPEED	95 mph (82 mph economical)
SERVICE CEILING	17,600 feet
ENGINE	Lycoming VO-540
RANGE	225 miles
ROTOR DIAMETER	35 feet 5 inches
CAPACITY	Three
SERVICE TIMEFRAME	1950s–1970s



THE MODEL

An industrial workhorse involved in aerial spraying, seeding, timber transport, law enforcement and rescue work, the Hiller 360/UH-12 was the first all-metal light helicopter in the civilian market of the late 1940s and early 1950s. Designed for both military and civilian applications, the Hiller 12 featured a two-bladed rotor system and a compact, bubble-canopy fuselage, providing excellent visibility for pilots. The U.S. military, particularly the Army and Air Force, adopted the Hiller 12 under various designations, including the OH-23, and it saw service in roles such as observation, reconnaissance and search-and-rescue missions during the Korean War and in the early years of the Vietnam War. The UH-12 gained a reputation for its reliability and versatility, making it a popular choice among early rotary-wing aircraft.

The Hiller 12E Raven was an improved variant, featuring a more powerful engine, increased payload capacity, and upgraded rotor dynamics for enhanced stability and performance. Introduced in the 1950s, the 12E variant was particularly well-suited for roles requiring precision flying, such as crop dusting, aerial surveying, and military observation. The 12E's refined design made it more efficient and easier to control, extending its service life in both military and civilian applications.

NOTABLE PEOPLE

STANLEY HILLER, JR.

Developing an early passion for aviation, Hiller designed the world's first successful coaxial helicopter at age 15 and presented his innovative XH-44 "Hiller-Copter" to the U.S. Army at 17—a feat that earned him approval and a draft deferment during WWII. He later founded Hiller Industries, which, in partnership with Henry J. Kaiser, evolved into United Helicopters in 1945 and later, Hiller Helicopters. In the 1960s, he reinvented himself as a turnaround specialist, leading successful restructurings of major companies including a merger between Baker International and Hughes Tool Co., a company originally established by Howard Hughes, Sr.

HISTORY OF THIS AIRCRAFT

This UH-12E is one of two Hillers with which Museum co-founder and aviator-pioneer Delford M. Smith founded Evergreen Helicopters, Inc. in the early 1960s. Equipped with patented "PaceSpreader" technology developed by Evergreen for precise application of seed or dry chemical fertilizers, UH-12s were involved in tree seeding and forest fertilization projects that would have been economically impossible without the helicopter. Evergreen's Hiller 12Es also provided many other services, such as aerial inventory (from counting moose to cars on the road), dredging, firefighting, medical evacuation and transport, support for construction and seismic work, and search and

rescue. By proving the worth and importance of using helicopters, Evergreen was at one time the world's largest operator of Hiller 12Es.

Transferred to the Museum's Permanent Collection. 2015.056.010

↑ Index

LOCATION: T

Hiller YH-32

Hornet (ramjet-powered experimental helicopter)

CRUISE SPEED	69 mph
SERVICE CEILING	6,900 feet
ENGINE	Two Hiller 8RJ2B ramjets, 40 lbf thrust each (tip-mounted)
RANGE	28 miles
ROTOR DIAMETER	23 feet
LENGTH	23 feet 8 inches
GROSS WEIGHT	1,080 pounds
CREW	One
TESTING TIMEFRAME	Early 1950s



THE MODEL

The Hiller YH-32 Hornet was a lightweight experimental helicopter built in the early 1950s, designed to explore new approaches to rotary-wing propulsion. Unlike traditional helicopters that relied on an engine-driven transmission system, the Hornet used small ramjet engines mounted at the tips of its rotor blades. This eliminated the need for a tail rotor or complex drivetrain, greatly simplifying the mechanical layout and reducing weight.

Despite its simplicity, the tip-jet system introduced major drawbacks. The ramjets were extremely loud, consumed fuel at a high rate, and offered only limited thrust, which restricted the aircraft's range and payload. The Hornet's unusual operation also made it difficult to handle safely, especially at low speeds or during extended flight. These shortcomings outweighed its advantages in maintenance and design.

The U.S. Army and Air Force evaluated the YH-32 but found it unsuitable for operational use. Only a small number were built, and they served primarily as test vehicles to study unconventional helicopter propulsion. While the Hornet never entered service, its experimental nature helped shape understanding of alternative helicopter designs during the early Cold War era.

NOTABLE PEOPLE

FRANK PETERSON

Hiller Aircraft's chief test pilot, Peterson played a central role in evaluating the experimental Hiller Hornet (XHJ-1). As one of the first pilots to fly the ramjet-powered helicopter, Peterson pushed the aircraft through its early trials, contending with its extreme noise, vibration, and fuel-hungry engines mounted at the rotor tips. His flight reports highlighted both the simplicity of the transmission-free design and the serious practical drawbacks that limited its potential. Peterson's firsthand experience was vital in demonstrating the challenges of tip-jet propulsion, ultimately shaping the conclusion that the Hornet was not suitable for operational service.

HISTORY OF THIS AIRCRAFT

This YH-32 Hornet is believed to be one of the fourteen that were built for the U.S. Army, although its serial number is still unconfirmed. It was acquired by the Museum in 2012 and restored by Museum Restoration volunteers. The Hornet was placed on display in 2013.

Transferred to the Museum's Permanent Collection. 2021.028.001

↑ Index

LOCATION: H

Hispano HA-200

Saeta (Arrow)

MAXIMUM SPEED	500 mph
CRUISE SPEED	373 mph
SERVICE CEILING	42,650 feet
ENGINES (2)	Turbomeca Marboré VI turbojets 1,058 lbs. thrust each
RANGE	870 miles
MAXIMUM WEIGHT	7,590 lbs.
CAPACITY	Two





The Hispano HA-200 *Saeta (Arrow)* is a 1950s Spanish two-seat advanced jet trainer designed by Willy Messerschmitt and built by Hispano Aviación. It was the first Spanish turbojet aircraft, the first Spanish aircraft equipped with a pressurized cockpit, and the first Spanish aircraft to be exported. In total, 211 copies were produced.

Based upon the piston-powered HA-100 *Triana* trainer, the HA-200 was the fourth jet airplane project by Messerschmitt. The aircraft was designed as a beginning and advanced trainer that was also adapted for weaponry training and reconnaissance missions.

It is powered by two Turbomeca Marboré engines located side by side in the lower part of the fuselage near the front area of the nose. Exhaust pipes are just behind the wings' trailing edges. The prototype first flew on August 12, 1955, and the first production aircraft, with the designation E.14, flew in October 1962.

The aircraft is extremely stable with incredible acrobatic capacity. It is very reliable and its two engines gave confidence to fledgling pilots.

The HA-220, or *Super Saetas,* designated C.10, first flew on April 25, 1970. It was a single seat version equipped with two underwing weapons pylons and two 7.62-mm machine guns for ground-attack. In 1974-75, the HA-220s saw their first combat missions during the Polisario uprisings in North Africa.

A total of 117 *Saetas* flew for the Spanish Air Force. Egypt manufactured 90 of the aircraft under license for their air force. In 1981 those on active service for Spain were retired.

Because it is the last link of the first-generation turbojets fighters that appeared during the Second World War, the *Saeta* has a long history of participation in aeronautical events and air shows all over the world.

↑ Index

LOCATION: T

Hughes 269

269 / 269A / TH-55 Osage — second prototype, s/n 0002

MAXIMUM SPEED	87 mph
CRUISE SPEED	80 mph
SERVICE CEILING	13,000 feet
ENGINE	Lycoming HIO-360-D14, 180 hp
RANGE	300 miles
ROTOR DIAMETER	25 feet 3.5 inches
CREW	Two
SERVICE TIMEFRAME	1964–1988





THE MODEL

The Hughes 269 was introduced in the mid-1950s as a light, affordable, and versatile helicopter aimed at both civilian and military markets. Designed with a minimalist tubular steel frame, bubble canopy, and exposed tail boom, it offered excellent visibility and straightforward maintenance. Its three-blade articulated main rotor and two-blade tail rotor gave it responsive yet stable handling, making it well-suited for training, utility, and agricultural roles. The 269 quickly earned a reputation for being rugged, reliable, and economical to operate.

In 1960, Hughes unveiled the improved 269A, which featured a slightly larger cabin to accommodate up to three occupants and refined systems that enhanced performance and safety. This variant proved highly influential, particularly after it was adopted by the U.S. Army as the TH-55 Osage, the Army's primary helicopter trainer for nearly two decades. The 269A's blend of forgiving flight characteristics and low operating costs made it a cornerstone of rotary-wing training, introducing thousands of new pilots to helicopters.

In the 1980s Schweizer Aircraft acquired the rights and continued production under the Schweizer 300 series, introducing further refinements and expanding the helicopter's capabilities while retaining the core design that had made it so effective. Later, Sikorsky acquired Schweizer, ensuring continued support and development. This lineage, beginning with the Hughes 269, illustrates the enduring value of the design, which remains in use worldwide for training and light utility roles more than six decades after its first flight.

NOTABLE PEOPLE

GALE J. MOORE

A Hughes test pilot during the early 1960s, Moore played an important role in advancing the Hughes 269 helicopter from prototype into a refined production aircraft. Known for his steady flying and technical insight, Moore conducted extensive flight evaluations that identified performance limits, handling characteristics, and areas for improvement. His feedback directly influenced refinements in control responsiveness, stability, and overall flight safety—qualities that made the 269 an excellent trainer and utility helicopter. Moore's contributions as a test pilot helped ensure the 269's success in both civilian aviation and its long-running role as the U.S. Army's TH-55 Osage.

HISTORY OF THIS AIRCRAFT

In 1956, two prototype Model 269s were built. This is the second one, with the serial number 0002, which was used to re-engineer the helicopter line for easier production and maintenance. This second prototype was reworked with a tubular boom to replace the original truss-work tail and was fitted with an improved and strengthened cockpit enclosure. Howard Hughes is rumored to have designated it for his personal use. It was acquired in 1991 and put on display in 1997.

Transferred to the Museum's Permanent Collection. 2015.056.009

Hughes Flying Boat HK-1, H-4

Spruce Goose

MAXIMUM SPEED (estimated)	230 mph at 5,000 feet
CRUISING SPEED (estimated)	150 mph at 5,000 feet
ENGINES	8 x Pratt and Whitney R-4360 w/3,000-hp.
WINGSPAN	320 feet
VERTICAL STABILIZER	51 feet
WEIGHT	300,000 lbs.
CAPACITY	750 Troops or 2 x Sherman tanks
CREW	18
RANGE (estimated)	2,975 miles using 12,500 gals. of gasoline



It was born of a critical national need to fly over Nazi submarines ravaging shipping lanes during World War II. First designated the HK-1 for the Howard Hughes and Henry Kaiser venture that responded to a government requirement, it was later called the H4 Hercules. The Hughes Flying Boat (HFB) was to be the biggest airplane ever built and probably the most prodigious aviation project of all time. Only the courage and solitary dedication of Howard Hughes and his small development group enabled this project to move forward.

Designed to carry 400 combat troops, the HK-1, still the biggest wooden aircraft ever built, was decades ahead of its time. It revolutionized jumbo flying bodies and large lift capability, shaping modern flight. Hughes engineers created the first artificial feel system in the control yoke, which gave the pilot the feeling of flying a smaller aircraft, but with a force multiplied two hundred times.

The project could not use materials such as steel and aluminum critical to the war effort, so the Hughes team constructed the HFB out of wood. Hughes used a process called “Duramold” to create almost every part of the aircraft. The Duramold process is a plywood-like series of thin wood laminations, with grains laid perpendicular to each other. Workers permeated the laminations with plastic resins, then they shaped and heated the pieces until cured. The result is a material that many engineers agree is both lighter and stronger than aluminum. The press insisted on calling the HFB the “Spruce Goose,” a name that Howard Hughes despised. Most of the huge plane is actually made of birch, with only small amounts of maple, poplar, balsa, and spruce. Birch was chosen because of its light weight, strength, and resistance to splitting, dry rot and deterioration.

All of the research and development that went into the new seaplane delayed the construction process. In mid-1944, Henry Kaiser withdrew from the project and Hughes took personal responsibility for all facets of the flying boat's design and production. He renamed the gigantic seaplane H-4, representing his aircraft company’s fourth design.

After the war’s end in 1945, criticism of the project mounted and a U.S. Senate sub-committee investigated alleged misappropriation of funds during the war. On top of the government-allocated $18,000,000, Hughes invested $7,000,000 of his own money into the project to keep it going. While Hughes testified before the investigative committee in Washington, D.C., the Hughes team assembled the HFB in the Long Beach dry dock. After his interrogation, Hughes was determined to

demonstrate the capability of his airplane. He returned to California and immediately ordered the seaplane ready for taxi tests.

On November 2, 1947, Howard Hughes and a small crew fired up the eight engines and thrilled thousands of onlookers with an unannounced flight. With Hughes at the controls, the flying boat lifted 25-30 feet off the water and flew one mile in less than a minute at a top speed of 90 mph before making a perfect landing. After the flight, Hughes placed the HFB in its custom-built hangar and ordered her maintained in flight-ready condition. She remained in “hibernation” for 33 years at a cost of approximately one million dollars per year. Hughes died in 1976.

HISTORY OF THIS AIRCRAFT

The HFB remained in storage until 1980 when ownership was transferred from the General Services Administration to SUMMA Corp. (parent of Hughes Tool.) From 1982 to 1992 it was on display in Long Beach, California under the operation of the Aero Club of Southern California and the Disney Corporation. In August of 1992 it was sold to Evergreen.

Disassembly for transport began August 10, 1992, and was completed on September 20th. It was taken apart into 38 separate elements. Crews, (including some of the original flight crew) carefully planned and documented the disassembly to ensure accurate reassembly for the seaplane’s future display. These elements were then shipped to their destination by land and water.

The passage from California to Oregon took several weeks. Propellers, engines and smaller parts were crated and shipped via truck. The rest, much too large for overland passage, sailed by barge to Portland. Leaving the Port of Long Beach on October 13th, the barge sailed north through the Pacific Ocean up the Columbia River and up the Willamette River in less than five days.

After a delay of several months to allow for the right water levels in the river, the sections were barged up the Willamette through Oregon City to Dayton. The move set new records at historic Willamette Falls for the longest and highest load ever to pass through the locks there. Off-loaded at Dayton, the pieces were transferred to trucks for the final leg of the journey. The Flying Boat arrived at Evergreen International Aviation in McMinnville on February 27, 1993.

Between 1992 and 2000, the massive parts underwent preservation and restoration at the hands of dedicated volunteers. They replaced the deteriorated fabric on the control surfaces and removed the old paint. This process exposed inspection stamps, signatures of men and women who worked on the original construction and evidence that the wood laminate had passed wind shear tests. The crew sanded the large pieces of the Flying Boat, primed them with a white latex finish, and repainted them in the original flight color of silver.

Meanwhile, in August 1999, construction began on the Flying Boat’s new hangar. A year later, on September 16, 2000, the fuselage, wings and tail slowly made their way to the new building. It took a little over a year to reassemble the Flying Boat. Before assembly, the crew lowered the fuselage into a seven-foot pit at the Museum's center south side. Volunteers assembled the wings and vertical tail first, followed a short time later by the assembly of the pylons.

Crews attached the eight Pratt and Whitney R-4360 engines to the wings and they painted and prepared the propellers before mating them to the engines. Next, they completed the assembly of the horizontal stabilizers, flaps, ailerons, rudder, and elevators. On December 7, 2001, crews attached the tail cone, signifying the completion of the Flying Boats’ incredible journey!

LOCATION: T

Hughes MD 500D

OH-6 Cayuse (ONCHO)

MAXIMUM SPEED	170 mph
CRUISING SPEED	150 mph
SERVICE CEILING	16,000 feet
ENGINE	Allison 250-C20B, 420 shaft hp
RANGE	260 miles
CAPACITY	5



THE MODEL

One of the world's most successful and versatile light turbine helicopters, the Hughes MD 500 was developed as a light observation helicopter for the US Army. Offered in various configurations and models it became one of the most popular civil helicopters in history.

Hughes won the US Army observation helicopter contest against competition from Bell and Hiller with its Allison 250 powered YOH-6A Cayuse, which first flew in February 1963. By then Hughes was already working on a civil variant, to be marketed as the Hughes 500. It was offered in basic five and seven seat configurations, as well as a 500U utility version. An Allison 250-C18A engine powered the 500 and 500U.

The OH-6 set 23 world records for helicopters in 1966 for speed, endurance and time to climb. On March 23, 1966, Jack Schwiebold set the closed circuit distance record in a YOH-6A at Edwards AFB, California. He flew without landing for 1,739.96 mi. And on April 7, 1966, Robert Ferry set the long distance world record for helicopters. He flew from Culver City, California to Ormond Beach, Florida, covering a total of 2,213.04 mi.

The OH-6A was used as a military scout during the Vietnam War. The pilots dubbed the little helicopter "Loach," a word created from the acronym of the program that spawned the aircraft, LOH (light observation helicopter.) It was quite effective when teamed with the AH-1G Cobra attack helicopter as part of what were known as "Pink Teams". The OH-6A "Loach" would find targets by flying low, "trolling" for fire, and lead in a Cobra, or "Snake", to attack.

In 1970 the model 500C followed with a more powerful 250-C20 turboshaft engine. From 1976 deliveries were of the model 500D, an improved version with again a more powerful engine, the 250-C20B, a T-tail, and new five blade main and optional four blade tail rotors. The 500D was followed by the 500E from 1982 with recontoured nose and various interior improvements including greater head and legroom. The 530F (first delivery January 1984) is a more powerful version optimized for hot and high work.

McDonnell Douglas acquired Hughes Helicopters in January 1984 and in August 1985 the Hughes name disappeared. From then on the 500E and 530F were built as the MD-500E and MD-530F Lifter.

HISTORY OF THIS AIRCRAFT

This helicopter, an MD 500D model, is one of the original aircraft Evergreen Aviation operated when it renewed its Onchocerciasis Control Program (ONCHO) contract in 1987. Evergreen's Hughes/MD 500 was one of the workhorses of the World Health Organization's ONCHO program. Onchocerciasis, also known as "river blindness," is a parasitic disease transmitted by the black fly, which caused a major public health epidemic for over 30 million people in 11 West African countries. Along with its sister craft, it has logged nearly 90,000 hours.

LOCATION: H

Hughes XF-11 (model)

TIME TO ALTITUDE	33,000 ft. in 17.4 minutes
EMPTY WEIGHT	37,100 pounds
RANGE	4,000 miles
CEILING	42,000 feet
CREW	Two; pilot & navigator/photographer
LENGTH	65 ft. 3 inches
WINGSPAN	101 ft. 5 inches
WING AREA	983 square feet
GROSS WEIGHT	47,500 pounds
MAXIMUM TAKEOFF WEIGHT	58,315 pounds
POWERPLANT	2 x Pratt & Whitney R-4360-31 Wasp Major 28-cylinder, air-cooled radial piston w/3,000 hp. each
PROPELLERS	8-bladed Hamilton Standard Hydromatic, contra-rotating
MAXIMUM SPEED	295 mph @ sea level, 450 mph @ 33,000 ft.
RATE OF CLIMB	1,000 feet per minute



The Hughes XF-11 was a prototype military reconnaissance aircraft, designed and flown by Howard Hughes, and built by Hughes Aircraft Company for the United States Army Air Forces (USAAF).

On the urgent recommendation of the President's son, Col. Elliott Roosevelt, who led a team surveying several reconnaissance aircraft proposals in September of 1943, General Henry "Hap" Arnold, Chief of the U.S. Army Air Forces, ordered 100 F-11s for delivery beginning in 1944. In this, General Arnold overrode the strenuous objections of the USAAF Material Command, which held that Hughes did not have the industrial capacity or proven track record track record to deliver on his promises.

Only two prototypes and a mock-up were completed.

The production aircraft had been canceled in May 1945, but the second prototype was completed and successfully flown in 1947. The program was extremely controversial from the beginning, leading the U.S. Senate to investigate the government's funding for the XF-11 and the Hughes H-4 Hercules Flying Boat.

The XF-11 used Pratt & Whitney R-4360-31 twenty-eight-cylinder radial engines. Each engine drove a pair of contra-rotating four-bladed, controllable-pitch propellers, which could increase performance and stability but at the cost of increased mechanical complexity. Due to constant problems with the contra-rotating propulsion system, the second prototype had regular single four-bladed propellers.

During the first flight of the prototype, Hughes did not follow the agreed testing program and communications protocol and remained airborne almost twice as long as planned.

An hour into the flight, a leak caused the right-hand propeller controls to lose their effectiveness and subsequently the rear propeller reversed its pitch, disrupting that engine's thrust, which caused the aircraft to yaw hard to the right and eventually to crash.

The USAAF account said that "It appeared that loss of hydraulic fluid caused failure of the pitch change mechanism of right rear propeller. Mr. Hughes maintained full power of right engine and reduced that of left engine instead of trying to fly with right propeller windmilling without power. It was Wright Field's understanding that the crash was attributed to pilot error."

The second prototype was fitted with conventional propellers and flown by Hughes on April 5, 1947, after he had recuperated from the serious injuries incurred from the crash. Initially the USAAF had insisted that Hughes not be allowed to fly the aircraft, but after a personal appeal to Generals Ira Eaker and Carl Spaatz, he would do so against posting $5 million in security.

Nevertheless, the government declined to fund a production run of the XF-11.

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LOCATION: T

Insitu A-20

InSight (UAV)

ENGINE	3W two-stroke piston, 1.5 hp
SERVICE TIMEFRAME	Mid-2000s



THE MODEL

The Insitu A-20 UAV, also known as the InSight, was developed as an evolution of Insitu's earlier ScanEagle drone, with improvements in endurance, payload capacity, and overall performance. Designed for intelligence, surveillance, and reconnaissance (ISR) missions, the A-20 was intended to provide real-time battlefield awareness for military and governmental agencies. Its small size and catapult launch capability allowed it to operate from various platforms, including naval vessels and remote land-based locations, making it a versatile asset for reconnaissance operations.

One of the key advancements of the A-20 was its ability to carry a larger and more sophisticated sensor suite, including electro-optical/infrared (EO/IR) cameras, synthetic aperture radar (SAR), and electronic warfare payloads. This enhanced capability allowed it to detect and track targets in diverse operational environments, from open ocean surveillance to complex urban battlefields. With a greater endurance than its predecessors, the A-20 could stay aloft for extended missions, providing continuous reconnaissance and reducing the need for frequent redeployments.

While the A-20 was a promising development, it ultimately did not enter large-scale production, as Insitu and its parent company, Boeing, continued to focus on the widely used ScanEagle and its successor, the Integrator UAV. However, the A-20's advancements influenced the design of future UAVs, particularly in terms of modular payload integration and extended endurance capabilities. Its development highlighted the growing demand for small, long-endurance drones capable of supporting real-time ISR and electronic warfare in modern military operations.

NOTABLE PEOPLE

DR. TAD McGEER

Founder of Insitu, McGeer played a foundational role in the development of small, long-endurance UAVs, including the technologies that influenced the Insitu A-20 InSight. An aerospace engineer, McGeer was responsible for designing the SeaScan, an early UAV that led to the ScanEagle, which informed the development of the A-20. His expertise in aerodynamics and autonomous flight systems helped shape the A-20's extended endurance, payload capabilities, and advanced surveillance functions. Although McGeer left Insitu before the A-20's full development, his pioneering UAV work laid the groundwork for its design and mission capabilities.

HISTORY OF THIS AIRCRAFT

This InSitu A-20 InSight operated for Evergreen Unmanned Systems, a division of the former Evergreen International Aviation. It began flying for Evergreen in 2007 and operated on a number of civilian contracts before the company was acquired by VT Group in 2010.

Transferred to the Museum's Permanent Collection. 2015.065.001

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LOCATION: T

Mastiff III

Israeli Aircraft Industries Mazlat — Unmanned Aerial Vehicle (UAV)

SERVICE TIMEFRAME	1980s
WINGSPAN	13 ft 11 in
TOP SPEED	115 mph
SERVICE CEILING	14,700 ft
ENDURANCE	7.5 hrs
ENGINE	One 22 hp piston engine



THE MODEL

The IAI Mazlat Mastiff III was an unmanned aerial vehicle (UAV) developed by Israel Aerospace Industries (IAI). The Mastiff III was an upgraded version of the earlier Mastiff—part of the first generation of UAVs—which used a television camera to provide real-time battlefield data. It was used by the Israeli military for locating missile sites in the Beqaa Valley during the 1983 intervention in Lebanon. Able to loiter over the battlefield for long periods, Mastiffs assisted in the destruction of 28 surface-to-air (SAM) missile sites.

The U.S. Navy and Marine Corps quickly took an interest in the technology and acquired several Mastiff UAVs for testing from Mazlat, a corporate partnership between Tadiran and Israeli Aircraft Industries. These tests resulted in the development of the larger, more powerful Pioneer UAV, which was used to provide intelligence for U.S. commanders during the first Gulf War. Mastiffs remained in service with the Israel Defense Forces through 1990.

HISTORY OF THIS AIRCRAFT

This Mastiff III UAV is on loan from the National Museum of the Marine Corps.

On loan from the National Museum of the U.S. Marine Corps. 2004.016.003

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LOCATION: T

Kaman SH-2F

Seasprite

MAXIMUM SPEED	165 mph
CRUISE SPEED	150 mph
SERVICE CEILING	22,500 feet
ENGINES (2)	Two General Electric T58-GE-8F, 1,350 shp each
RANGE	422 miles
ROTOR DIAMETER	44 feet
CREW	Three
SERVICE TIMEFRAME	1962–1993
ACCESSION	ICL2005.002.001





THE MODEL

The Kaman Seasprite is a ship-based, twin-engine utility helicopter developed for the U.S. Navy in the late 1950s by Kaman Aircraft Corporation. Designed for use on the confined decks of U.S. Navy destroyers and frigates, the Seasprite is a compact helicopter which features folding rotor blades to reduce its length. Unlike some of Kaman's earlier rotorcraft, the Seasprite did not use the company's signature intermeshing rotor system; instead, it featured a more conventional single main rotor and tail rotor configuration. Throughout its service, the Seasprite proved itself as a versatile platform, fulfilling roles in search and rescue, transport, and liaison duties.

The SH-2F variant, introduced in the 1970s, marked a significant upgrade in the Seasprite's capabilities by adapting the airframe for anti-submarine warfare (ASW). Outfitted with advanced sensors and radar, sonobuoys, and the ability to carry torpedoes, the SH-2F allowed surface ships to extend their ASW reach far beyond the range of shipboard sensors. Twin General Electric T58-GE-8F turboshaft engines gave it improved performance and redundancy for overwater operations. With the SH-2F, the Seasprite remained a key component of the U.S. Navy's Light Airborne Multi-Purpose System (LAMPS) until it was gradually phased out in favor of more modern platforms.

NOTABLE PEOPLE

CHARLES H. KAMAN

Founder of Kaman Aircraft Corporation, and the designer of the Kaman Seasprite. A pioneering aerospace engineer and innovator, Kaman developed a unique intermeshing rotor system that eliminated the need for a tail rotor, improving stability and maneuverability—which became a hallmark of his designs.

Beyond aviation, Kaman was also a talented guitarist. He founded Kaman Music Corporation, and invented one of the first electrically amplified acoustic guitars. His legacy bridges both the aerospace and music industries, reflecting a rare blend of technical ingenuity and artistic passion.

HISTORY OF THIS AIRCRAFT

This SH-2F Seasprite is on loan from the National Naval Aviation Museum.

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LOCATION: T

Lancet 3 Drone

THREAT LEVEL 2: Midsize commercial drones with moderate payload

DEPLOYED BY	Russia
COUNTRY OF ORIGIN	Russia (designed by ZALA Aero Group)
ROLE	Loitering munition (kamikaze/suicide drone) for precision strikes
FRAME	4.9 ft length, X-shaped wings (2 fore, 1–2 rear), composite materials
NUMBER OF PROPELLERS	1 (rear-mounted, two-bladed pusher propeller)
RANGE	Up to 43 miles
ARMAMENT	6.6–11 lb warhead (HE fragmentation, thermobaric, or HEAT)
TYPICAL TARGETS	Artillery (howitzers, MLRS), tanks, air defense systems, naval vessels
HOW CONTROLLED	Electro-optical guidance, real-time video, pre-programmed coordinates, AI-assisted targeting, operated by two-person crew via ground station
MANEUVERABILITY	Highly maneuverable, capable of striking moving targets, low radar signature



The Museum gratefully acknowledges the generous support of Dr. Stephen and Marge Brenneke and The Laney Family Foundation, whose contributions made this exhibit possible.

LOCATION: H

Learjet 24

Biz Jet

MAXIMUM SPEED	565 mph
CRUISING SPEED	534 mph
SERVICE CEILING	45,000 feet
ENGINES (2)	General Electric CJ610-4 2,950 lbs. thrust each
RANGE	978 miles
CAPACITY	Two crew, five passengers



The Learjet 24 is an American six-to-eight-seat twin-engine high-speed business jet, which was manufactured as the successor to the Learjet 23. It was one of the first private jets in production and holds many records. Fit for short-distance travel, the Learjet 24 offers more performance and utility in the small cabin, light jet category than the original Learjet 23.

When the first Learjet flew on October 7, 1963, there was nothing on the civilian market that could come close to its performance. Suddenly anybody could fly as fast as the airlines. It was not the first civilian jet for sale, but the jets that came before were bigger, much more expensive, and never came close to offering the same convenience as the tiny jets from Wichita.

The Learjet's origins are found in the design of a Swiss fighter plane which did not go into production. William Lear purchased the tooling from the Swiss and created the world's first “business jet”. The Lear 24 first flew in 1966; the 3,000th Learjet was delivered in June 2017.

The cabin is arranged not for maximum comfort, but for utility. Its design is ideal for optimized speed, featuring a small fuselage cross-section. Seating is configured as one bench seat, two forward-facing seats and a single side-facing seat against the starboard wall. A pocket-sized refreshment center and a baggage compartment (accessible only inside the cabin) are also included. It uses the civilian version of the engine that powers such military aircraft as the Northrop T-38 Talon, Northrop F-5, Canadair CT-114 Tutor, and Cessna A-37 Dragonfly light attack aircraft.

The type was certified in March 1966. Shortly thereafter, a Learjet 24 piloted by Hank Beaird, John Lear, and Rick King, with journalist John Zimmerman on board, set 18 international aviation records by completing a round-the-world trip in 50 hours and 19 minutes of flight, not counting time spent at the 17 refueling stops. The total time was 65 hours and 38 minutes from Wichita to Wichita.

HISTORY OF THE MUSEUM’S AIRCRAFT

The museum's Learjet was donated by Evergreen Airlines in 2007 and painted to resemble· an aircraft that served with NASA at the Dryden Flight Research Center, now Armstrong Flight Research Center at Edwards Air Force Base in California.

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LOCATION: H

Lektro 1967 Airporter

The World's First Electric Towbarless Aircraft Tractor

INTRODUCED	1967
POWER	Battery-electric
CAPACITY	Designed for light aircraft
DISTINCTION	World's first towbarless aircraft tug



The Airporter was developed by Oregon-based LEKTRO for Flightcraft, a Portland-area fixed-base operator. Flightcraft's Sy King and LEKTRO founder Wilt Paulson were looking for a safer alternative to conventional tow bars, which could place damaging stresses on aircraft nose landing gear. Their solution was the Airporter, which used a hydraulic cradle to lift and carry an aircraft's nose wheel, eliminating the need for a tow bar.

The innovative tug was built around a LEKTRO electric cart chassis originally designed for a very different purpose: feeding mink. The chassis was essentially reversed, placing the drive wheels at the front and the steering wheels beneath the operator. A hydraulic lifting cradle was then added to the front, allowing the Airporter to securely capture and lift an aircraft's nose gear.

This simple but ingenious Oregon-built vehicle pioneered the towbarless aircraft tug. The concept proved highly successful, and LEKTRO went on to refine the design and produce thousands of towbarless electric tractors used at airports and aviation facilities around the world.

On loan from Oshkosh AeroTech/LEKTRO.

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LOCATION: NL

Ling-Temco-Vought A-7

Corsair II

MAXIMUM SPEED	698 mph @ sea level
CRUISING SPEED	535 mph
SERVICE CEILING	42,000 feet
ENGINE	Allison TF 41-A-2 14,500 lbs. thrust
RANGE	1,231 miles
ARMAMENT	1 x M61A1 Vulcan 20-mm cannon plus 15,000 lbs. of ordnance
CREW	One



The A-7 *Corsair II* was an American carrier-capable subsonic light attack aircraft designed by Ling-Temco-Vought to replace the Douglas A-4 *Skyhawk*. Its airframe design was a somewhat smaller version of the supersonic Vought F-8 *Crusader*. It was designed to be subsonic to give it a greater payload and longer range.

The *Corsair II* initially entered service with the US Navy during the Vietnam War. It was later adopted by the US Air Force, including the Air National Guard, to replace the Douglas A-1 *Skyraider*, and the North American F-100 *Super Sabre*.

The USAF A-7Ds flew a total of 12,928 combat sorties during Vietnam with only six losses – the lowest of any U.S. fighter in the theater. The aircraft was second only to the Boeing B-52 *Stratofortress* in the amount of ordnance released on Hanoi and it dropped more bombs per sortie with greater accuracy than any other U.S. attack aircraft.

It was the first U.S. aircraft to have a modern head-up display, now a standard instrument, which showed information such as dive angle, airspeed, altitude, drift and aiming. The integrated navigation system allowed for another innovation – the projected map display system which accurately showed aircraft position on two different map scales. The radar also fed a digital weapons computer which made possible accurate delivery of bombs from a greater stand-off distance, greatly improving survivability compared with faster platforms.

It was retired from the Air National Guard service in 1991. A total of 1,569 were built for both services. The Air Force replaced it with the Fairchild Republic A-10 *Warthog* and the Navy with the McDonnell Douglas F/A-18 *Hornet*.

HISTORY OF THE MUSEUM'S AIRCRAFT

This A-7 is on loan from the National Museum of the United States Air Force. The markings are of the 354th Tactical Fighter Wing, Myrtle Beach, South Carolina while operating out of Korat RTAFB, Thailand during the Vietnam War.

Link Instrument Trainer AN-T-18

POWER	110 volt AC electric (suction pumps and bellows)
WINGSPAN	4 feet 10 inches
LENGTH	8 feet
HEIGHT	8 feet 2 inches
CAPACITY	One (single pilot's seat)



HISTORY OF THE MODEL

In the 1920s, the challenge of flying in adverse situations, at night or in bad weather, limited the effectiveness of military aircraft and the profitability of commercial air carriers. Additionally, training pilots to fly aircraft in bad weather was in itself dangerous. The solution was an instrument flight trainer.

Edwin Link, an employee at his father's Link Piano and Organ Company, developed an effective instrument trainer in the late 1920s, gaining a patent in 1931. Using spare piano and organ parts, Link's trainer utilized pneumatic bellows and electrically driven suction pumps to create the "feel" of an aircraft in flight. It was first used in amusement parks, but no one really paid attention to it until 1934 when the US Army Air Corps was suddenly called on to carry mail and was lacking experienced pilots. When nearly a dozen Army pilots, who had been trained to fly by watching the ground, were killed in one week, the Air Corps began to buy the Link trainers.

By 1941, nearly all-American combat pilots had training on Links. Numerous German and Japanese pilots also learned on Link Trainers sold prior to World War II. By the end of the war, the U.S. military had purchased well over 7,000 of them and hundreds of thousands of student aviators had flown in them. It was far cheaper to operate per hour than an actual training aircraft. Most importantly, it was safe to fly, having never lost a pilot in a simulated "crash."

Mounted on a pedestal and connected to an adjacent instructor's console, the trainer simulated the roll, pitch, and yaw of a real aircraft. It thereby taught them the basics of instrument flying in bad weather or at night. It quickly earned the nickname "Pilot Maker," although it was usually referred to simply as the "Blue Box." The numeric designation stands for **A**rmy **N**avy **T**rainer 18.

It consists of a wooden box approximating the shape of a cockpit and forward fuselage section, which is connected via a universal joint to a base. Inside the cockpit are a single pilot's seat, primary and secondary aircraft controls and a full suite of flight instruments. The base contains several sets of air-driven bellows to simulate movement, an air compressor that both drives the bellows and provides input to a number of aircraft instruments, and a device known as a Telegon Oscillator which controls the remaining instruments.

The second major component is an external instructor's station, which consists of a large map table, a repeated display of the main flight instruments, and a moving marker known as a 'crab'. The crab moves across the glass surface of the map table, plotting the pilot's track. The pilot and instructor can communicate with each other via headphones and microphones.

The ANT-18 has three main sets of bellows. One set of four bellows (one under each corner of the cockpit) controls movement in the pitch and roll planes. A very complicated set of bellows at the front of the cockpit controls movement in the yaw plane. A third set simulates vibration such as stall buffet. Both the trainer and the instructor's station are powered from standard 110VAC/240VAC power outlets via a transformer, with the bulk of internal wiring being low voltage. Simulator logic is all analog and is vacuum tube based.

HISTORY OF THIS MODEL

The Evergreen Aviation Museum’s AN-T-18 was produced in 1943 and is typical of military Link Trainers of the period. It was donated by Mr. Don Clark in 2000 and has been fully restored by museum volunteers.

Lockheed F-104

Starfighter

MAXIMUM SPEED	1,325 mph
CRUISING SPEED	519 mph
SERVICE CEILING	50,000 feet
ENGINE	GE J79-GE11A 15,600 lbs. thrust
RANGE	1,000 miles
ARMAMENT	1 x M61 20-mm Vulcan cannon + a capacity of 4,000 lbs. for ordnance
CREW	One





The F-104, sometimes called "a missile with a man in it", was designed as a Mach-2 interceptor and designed for optimum performance at Mach 1.4. It was exceptionally stable at high speed (600+ knots) at very low level, making it a formidable tactical nuclear strike-fighter. The first prototype was completed by early 1954 and it became operational in 1958.

The F-104 was produced in two major versions. Armed with a six-barrel M-61 20mm Vulcan cannon, it served as a tactical fighter, and when equipped additionally with heat-seeking Sidewinder missiles, as a day-night interceptor.

The US Air Force only purchased 296 aircraft. It was best known by its use by other countries as a fighter-bomber. Eventually 2,578 aircraft would be built by the U.S. and other countries.

The F-104 featured a radical wing design. Lockheed tests determined that the most efficient shape for high-speed, supersonic flight was a very small, straight, mid-mounted, trapezoidal wing. The wing's leading edges were so thin (0.41 mm) that they presented a cut hazard to ground crews; protective guards had to be installed on the wingtips during ground maintenance.

On May 18, 1958, an F-104A set a world speed record of 1,404.19 mph, and on Dec. 14, 1959, an F-104C set a world altitude record of 103,395 feet. The *Starfighter* was the first aircraft to hold simultaneous official world records for speed, altitude, and time-to-climb. NASA used it as a chase plane and for high altitude research.

In the mid-1960s the safety record of the F-104 became high-profile news. No fewer than 262 German F-104s crashed. In June 1962 four F-104s crashed on the same day. 116 German pilots died between 1962 and 1984 and the F-104 became known as Witwenmacher ("The Widowmaker") in West Germany. Some operators lost a large proportion of their aircraft through accidents, although the accident rate varied widely depending on the user and operating conditions; the German Air Force and Federal German Navy lost about 30-percent of aircraft in accidents over its operating career and Canada lost 46-percent of its F-104s. The Spanish Air Force, however, lost none.

The F-104's U.S. service was quickly wound down after 1965. At the time, USAF doctrine deemed the airplane inadequate for either the interceptor or tactical fighter-bomber role, lacking both payload capability and endurance in comparison with other USAF aircraft.

The international service of the F-104 began to wind down in the late 1970s, being replaced in many cases by the General Dynamics F-16 *Fighting Falcon*, but it remained in service with some air forces

for another two decades. The last *Starfighter* was retired from the Italian Air Force on 31 October 2004.

HISTORY OF THE MUSEUM'S AIRCRAFT

Our aircraft was last flown by the Belgian Air Force. It was donated by Roger Kelsay of Hillsboro, Oregon in 2010 and restored by the Evergreen Volunteer Restoration Team.

Lockheed F-117A

Nighthawk

MAXIMUM SPEED	684 mph
SERVICE CEILING	45,000 ft.
ENGINES (2)	GE F404-F1D2 Turbofans 9,040 lbs. thrust each
RANGE	1,070 mi.
GROSS WEIGHT	52,500 lbs.
ARMAMENT	2 x internal weapons bays for 1-2,000 bombs each
CREW	One
SERVICE YEARS	1983 - 2008



On Nov 10th, 1988, the F-117A stealth aircraft was revealed to the world, after being in the black world for 6 years. A very grainy photo was released at the same time. The announcement had been delayed by 3 weeks, due to the presidential election. On the same day the 4450th was deactivated and the aircraft were assigned to the 37th TFW.

On Dec 20, 1989, the US military began operation "*Just Cause"*, to remove Panamanian President Manuel Noriega from power. As part of this operation eight F-117As were launched from their base at the Tonopah Test Range (TTR) in Nevada. The aircraft needed to be refueled, by tankers, a total of four times. After the first tanking, the 2 air spares returned to Tonopah. The six aircraft that continued were loaded with two GBU-27 laser guided bombs. Capt. Greg "Beast" Feest, flying aircraft 816, had been selected, to drop the first bomb near the Panama special forces barracks. Capt. Feest had the best bombing scores in the 37th TFW. This was to be a show of power to keep the special forces from participating in the defense of Panama. The special forces had already left the barracks. The other strikes by F-117As were canceled and the aircraft recovered to England AFB in Louisiana. The mission was in the air for over 14 hours.

Saddam Hussein moved Iraq's Republican Guard troops into Kuwait on Aug 2, 1990. Saudi Arabia, fearing that the Iraq troops would continue into their oil fields, gave permission for US and Coalition forces to move into bases on Saudi soil. This operation was called "*Desert Shield"*.

On Aug 19, twenty-two F-117's flew from TTR to Lang-ley AFB, in Virginia. After crew rest the aircraft continued to King Khalid Air Base in Saudi Arabia. Four air spares re-turned to TTR. On Dec 2, eighteen more aircraft were sent to King Khalid Air Base. The 37th troops soon began calling King Khalid "Tonopah East". From the time the aircraft arrived until the beginning of Desert Storm the thirty-six aircraft flew orientation and training missions. They also flew towards the Iraqi border to test the defenses.

The last combat for the F-117A's was NATO Operation Allied Force, in Yugoslavia. Hostilities began on March 24th and ended on June 10th, 1999. The twelve deployed F-117A's operated from bases in Italy and Germany. During this conflict the only F-117A was lost in combat.; caused 70% of the country to lose power and parts of the grid to be unrepairable.

HISTORY OF THE MUSEUM'S EXHIBIT

The Museum's F-117A is 85-0816 and called the *"Lone Wolf*". It was used to drop the first bombs of Just Cause and Desert Storm. This aircraft was accepted on 31 Oct 1985 and has flown a total of 2,451 sorties with 4,162.8 hours. It flew one mission during Just Cause, thirty-nine missions during Desert Storm and eight missions during Iraqi Freedom. The aircraft was retired in October 2007.

At 2:51 AM on Jan 17, Maj. Greg “Beast” Feest, using this aircraft dropped the first bomb in Desert Storm. His target was the main air defense radar control center. Over 42 nights of conflict, Mission planning was critical to the unit’s success. F-117A’s flew nearly 1300 sorties and 6900 hours. Target hit rate of 80% was claimed. After a review that figure was lowered. This aircraft is on loan from the National Museum of the United States Air Force.

↑ Index

LOCATION: TO

Lockheed F-94C

Starfire

MAXIMUM SPEED	640 mph
SERVICE CEILING	51,400 feet
ENGINE	Pratt & Whitney J48-P-5 turbojet 8,750 lbf. thrust
RANGE	805 miles, combat
GROSS WEIGHT	24,184 lbs.
ARMAMENT	24 or 48 × 70-mm rockets
CREW	Two





The Lockheed F-94 *Starfire* was the US Air Force's first operational jet-powered all-weather interceptor aircraft. It was the first U.S. production jet with an afterburner. The -C model was the only variant to be officially named *Starfire*. With time, the entire F-94 family adopted the name. Built to a 1948 specification for a radar-equipped interceptor, the F-94 was specifically designed to counter the threat of the USSR's new Tupolev Tu-4 bombers which were, in fact, reverse-engineered Boeing B-29s.

The F-94 was derived from the TF-80C which was a two-seat trainer version of the F-80 *Shooting Star*. To modify them, a lengthened nose area with guns, radar and automatic fire control system was added.

A contract was awarded to Lockheed in early 1949, with the first flight on April 16, 1949. The early test YF-94s used seventy-five percent of the parts used in the earlier F-80 and T-33As. In July 1951, the first production F-94C aircraft were put into service, 387 examples being delivered before May 1954.

The fire control system was a short-range radar useful only in the terminal phases of an interception—most of the operation was directed using ground-controlled instructions. Later in its career most of the F-94C’s operation would be guided using the Semi-Automatic Ground Environment (SAGE) system.

The F-94C *Starfire* was significantly modified from the early F-94 variants and to improve performance, a totally new wing was fitted, much thinner than the previous one and a swept tail surface.

The J33 engine was replaced and the fire control system was upgraded. The guns were removed, replaced with an all-rocket armament mounted in a ring around the nose radome. The rockets were loaded into flip-up panels on the sides of the nose and fired by opening four panels just behind the radome. This created a problem in that the nose-mounted rockets blinded the crew with their smoke and fire. More severely, firing these rockets could cause a flameout of the engine from the rockets’ exhaust and could lead to the loss of the aircraft. Mid-wing fuel and rocket pods were added, each holding 12 rockets. Most of the time, the nose rockets were not installed, and the mid-wing pod rockets were the sole armament.

The F-94C was retired from USAF service in 1959, Air National Guard units retired their F-94s a year later. This aircraft is on loan from the National Museum of the United States Air Force.

Lockheed GTD-21B

D-21 Drone

MAXIMUM SPEED	2,570 mph (Mach 3.35)
SERVICE CEILING	95,000 feet
ENGINE	Marquardt XRJ43-MA20S-4 ramjet
LENGTH	42 ft 10 in
SERVICE TIMEFRAME	1969–1971



During the early 1960s, President Dwight D. Eisenhower discontinued manned “spy flights” and the United States sought a new way to observe the Soviet Union. The Lockheed D-21 Drone became the solution. Conceived and developed by Lockheed, the D-21 provided unmanned reconnaissance of “enemy” territory.

Development of the D-21 Mach 3+ reconnaissance drone began in October 1962 and was completed a year later. Soon after, the United States Air Force initiated project Tagboard, which launched the drone from an A-12 supersonic aircraft—the forerunner of the SR-71 Blackbird. The Tagboard project re-designated the A-12 as M-21 (M for “Mother”), and provided for the D-21 (D being for “Daughter”) to carry a camera package for photoreconnaissance. Its mission required it to fly over Soviet territory, take pictures, and jettison the camera package via parachute before self-destructing. The camera package was later retrieved either mid-air by a C-130 or from a designated position on the Earth.

Launch problems doomed the Tagboard project; however, another operation named Senior Bowl launched the D-21 from under the wings of a B-52H bomber using rocket boosters. Senior Bowl resulted in four operational missions flown over the Peoples Republic of China, specifically focusing on their secret nuclear test facilities located near Lop Nor in Northwestern China. Control and guidance problems continued to limit the accuracy of the drone—with 21 missions flown, only four were termed successful—causing the cancellation of the project in 1971.

NOTABLE PEOPLE

RAYMOND TORICK, LAUNCH CONTROL OFFICER (LCO)

During the fourth Tagboard flight test, the D-21 collided with the M-21 mother ship at Mach 3.25 over the Pacific Ocean near California. Crewmembers Bill Park and Ray Torick ejected, but Torick’s flight suit was compromised by the ejection and he drowned before rescue. The event resulted in the termination of the M-21/D-21 Tagboard program.

HISTORY OF THIS AIRCRAFT

Lockheed produced 39 D-21 Drones. One of those produced, the Museum’s D-21 Drone, number 534, never flew a reconnaissance mission. The Air Force placed the drone in storage at 309th AMARG, Davis-Monthan AFB in Arizona upon cancellation of the program. It sits on a D-21-specific trailer used for storage, and mobility. This trailer also enabled a D-21’s attachment to a B-52H “mother ship.” Drone 534 began its life as a “B” model and did not receive an upgrade, as did earlier drones. The subtle difference between the “A” and “B” were the two probes attached on either side of the nacelle. Restored by Museum volunteers, this D-21 Drone is on loan from the National Museum of the United States Air Force.

This aircraft is on loan from the National Museum of the United States Air Force.

LOCATION: T

Lockheed Martin P-791

Airship (main tail sections — not yet installed)

STATUS	Main tail sections are here, waiting to be installed
SIZE (COMPLETE AIRSHIP)	More than 120 ft long, 50 ft wide, 30 ft tall
TAIL NUMBER	N791LM



“The most advanced airship ever produced is here and waiting to be installed!”

These are the main tail sections of the Lockheed Martin P-791. At more than 120 feet long, 50 feet wide and 30 feet tall, the P-791 will be yet another large format one-of-a-kind exhibit that you can only see here at the Museum.

To learn more about it, Google the tail number: N791LM



Lockheed SR-71A

Blackbird / Habu

MAXIMUM SPEED (classified)	~2,200+ mph (Mach 3.3)
CRUISING SPEED	Mach 3.2
SERVICE CEILING (classified)	~85,000+ feet
ENGINES (2)	Pratt & Whitney J58 34,000 lbs. thrust each
CREW	Two
RANGE	3,000+ miles







Unofficially known as the *Blackbird*, this long-range strategic reconnaissance aircraft was developed from Lockheed's A-12 and YF-12A aircraft. It is one of the most spectacular airplanes to have ever flown and is the world's fastest and highest-flying air-breathing production aircraft.

The design originated in secrecy during the late 1950s with the A-12 reconnaissance aircraft that first flew in April 1962 and remained classified until 1976. The SR-71, derived from the A-12, completed its first flight on Dec. 22, 1964. A total of thirty-two SR-71s were designed and built between 1962 and 1966 in total secrecy at the Burbank, California Lockheed plant known as the "Skunk Works".

It is a delta wing, two-place aircraft, powered by two axial-flow Pratt & Whitney J58 turbojet engines. The first operational aircraft was designed around a stealth aircraft shape and materials; the SR-71 had several features to reduce its radar signature.

It is over 107 feet in length, 18-and-a-half feet tall and has a wingspan of over 55 feet. Made mostly of titanium alloys to withstand heat, it was designed to operate at high supersonic speeds and high altitudes.

However, titanium proved to be a particularly sensitive material from which to build an airplane. The brittle alloy shattered if mishandled. Conventional cadmium-plated steel tools embrittled the titanium on contact so new tools were designed and fabricated—out of titanium. Ironically, much of the ore needed to fabricate the tools and airplanes came from the Soviet Union.

Fuselage panels were built to fit only loosely on the ground. Proper alignment was achieved as the airframe heated up and expanded several inches. Because of this, and the lack of a fuel sealing system that could handle the airframe's expansion at extreme temperatures, the aircraft leaked its JP-7 fuel on the ground prior to takeoff.

Since turbine engines will not operate at supersonic speeds unless the air flow at the engine inlet is at subsonic speed, the SR-71's engine system used moveable spikes to vary or break up the intake air, assuring that the speed of the air entering the engine was subsonic.

The sensors on this spy plane could scan more than 100,000 square miles of the Earth's surface every hour. During its reconnaissance missions in the Vietnam War, the North Vietnamese fired approximately 800 surface-to-air missiles at SR-71s, none of which managed to score a hit.

On July 28, 1976, the SR-71 set a world speed record of 2,193 mph. The same day, another SR-71 set a world altitude record of 85,068.997 feet.

While deployed at Okinawa, the SR-71s and their aircrew members received the nickname *Habu* after a pit viper indigenous to Japan which the Okinawans thought the plane resembled.

HISTORY OF THE MUSEUM'S AIRCRAFT

The S/N of the Museum's aircraft is 61-7971 and it's commonly referred to as "number 971." Its National Aeronautics and Space Administration (NASA) number is 832.

Number 971's first flight was on November 17, 1966. During the Vietnam War, the aircraft flew missions over North Vietnam, North Korea and along the coastline of China.

From October 1973 through April 1974, this aircraft, along with other SR-71s participated in Operation "Giant Reach" over the Middle East. While the average SR-71 mission lasted four and a half hours, most of the "Giant Reach" reconnaissance flights lasted for more than 10 hours, requiring up to six refuelings, with flights often sustaining speeds of Mach 3 for five or more hours.

This SR-71 was one of three *Blackbirds* used by NASA's Dryden Flight Research Center; it was deactivated and stored from 1990 to 1994.

On January 12, 1995, pilots Steve Ishmael and Marta Bohn-Meyer ferried number 971 to Palmdale, California where it became the first SR-71 to join the USAF inventory as a reactivated reconnaissance aircraft. After funding was cancelled on October 15, 1997, the *Blackbirds* were grounded. Number 971's last mission occurred on September 30, 1997, with flight time on the airframe of 3,512.5 hours of Air Force operation, plus 153.3 hours of NASA operation for a total of 3,665.8 hours

The Air Force transferred ownership of this and two other flyable SR-71s to NASA in July 1999. Number 971 was parked on a ramp at NASA / Dryden, where she remained until being loaned to the Museum in 2002 by the Air Force.

Lockheed T-33A

T-Bird

MAXIMUM SPEED	600 mph
CRUISING SPEED	455 mph
ENGINE	Allison J33-A-35 5,400 lbs. thrust
RANGE	1,345 miles
SERVICE CEILING	45,000 feet
CREW	Two



The U.S. Air Force stepped into the jet age with Lockheed's P-80 *Shooting Star,* America's first operational jet fighter. But with this new era came new challenges and the P-80's safety record left much to be desired.

Veteran pilots of prop-driven *Mustangs* and *Thunderbolts,* with years of experience handling piston-powered fighters, weren't instant experts at the controls of these strange new jets. It was clear that a trainer was needed to teach the finer points of flying in the jet age.

The T-33's design originated from a P-80 that was stretched more than three feet to make room for a second seat. The *T-Bird,* as it was soon dubbed, looked clean and graceful and was a dream to fly.

T-Birds began service with the Air Force in 1948. For nearly 13 years they helped train jet pilots. In the 1950's, more T-33s were built than any other jet aircraft.

When replaced by newer training aircraft, *T--Birds* towed targets, simulated intruders, and served as "hack" aircraft flying military personnel and small parts from place to place. It was said that every military jet pilot in the free world had spent time in a T-33.

Successful in the U.S., the *T-Bird* has flown with the air forces of more than 40 countries as trainers, fighters, and bombers for almost 40 years. In addition to hundreds of ex-U.S. aircraft supplied to friendly governments, Canada and Japan have both built their own T-33s under license. Cuban *T-Birds* even shot down American CIA bombers during the failed Bay of Pigs invasion in 1961. The aircraft is recognized worldwide, with some foreign T-33s still flying in military service today. Production ceased in 1959 after almost 5,700 had been delivered.

HISTORY OF THE MUSEUM'S AIRCRAFT

THE MUSEUM'S T-33 HAS BEEN IN THE NORTHWEST SINCE ITS FIRST DEPLOYMENT.

Built at Lockheed Aircraft in Burbank, California in 1955, the plane was assigned to the Oregon Air National Guard's 123rd Fighter-Interceptor Squadron based at Portland International Airport in October of that year.

In March of 1963, the aircraft was transferred from its former squadron to the entire 142nd Fighter-Interceptor Group also based in Portland. In November of 1988, the *T-Bird* was dropped from the Air Force inventory and loaned to Evergreen.

Today, the plane's canopy rail carries the name of Major General Charles A. Sams, former commander of the Oregon Air National Guard. When Sams joined the Air Guard in 1955, he flew his first sortie in what was a nearly brand-new T-33. In 1985, Sams flew this aircraft again on his "champagne flight," his last mission before retirement.

↑ Index

LOCATION: T

Mark 4 7″ FPV Drone

THREAT LEVEL 1: Light commercial drones with small payload

DEPLOYED BY	Ukraine
COUNTRY OF ORIGIN	China; assembled in Ukraine with local/imported components
ROLE	Kamikaze and bomber drone for military operations
FRAME	11.6 in True-X or H-type, 3K carbon fiber, durable, 4.4 lb payload
NUMBER OF PROPELLERS	4 (7 in, typically tri-blade)
RANGE	1.9–7.5 miles
ARMAMENT	RPG-7 warheads, improvised explosives, or small bombs
TYPICAL TARGETS	Tanks, armored vehicles, fortifications, enemy positions
HOW CONTROLLED	FPV goggles (e.g., DJI or analog) for live 1080p feed, radio controller (e.g., FrSky Taranis) for throttle/pitch/yaw/roll, flight controller (e.g., F405) for stability
MANEUVERABILITY	Highly agile, low-altitude flights to evade defenses



The Museum gratefully acknowledges the generous support of Dr. Stephen and Marge Brenneke and The Laney Family Foundation, whose contributions made this exhibit possible.

↑ Index

LOCATION: T

McCulloch J-2

Gyrocopter

AIRCRAFT TYPE	Civil utility autogyro
SERVICE TIMEFRAME	1972–1979
MAIN ROTOR DIAMETER	25 ft 11 in
LENGTH	15 ft 9 in
TOP SPEED	110 mph
SERVICE CEILING	8,010 ft
ENGINE	One Lycoming O-360-A2D 4-cylinder engine
ACCESSION	2017.023.001



THE MODEL

Designed and first flown in June 1962, the McCulloch J-2 was a two-seat autogyro with an enclosed cabin. Reportedly selling for $15,900, McCulloch Aircraft Corporation produced 83 of these aircraft from 1969 through 1972.

GENERAL CHARACTERISTICS

Crew: one pilot

Capacity: one passenger

Empty weight: 1,109 lb (503 kg)

Max takeoff weight: 1,598 lb (725 kg)

Powerplant: 1 × Lycoming O-360-A2D 4-cyl. horizontally opposed, 180 hp (130 kW)

Main rotor area: 530 sq ft (49 m2)

PERFORMANCE

Range: 200 mi (320 km, 170 nmi)

Rate of climb: 690 ft/min (3.5 m/s)

LOCATION: T

McDonnell Douglas F-15A

Eagle

MAXIMUM SPEED	1,875 mph (Mach 2.5)
CRUISING SPEED	600 mph
SERVICE CEILING	65,000 feet
ENGINES (2)	Pratt & Whitney FII0-PW-100 25,000 lbs. static thrust each
RANGE	3,450 miles (with auxiliary tanks)
ARMAMENT	M61-A1 20-mm cannon + AIM-7, AIM-9 and AIM-120 missiles
CREW	One





The F-15 Eagle is an all-weather tactical fighter designed to win and maintain air superiority in aerial combat. It was developed for the US Air Force to replace the F-4 Phantom II and first flew in July 1972. The Air Force introduced the F-15 as the first dedicated USAF air superiority fighter since the F-86 Sabre.

Powered by new Pratt & Whitney F100 engines, it achieved a combat thrust-to-weight ratio in excess of 1:1. The F-15 has look-down/shoot-down radar that can distinguish low-flying moving targets from ground clutter. It uses computer technology with new controls and displays to lower pilot workload and requires only one pilot, which saves weight.

Unlike the F-14 or F-4, the *Eagle* has only a single canopy frame giving the pilot clear vision forward. The F-15's maneuverability is derived from low wing loading (weight to wing area ratio) with a high thrust-to-weight ratio enabling the aircraft to turn tightly without losing airspeed. The F-15 can climb to 30,000 feet in around 60 seconds.

Criticism from the Air Force's "fighter mafia" that the F-15 was too large to be a dedicated dogfighter and too expensive to procure in large numbers, led to the Lightweight Fighter (LWF) program, which spawned the USAF F-16 *Fighting Falcon* and the middle-weight Navy F/A-18 *Hornet*.

As of 2019, the F-15 in all air forces has an air-to-air combined kill record of 104 to 0. The U.S. and Israel maintain that the air superiority versions of the F-15 (-A/-B/-C/-D models,) have never been shot down by an enemy. Over half of these F-15's kills were made by Israeli Air Force pilots. In 1979–81 during Israeli Lebanese border disputes, F-15As downed 13 Syrian MiG-21 *Fishbeds* and 2 Syrian MiG-25 *Foxbats*, the latter being the aircraft the F-15 was designed to kill. In the 1982 Lebanon War, Israeli F-15s shot down 40 Syrian jet fighters (23 MiG-21s and 17 MiG-23 *Floggers*) and 1 Syrian SA.342L *Gazelle* helicopter.

According to the USAF, its F-15Cs had thirty-four confirmed kills of Iraqi aircraft during the 1991 Gulf War, mostly by missile fire. The single-seat F-15C was used for air superiority, and the F-15E *Strike Eagle* was heavily used in air-to-ground attacks. The -E derivative is a two-seat all-weather strike fighter which entered service in 1989.

HISTORY OF THE MUSEUM'S AIRCRAFT

The Museum's *Eagle* was manufactured by McDonnell Douglas aircraft in St. Louis, Missouri. It served in the U.S. and Germany. In 1982, the aircraft was transferred back to the U.S., operating from Eglin AFB, Florida. In 1988, this *Eagle* was transferred to the National Guard service and was

based at Otis AFB, Massachusetts. It was transferred to storage in Arizona in April of 1994. The National Museum of the United States Air Force loaned it to Evergreen in May of 1996.

Today the aircraft wears the squadron insignia of the Oregon Air National Guard and stands as a memorial to two *Eagle* pilots, Captain Michael King Smith and Major Rhory Roger Draeger, who died of injuries sustained in an automobile accident in March of 1995.

McDonnell Douglas F-4C

Phantom II

MAXIMUM SPEED	1,400 mph (Mach 1.8)
CRUISING SPEED	590 mph
SERVICE CEILING	59,400 feet
ENGINES (2)	GE J79-GE-15 17,500 lbs. thrust each
COMBAT RADIUS	494 to 786 miles
ARMAMENT	Up to 16,000 lbs. of ordnance
NUMBER OF CREW	Two





Described by some pilots as “brutishly ugly,” the two-seat F-4 *Phantom II* formed the backbone of American tactical air power during the 1960s and 70s. The YFH-1, the F-4 prototype, first flew on May 27, 1958. The *Phantom II* won a US Navy contract for an all-weather naval interceptor and entered service in 1960. As the Navy felt the age of the close-range “dog fight” was over, the F-4 was initially armed only with air-to-air missiles.

Secretary of Defense Robert McNamara pressured the US Air Force to evaluate the F-4 against its best fighter aircraft. In flight tests, the F-4 out-performed all the Air Force fighters then in service. Swallowing its pride, the USAF ordered the F-4 in great numbers starting in 1962 and quickly became the world’s largest F-4 operator.

Shortly after its introduction, the *Phantom* set 16 world records, including an absolute speed record of 1,606.342 mph and an absolute altitude record of 98,557 feet. Although set between 1959-1962, five of the speed records were not broken until 1975.

By the time of the Gulf of Tonkin incident in August 1964, fully half of all deployed Navy fighter squadrons were equipped with the *Phantom.* The Navy, Air Force, and Marine Corps all operated the F-4 simultaneously during the Vietnam War.

Carrying up to 16,000 pounds of ordnance, a flight of F-4s could deliver a devastating amount of firepower to enemy positions. Additionally, while not as nimble as North Vietnamese MiG-17s or MiG-21s, the massive F-4 could perform well against them in air-to-air engagements.

The F-4 also held a record for the longest continuous production with a run of 24 years and when manufacturing ended in 1981, 5,195 *Phantoms* had been built, making it America’s most numerous supersonic military aircraft.

Thanks to its adaptability, the F-4 remained in service into the 1990s. The *Phantom* was also the only aircraft used by both U.S. military flight demonstration teams. The Air Force Thunderbirds and the Navy Blue Angels both switched to the F-4 for the 1969 season; the Thunderbirds flew it for five seasons, the Blue Angels for six.

HISTORY OF THE MUSEUM’S AIRCRAFT

The USAF accepted this F-4C, S/N 63-7647, from McDonnell Aircraft of St. Louis, Missouri on November 12, 1963. It spent much of the next ten years in Southeast Asia serving with several different fighter units, including the 8th Tactical Fighter Wing and the famed “Triple Nickels” – the 555th Tactical Fighter Squadron.

In March 1976, the Air Force assigned it to the 154th Tactical Fighter Group (Hawaiian Air National Guard) stationed at Hickam AFB, Hawaii. The aircraft was reassigned to the 142nd Fighter-Interceptor Group, Oregon Air National Guard, based at Portland International Airport in July 1987. The 142nd retired the aircraft in October 1989 and it was dropped from USAF inventory at that time. The aircraft carries the tactical gray paint scheme worn by Oregon Air National Guard F-4s in the late 1980s. This aircraft is on loan from the National Museum of the United States Air Force.

McDonnell Douglas VC-9C

Nightingale / VIP transport

CRUISE SPEED	504 mph
SERVICE CEILING	37,000 feet
RATE OF CLIMB	3,000 fpm
ENGINES (2)	Pratt & Whitney JT8D-9A
RANGE	2,000 miles
MAXIMUM WEIGHT	108,000 pounds



The VC-9C *Nightingale* is a military version of the McDonnell Douglas DC-9-32 civilian airliner.

The DC-9 first flew in February 1965 and was built in a number of -9 models, before the type was redesigned and re-designated as the MD-80 and MD-90.

The U.S. military purchased 41 aircraft under the C-9 designation; 21 C-9A *Nightingale* aerial ambulance and cargo versions for the Air Force; 24 C-9B *Skytrain II* cargo and passenger aircraft for the Navy and Marine Corps, and three VIP-configured VC-9Cs for the Air Force, which were delivered in 1976.

Special Air Mission (SAM) aircraft, such as the VC-9C, provide safe, comfortable, and reliable air transportation for the President, Vice President, the First Lady, and other high-ranking American and foreign dignitaries. Flying worldwide, SAM aircraft must meet stringent schedule and protocol requirements under intense media scrutiny.

The 89th Airlift Wing, at Joint Base Andrews, Maryland, provides this service with 17 aircraft dedicated to the SAM and 15 helicopters supporting federal emergency requirements. The SAM fleet is a diverse mix of long, medium, and short-range aircraft, suitable for both large and small passenger loads.

SAM 31683, as this VC-9C was designated, normally carried one principal VIP plus staff and is divided into three sections: forward (crew area), center (stateroom) and aft (staff and passenger area).

The forward section includes the cockpit, a 4-seat security police area, a secure communications center, a galley, and a lavatory. The stateroom is configured with a couch plus two first-class airline seats facing towards the rear and one forward-facing first-class airline swivel seat for the principal VIP. The aft section serves as a combination staff and passenger compartment and has an additional 39 first class airline seats and a lavatory.

During 1995/1996, the aircraft was upgraded to serve as an Air Force 2 platform.

The VC-9C was replaced by the Boeing C-32A, a version of the 757-200 airliner, in the Air Force Two role with the Boeing C-40C, a version of the 737-700 airliner, in the general VIP transport role.

HISTORY OF THE MUSEUM'S AIRCRAFT

No records are available as to who flew as passengers on 73-1863, however it was regularly used to carry both U.S. and foreign dignitaries. It served the Ford, Carter, Reagan, G.H.W. Bush, Clinton, and G.W. Bush administrations. It is known to have carried the 1980 US Olympic "Miracle on Ice" Hockey team to have lunch with President Carter at the White House in April 1980.

Sometimes the VC-9Cs were used to fly the President into smaller airports that could not accommodate the VC-25 (747) that was the normal transport for the President. At those times, the VC-9C would have carried the call sign, "Air Force One." It is not known if any of the Presidents flew on this aircraft.

Its first flight from the McDonnell Douglas factory was March 11, 1975, and it was accepted by the Air Force on May 2, 1975. It was assigned to the 89th Military Airlift Wing (MAW) at Andrews AFB, Maryland for use as a SAM transport. It operated on worldwide missions with the 89th MAW from 1975 to 2005. It was transferred to the 932nd Airlift Wing, Scott AFB, Illinois in 2005.

73-1683 performed the last USAF flight of a VC-9 on September 16, 2011, from Scott AFB, Illinois to Phoenix, Arizona for transfer to the State Department. The U.S. State Department registered the aircraft as N683AL in 2011 (the N-number transferred to Evergreen in September 2013.) It was released from the State Department to GSA control in March 2013 and was acquired by the Museum. It was flown from the Phoenix-Williams Gateway Airport to McMinnville on September 4, 2013.

LOCATION: HO

McDonnell F-101A

Voodoo

MAXIMUM SPEED	1,200 mph
CRUISING SPEED	550 mph
SERVICE CEILING	58,400 feet
ENGINES (2)	Pratt & Whitney J57-P-13 15,000 lbs. thrust
RANGE	690-mile radius
ARMAMENT	3 x M39 20-mm cannon, 1 x tactical nuclear weapon
CREW	One



The F-101 *Voodoo* is a twin-engine supersonic military fighter first flown in 1954 and introduced into US Air Force service in 1957 to replace the F-84F. The aircraft's appearance is characterized by thin, short, swept wings with triangular intake ducts in the wing roots, and swept back empennage.

Its original design was as a tactical fighter-bomber intended to carry a single nuclear weapon. It was armed with 20mm cannons and capable of carrying either conventional or nuclear weapons. The *Voodoo's* career as a fighter-bomber was relatively brief, but the reconnaissance versions served for some time.

On November 27, 1957, during "Operation Sun Run," an RF-101C set the Los Angeles-New York City-Los Angeles record in 6 hours 46 minutes, the New York to Los Angeles record in 3 hours, 36 minutes, and the Los Angeles to New York record in 3 hours 7 minutes. On December 12, 1957, a *Voodoo* set a world speed record of 1,207 mph.

The most produced versions were the RF-101C photo reconnaissance aircraft and the F-101B two-place interceptor armed with missiles and two nuclear air-to-air rockets.

The RF-101 reconnaissance variant was instrumental during the Cuban Missile Crisis and saw extensive service during the Vietnam War. Interceptor versions served with the Air National Guard until 1982.

While the *Voodoo* was a moderate success, it may have been more important as an evolutionary step towards its replacement in most roles—the McDonnell Douglas F-4 *Phantom II*. A total of 807 *Voodoos* were built, with 77 being F-101As.

HISTORY OF THE MUSEUM'S AIRCRAFT

F-101A, serial number 53-2418 is one of the few -A models remaining. It was the first production aircraft. Its maiden flight was on September 29, 1954 at Edwards AFB where it reached Mach 0.9 at 35,000 feet. Its service history is unknown. It is on loan from the Kelsay family of Cornnell, Washington.

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LOCATION: T

McDonnell KDD-1

Katydid — Unmanned Aerial Target Drone

SERVICE TIMEFRAME	1940s
WINGSPAN	12 ft
TOP SPEED	250 mph
SERVICE CEILING	15,000 ft
ENDURANCE	40 mins
ENGINE	McDonnell XPJ40-MD-2 pulsejet engine



THE MODEL

Prior to 1941, the battleship was considered master of the seas, and the only thing that it had to fear was other battleships. But as Pearl Harbor and the sinking of the HMS Prince of Wales and HMS Repulse showed, the battleship's principal enemy was now the airplane. Throughout the war, ships of all nations were upgraded with more anti-aircraft guns requiring more trained gunners.

To make gunnery training realistic, the U.S. Navy selected McDonnell Aircraft to design and build a high speed, unmanned target drone to simulate fast moving aircraft. The result was the Katydid. Powered by a pulse jet similar to the German V-1 Buzz Bomb, the KDD-1 could be launched from a ground based catapult or from the wing of a PB4Y Privateer bomber. It was steered by commands of a radio operator and at the end of its flight, would be brought back to Earth by parachute for re-use.

HISTORY OF THIS AIRCRAFT

This Katydid was a gift of the National Air & Space Museum and was restored by Evergreen volunteers in 2009.

Gift of the National Air and Space Museum. 2009.092.001

Messerschmitt Me 262 (composite)

Schwalbe (English: Swallow)

MAXIMUM SPEED	540 mph
CRUISING SPEED	460 mph
SERVICE CEILING	38,000 feet
ENGINES (2)	Junkers Jumo 004 B-1 turbojets 1,980 lbs. thrust ea.
RANGE	650 miles
ARMAMENT	4 x 30-mm MK-108 cannons + bombs, 52-mm rockets
CREW	One



The Me 262 was the first jet in mass production and the first to fight in the air. A radical design, it utilized two turbine engines and first flew on jet power in July 1942. Design work started before World War II in 1938, but problems with engines, metallurgy and top-level interference kept the aircraft from operational status with the Luftwaffe until mid-1944.

The Me 262 was faster and more heavily armed than any Allied fighter, including the British jet powered Gloster *Meteor*. One of the most advanced aviation designs in operational use during World War II, the Me 262's roles included light bomber, reconnaissance, and experimental night fighter versions. The fighter-bomber versions were nicknamed *Sturmvogel* (“Storm Bird”.)

Pilots were ecstatic with its performance and commanding general of fighters, Adolf Galland, said “it flew as if being pushed by angels.” Although Me 262 pilots claimed a total of 542 Allied kills, engine reliability problems and attacks by Allied forces on fuel supplies during the deteriorating late-war situation reduced the effectiveness of the aircraft. In the end, the Me 262 had a negligible impact on the course of the war because of its late introduction and the small numbers put in operational service.

The Allies countered its potential effectiveness in the air by attacking the aircraft on the ground and during takeoffs and landings.

Although 1,400 Me 262s were produced, less than 300 saw combat. Most Me 262s did not make it to operational units because of the destruction of Germany's surface transportation system. Many of those that did were unable to fly because of lack of fuel, spare parts or trained pilots.

Captured Me 262s were studied and flight tested by the major powers, and ultimately influenced the designs of several post-war aircraft such as the North American F-86 *Sabre* and Boeing B-47 *Stratojet*.

HISTORY OF THE MUSEUM’S AIRCRAFT

This non-flying reproduction built by Legend Flyers of Everett, Washington, uses the same materials and construction techniques as the original Me 262. It’s marked as an aircraft flown by Lieutenant Alfred Ambs who shot down seven B-17s and one P-51. Ambs was shot down on March 24, 1945, by Earl Lane, one of the Tuskegee Airmen. This composite aircraft is on loan from the Collings Foundation.

Mikoyan Gurevich MiG-15 UTI

NATO designation: Fagot

MAXIMUM SPEED	665 mph
CRUISING SPEED	300 mph
SERVICE CEILING	51,000 feet
ENGINE	Klimov VK-1 5,952 lbs. thrust
RANGE	880 miles with external tanks
ARMAMENT	1 x 23-mm canon
CREW	Two



The design of the aircraft that would make MiG a household name throughout the world began in March 1946, at a meeting of all the major fighter constructors in the USSR.

The Kremlin wanted a new jet-powered interceptor with swept wings, able to operate from rough airfields, reach Mach 0.9, have good maneuverability and have at least one hour's flight endurance. It was conceived by the team of **Mi**koyan and **G**urevich (Mi & G) as the MiG I-310 and was the world's first swept wing fighter.

The MiG-15*,* as it was later designated, was a remarkable combination of German wartime aerodynamic research, British jet-engine technology and Soviet design ingenuity.

The airframe, initially designed in 1946, could not fly until Soviet jet-engine technology developed further. This problem was solved in 1947 when the British naively agreed to supply the Soviet Union with examples of the Rolls-Royce *Derwent* 5 engine. This power plant was immediately copied and installed into the prototype MiG-15 airframe. The aircraft entered service in 1949.

At the outset of the Korean War, the MiG-15, armed with 23-mm and 37-mm cannons, shot down a number of US Air Force B-29s and forced a halt to daylight bombing raids. It was clearly superior to the American F-80 and P-51 fighters then in Korea.

Faced with the fact that the Soviets had indeed developed an advanced jet fighter, the United States rushed the North American F-86 *Sabre* into the Korean air war. Although the MiG could outclimb the *Sabre* at altitude, it couldn't match its roll rate, turn radius or visibility.

Despite its higher speed, excellent maneuverability, and high service ceiling, the MiG-15 was not very stable as a gun platform. Because of wing flexing and poor aileron effectiveness it tended to Dutch roll at high speeds. Its cockpit instrumentation was primitive and stick forces were heavy.

Better-trained American pilots racked up a claimed kill ratio of 14:1 against the MiGs. The epic MiG/*Sabre* dogfights in "MiG Alley" along the Yalu River are among the most storied in air combat history.

The MiG-15 was flown by every Soviet-bloc country and by virtually every country supplied by Russian military aid up to and including the mid- 1960's.

HISTORY OF THE MUSEUM'S AIRCRAFT

The MiG-15 in Evergreen's collection is Chinese-built and was used extensively as a jet-trainer. The "UTI" designation denotes that it is an armed trainer and/or transition fighter.

LOCATION: H

Mikoyan Gurevich MiG-17A

NATO designation: Fresco

MAXIMUM SPEED	665 mph
CRUISING SPEED	535 mph
SERVICE CEILING	54,500 feet
ENGINE	Klimov VK-1A 6,040 lbs. thrust
RANGE	1,335 miles
ARMAMENT	2 x 23-mm cannon, 1 x 37-mm cannon, + 1,100 lbs of ordnance
CREW	One



An outgrowth of the innovative MiG-15, the MiG-17 had a lengthy and successful career as a fighter and light attack aircraft.

When Western observers first caught a glimpse of the MiG-17, they assumed that the new fighter was simply a lengthened MiG-15; however, the MiG-17 was in fact a quite different airplane. Because of many aerodynamic improvements, the MiG-17 flew higher, farther, faster and was much more stable at high attitudes than the MiG-15.

The major novelty was its introduction of a swept wing with a "compound sweep" configuration: a 45° angle near the fuselage, and a 42° angle for the outboard part of the wings. Other easily visible differences to its predecessor were the three wing-fences on each wing, instead of the MiG-15's two, and the addition of a ventral fin.

When flown by a skilled pilot, the nimble and lightweight MiG-17 was a worthy adversary to heavier American aircraft such as the Chance Vought F8U *Crusader,* the Republic F-105 *Thunderchief* and the McDonnell Douglas F-4 *Phantom II,* which it fought in the Vietnam War.

Armed with two NR-23 23-mm cannons and a single N-37 37-mm cannon, the basic MiG-17 was a superb air defense fighter. From 1952 to 1958, the Soviet Union produced more than 6,000 of them. Additional MiG-17 production occurred in many Iron Curtin nations. In fact, more than 30 different countries utilized the MiG-17 and the type has seen combat in Asia, Africa and the Middle East.

HISTORY OF THE MUSEUM'S AIRCRAFT

Unlike many of the MiG-17s currently on display or operated in the United States, this MiG, factory number 115, (S/N 541393), was built in the Soviet Union. It was first flown and delivered to the Soviet Air Forces on July 28, 1953. Not long after entering service, the aircraft received the more dependable VK-1A turbojet engine.

It served in the USSR until 1961, at which time it was transferred to Bulgaria as part of an extensive military arms assistance package. This aircraft may have flown in support of Soviet troops during the 1968 Czech Uprising. Bulgarian maintenance records show that the aircraft remained in active service until 1991.

In late 1999, Mr. George Gould of Galveston, Texas purchased this MiG from the Bulgarian Air Force. The aircraft entered the United States in a shipping container and Gould and a partner spent nearly three years reassembling and painting it. Mr. Gould donated the aircraft to the Museum in 2003. It retains its original VK-1A engine and cockpit instrumentation. It wears the colors of a Bulgarian Air Force MiG-17A from the late 1960s.

LOCATION: NL

Mikoyan Gurevich MiG-29

NATO designation: Fulcrum

MAXIMUM SPEED	1,518 mph (Mach 2.3)
CRUISING SPEED	640 mph
SERVICE CEILING	59,060 feet
ENGINES (2)	Klimov RD-33K afterburning turbofans 22,200 lbf. each
RANGE	430 mi. combat / 1,800 mi. ferry
ARMAMENT	1 x 30-mm GSh-30-1 cannon + 7,720 lbs. of weapons including six missiles
CREW	One





The history of the MiG-29, like that of the larger Sukhoi Su-27 *Flanker,* started in 1969 when the Soviet Union learned of the US Air Force's 'FX' program, which resulted in the F-15 *Eagle*. Soviet leadership soon realized that the new American plane would represent a serious technological advantage over their existing fighters.

The MiG-29 is a single-seat supersonic, all-weather, air superiority fighter representing, with the MiG-31 *Foxhound*, perhaps the last fighter production items from the Mikoyan Design Bureau. Its primary role is to destroy targets at distances of up to 125 miles. In addition, the basic MiG-29 is capable of limited air-to-ground operations and in advanced versions, has been optimized to attack both stationary and moving targets with precision guided munitions.

In 1984, the MiG-29 replaced the MiG-23 in the frontal aviation role and was positioned relatively close to the front lines, tasked with providing local air superiority to advancing Soviet motorized army units. Rugged landing gear and protective intake grates meant the MiG-29 could operate from the damaged or under-prepared airstrips Soviet war planners expected to encounter during a rapid armored advance. It was also tasked with protecting ground attack aircraft from NATO fighters.

The MiG-29 looks much like the Sukhoi Su-27. It is built largely out of aluminum with some composite materials. It has a mid-mounted swept wing with blended leading-edge root extensions (LERXs) swept at around 40°. There are swept tailplanes and two vertical fins, mounted on booms outboard of the engines. Automatic slats are mounted on the leading edges of the wings; on the trailing edge, there are maneuvering flaps and wingtip ailerons.

The MiG-29 has two widely spaced turbofan engines. The space between the engines generates lift, thereby reducing effective wing loading, to improve maneuverability. The engines are fed through wedge-type intakes fitted under the LERXs, which have variable ramps to allow high-Mach speeds. As an adaptation to rough-field operations, they can be closed completely for takeoff, landing and low-speed flying, thereby preventing ingestion of ground debris.

In total, over 800 were delivered to the Soviet / Russian Tactical Air Forces and around 500 airframes prepared for initial export customers. By 1989, it was serving in 12 different air forces around the world. It is the only Russian aircraft on operational duty in NATO. This aircraft is on loan from the National Museum of the United States Air Force.

Mikoyan-Gurevich MiG-21MF-75

NATO designation: Fishbed

MAXIMUM SPEED	1,468 mph
CRUISING SPEED	580 mph
SERVICE CEILING	58,400 ft.
ENGINE	Tumanskiy R25-300 15,650 lbs. thrust
RANGE	751 miles
ARMAMENT	1 x GSh-23 23-mm cannon, 2 x K-13A missiles, 2 x 500 lb. bombs
CREW	One



The MiG-21 was designed in 1954 as a Mach 2 interceptor. Its first flight was in 1955 and it became operational with the Russian Air Force in 1959. Over 13,000 of these aircraft were built and they served with over 50 countries.

Soviet fighters like the MiG-21 are designed and built differently from their Western counterparts. Soviet aircraft can be manufactured with traditional materials and simple techniques being built fast, cheap, and in large numbers. MiGs are tough, simple, rugged planes that can operate from unprepared airfields with minimum logistical support and be maintained by simple, basically unskilled labor.

Its Russian nickname is "Balalaika", from the aircraft's planform-view resemblance to the Russian stringed musical instrument. It was retired from the Russian Air Force in 1990 but is still flown by some countries. The Chinese version has the NATO designation, J-7. Its main armament was a GSh-23 twin barreled 23-mm cannon. Later, two missiles were added under the wings.

The aircraft was light and maneuverable but suffered from short range. Although the MiG-21 lacked the long-range radar, missiles, and heavy bombing payload of its contemporary multi-mission U.S. fighters, it proved a challenging adversary in the hands of a skilled pilot, especially when used in high-speed hit and run attacks under ground radar control. Using this tactic, the North Vietnamese Air Force shot down over 120 U.S. aircraft during the Vietnam War.

For combat survivability the MiG-21 had an advantage over the F-105 and, to a lesser degree, the F-4. A simple and unsophisticated hydraulic system design insured minimum damage to the MiG control system. In addition to this, a bladder type fuel tank, vented to the atmosphere, decreased effectiveness of an incendiary round or other hit.

HISTORY OF THE MUSEUM'S AIRCRAFT

Our aircraft was built in 1975 and was last flown by the Polish Air Force before being sold to Mr. George Gould of Galveston, Texas. He donated it to the museum in 2009.

Mikoyan-Gurevich MiG-23

NATO designation: Flogger

MAXIMUM SPEED	1,553 mph (Mach 2.2)
CRUISING SPEED	600 mph
SERVICE CEILING	60,695 feet
RANGE	570 miles combat, 1,750 miles ferry
ENGINE	Khatchaturoy R-35-300 28,700 lbs. thrust
ARMAMENT	1 x Gryazev-Shipunov GSh-23L 23-mm cannon, + 6,000 lbs. of ordnance
CREW	One



The MiG-23 is a swing-wing, single engine fighter aircraft introduced into service in 1970. It was designed to remedy the deficiencies of the short range and limited armament of the MiG-21.

It could be used for either air-to-air or air-to-ground attack missions. Meant as a point defense fighter, the *Flogger* offered a powerful radar, an infrared search and track system, a selection of radar and infrared guided weapons and tremendous speed (Mach 2.35) to counter its adversaries. It was the first attempt by the Soviet Union to design look-down/shoot-down radar and one of the first to be armed with beyond-visual-range missiles.

In addition to a much more powerful engine, the MiG-23's most significant new feature was its variable sweep wing.

Like the US Air Force's swing-wing F-111, the sweep of the MiG-23's wings could be changed in flight. Fully spread, this gives a shorter takeoff and landing roll while carrying a heavier weapons load. With the wings fully swept back, the MiG-23 has greater speed. The wing has three sweep settings: 16, 45, and 72 degrees.

Six short-range missiles, a built-in high-speed 23-mm cannon and the onboard radar's rapid automatic target lock-on, and the capability for the pilot to select the optimal sweep wing angle makes the MiG-23 highly effective in dog fights.

Over 5,000 were built and flown by the Russian Air Force and other countries aligned with the USSR.

HISTORY OF THE MUSEUM'S AIRCRAFT

This MiG-23 was obtained from Egypt and used by the US Air Force to evaluate its performance against U.S. fighters (code named, Constant Peg) and was probably flown as an aggressor aircraft by the 4477th Test and Evaluation Squadron at Tonopah Test Range, Nevada. It is on loan from the National Museum of the US Air Force.

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LOCATION: H

Naval Aircraft Factory N3N-3

Canary

MAXIMUM SPEED	126 mph
CRUISING SPEED	98 mph
SERVICE CEILING	15,200 feet
ENGINE	Wright R-760-2 285 hp.
RANGE	470 miles
CAPACITY	Two



Produced between 1935 and 1942, the N3N was the only aircraft entirely designed and manufactured by the Naval Air Factory (NAF)—a US Navy-run manufacturing complex in the Philadelphia Navy Yard.

The NAF was established in 1918 to assist in solving the problem of aircraft supply which the Navy Department faced upon the entry of the U.S. into World War I. The Army's requirements for an enormous quantity of planes created a decided lack of interest among aircraft manufacturers in the Navy's requirements for a comparatively small quantity of aircraft.

So the Navy Department built a Navy-owned aircraft factory in order to assure a part of its aircraft supply, to obtain cost data for the Department's guidance in its dealings with private manufacturers, and to have under its own control a factory capable of producing experimental designs. The NAF ended aircraft production in early 1945.

The N3N would be the last mass-produced aircraft built by the NAF and the last biplane to see service with the United States. The Navy bought the rights and the tooling for the Wright R-760 series engine and produced their own.

It would be on the ground that the N3N proved at its most dangerous, the long nose of the airplane making visibility difficult during taxiing. Nicknamed "The Yellow Peril," the *Canary* was a two seat bi-wing primary trainer. Navy primary flight training schools used N3Ns extensively throughout World War II. In addition to the standard wheeled version, for use on water it could be equipped with a single float under the fuselage and floats under the outer tips of the lower wing.

The N3N had a fabric covered, bolted steel-tube fuselage. The wings were all-metal with a fabric covering as well. The tail section, with a large rounded vertical stabilizer that was the trainer's most prominent physical feature, was connected to the fuselage by just four bolts.

Nearly 1,000 *Canaries* were built. It was flown at the US Naval Academy until 1961. They were the last biplanes retired from U.S. military service.

HISTORY OF THE MUSEUM'S AIRCRAFT

THE MUSEUM'S N3N-3 WAS DONATED BY ERNEST MCCALL IN 2008.

LOCATION: HO

North American F-100F

Super Sabre

MAXIMUM SPEED	864 mph
CRUISING SPEED	586 mph
SERVICE CEILING	50,000 feet
ENGINE	Pratt & Whitney J57-P-21-A 17,000 lbs. thrust
RANGE	1,500 miles w/drop tanks
ARMAMENT	2 x 20-mm M39 cannons + 6,000 lbs. of ordnance
CREW	Two



Nicknamed “The Hun” after its model number—one **hun**dred—when it entered service on September 27, 1954, the F-100A *Super Sabre* was the first production jet fighter to maintain level supersonic flight. It was an improvement over North American’s successful F-86 *Sabre*. Continued modifications resulted in the F-100C, which had refueling capabilities.

Advanced avionics, a larger wing, tail fin, and landing flap modifications resulted in the F-100D fighter-bomber. First flown on January 24, 1956, North American built 1,274 -D models. On December 26, 1956, two F-100Ds became the first-ever aircraft to successfully perform buddy refueling. Nuclear weapons could be carried on the left wing or on the fuselage centerline. Depending on the weapon, explosive yields ranged from one kiloton to nearly ten megatons.

For delivery of these nuclear weapons, the F-100D carried the AN/AJB-1B low-altitude bombing system (LABS). In a typical mission, the F-100D would approach the target at extremely low altitude at approximately 500 mph. Then the pilot would use a 4G pull up and, partway into the maneuver, the computer would automatically release the bomb. The pilot completed his attack maneuver (which was like an Immelmann) and egressed the target area at low altitude and, needless to say, extremely high speed.

Modification of the single-seat -D model resulted in the F-100F — a two-seat trainer. First flown on March 7, 1957, it featured six wing hard points designed to carry external stores, and two 20-mm cannons instead of the four featured on the F-100D. The -F model also saw service as a Forward Air Controller (FAC), known as “Misty FAC” during the Vietnam War. The lengthy operations at low altitude and over heavily defended territory made the Misty FAC mission extremely dangerous. Pilots were volunteers flying for 120 days or 60 missions, whichever came first.

Some F-100Fs featured the ability to attack surface-to-air missile (SAM) radar-guided sites, earning them a “Wild Weasel” designation.

Between 1957 and 1959, North American built 340 F-100F *Super Sabres*. After they were withdrawn from service, a large number saw duty as remote-controlled target drones.

HISTORY OF THE MUSEUM’S AIRCRAFT

Acquired through the Government Surplus Program, this F-100F, S/N 56-3832, features parts from F-100F S/N 56-3861. North American manufactured both aircraft at its Inglewood, California plant during late 1957 and both began service with the Air Force at Robins Air Force Base in Georgia as well as with the National Guard in Arizona.

This aircraft was acquired by the Museum and restored at the Evergreen Air Center in Marana, Arizona. It honors General Merrill A. McPeak, an Oregon Aviation Hall of Honor inductee.

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LOCATION: H

North American F-86H

Sabre

MAXIMUM SPEED	691 mph (1,112 kph)
CRUISING SPEED	616 mph (991 kph)
SERVICE CEILING	50,100 feet (15,270 m)
ENGINE	General Electric J73-GE-3E w/9,070 lbs. thrust (40.3 kN)
ARMAMENT	4 x 20-mm M39 cannon + 16 rockets or a 2,000 lb. bomb or nuclear device
RANGE	1,050 miles
CREW	One



Forerunner of the operational *Sabre* was the XF-86, which first flew Oct. 1, 1947. The first swept-wing airplane in the U.S. fighter inventory, the F-86 scored consistent victories over Russian-built MiG fighters during the Korean War accounting for a final kill ratio of 10-to-1.

North American test pilot George Welch became the first to fly a production airplane at Mach 1 in routine flight. The F-86 was technically rated as subsonic, but in 1953, an F-86D set a speed record, flying at 715 mph.

The F-86A contained a booster control system which added full power-operated control for better maneuverability at high speed. The F-86E and subsequent models incorporated a unique control system, developed by North American, called the “all-flying tail.”

The F-86H, perfected after the signing of the Korean Armistice, represented the practical application of knowledge gained from the thousands of combat missions flown by the earlier F-86A, -E and -F variants. Primarily a fighter-bomber, the F-86H was larger and heavier than its predecessors, but it had better all-around performance. The “H” production models were equipped with the Low Altitude Bombing System (LABS) and provision for delivering a nuclear weapon.

More than 450 “H” models were produced. Although never used in combat, they provided the US Air Force with a formidable fighter-bomber aircraft until the advent of the supersonic F-100 *Super Sabre*. Total, more than 6,000 F-86s were manufactured by North American Aviation.

The -H model’s special features included:

Swept-back wing and tail.

Electrically operated flaps.

Hydraulically operated speed brakes.

Automatic wing leading-edge slats.

Hydraulic-powered-operated irreversible controls with artificial feel for the all-movable horizontal tail and ailerons

HISTORY OF THIS AIRCRAFT

Cannon AFB in New Mexico hosted the 388th Fighter-Bomber Wing, activated in November 1953. The 388th was sent overseas in October 1954 and when they moved out, the Museum’s F-86H was donated for a base front gate guard display. After many years the base chose to dispose of the aircraft, and the aircraft later came to the Museum. It was covered in a thick layer of bird deposits, and all the surfaces were frozen solid. Many of the panels on the aircraft were corroded and needed

to be changed. Evergreen's restoration section worked for several years replacing the sheet metal and bringing the *Sabre* up to display standards. This aircraft is on loan from the National Museum of the United States Air Force.

North American FJ-3

Fury

MAXIMUM SPEED	681 mph
CRUISING SPEED	518 mph
SERVICE CEILING	49,000 feet
ENGINE	Wright J65-W-4B turbojet 7,800 lbs. of thrust
RANGE	ferry 1784 mi., combat 990 mi.
ARMAMENT	4 x 20-mm cannon, 4 x AIM-9 Sidewinder missiles + 500 or 1,000 lbs. bombs
CREW	One



The North American FJ *Fury* was the first operational jet aircraft in US Navy service. Ordered in late 1944 as the XFJ-1 in competition with proposals from Douglas and Vought, the *Fury* began as a straight-wing, tricycle gear fighter with a single turbojet passing through the fuselage. The first production FJ-3 flew on December 11, 1953.

The wing, empennage and canopy strongly resembled that of the piston-engine P-51 *Mustang*, North American's successful World War II fighter. The design was also the basis for the XP-86 prototype of the US Air Force's F-86 *Sabre*.

By July of 1954, twenty-four FJ-3s had been delivered, and the aircraft began its Fleet Introduction Program at the Naval Air Testing Center (NATC) at Patuxent, Maryland. The flavor of the test flying environment at Patuxent during the mid-1950s was described very well by Tom Wolfe in his book, “The Right Stuff.”

Navy Squadron VF-173 based at Jacksonville, Florida was first to receive the FJ-3, becoming active with the fighter in September of 1954. It made its first carrier landings aboard the *USS Bennington* on May 8, 1955.

The last aircraft on the original FJ-3 contract was finished in February 1956 after a total of 389 were built. A second order for FJ-3s had been given to North American on March 15, 1954. This called for 214 aircraft but was later cut back to 69, however, more were added on November 2, bringing the final total to 149.

The Wright J65 engine used in the *Fury* had some severe lubrication problems that could cause it to seize up and lose all power during a catapult launch, dropping the aircraft into the ocean. The FJ-3 was also prone to engine flameouts, but probably not much more so than many other jet fighters of its day.

On October 1, 1962, the FJ-3 was re-designated F-1C. It is believed that the FJ-3 never fired its weapons in anger, although it did fly support during the American intervention in Lebanon in 1958. This aircraft is on loan from the National Museum of the Marine Corps.

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LOCATION: H

North American SNJ-4 / AT-6

Texan (U.K.: Harvard)

MAXIMUM SPEED	205 mph
CRUISING SPEED	150 mph
SERVICE CEILING	21,000 feet
ENGINE	Pratt & Whitney R-1340-AN1 600 hp.
RANGE	750 miles
CAPACITY	Two



Called “the most universally used airplane in history,” the *Texan* trainer rivals the famed DC-3 in longevity and variety of uses. It originated from the North American Aviation NA-16 prototype first flown on April 1, 1935. During its career, the SNJ (US Navy), AT-6 (US Army), *Harvard* (British Commonwealth) or *J-Bird* as it was variously called, served as a trainer for instrument flight, aerobatics, bombing and gunnery. It was also equipped with a tail hook for carrier qualification.

Aviation cadets honed many of the skills required for combat in the *Texan*, including instrument flying, formation flying, navigation, radio communication, gunnery, and operation of an aircraft with complex features such as variable pitch propellers, retractable landing gear, and flaps. By the time most students began training on the *Texan*, they had already passed the weed-out stage of primary flight training. They would usually have already acquired 80-100 hours of flight time on primary trainers.

In service for the United States for more than 20 years, the *Texan* was also used in combat zones, primarily in photography, scouting, and utility roles. It saw extensive use in Korea as a spotter aircraft which contributed to the evolution of the Forward Air Controller concept.

Several nations have employed the *Texan* as a fighter and bomber. In fact, a Mexican AT- is credited with sinking a submarine during World War II. By the end of the war in 1945 a total of over 17,000 SNJ / AT-6 models and variants had been built. Israel, France, Cambodia, and South Africa continued using the *Texan* as a combat aircraft into the 1960's. Fourteen countries still employed the *Texan* in some capacity with its use in combat documented as recently as 1980. Today, T-6s are by far the most common warbird type seen at air shows.

HISTORY OF THE MUSEUM’S AIRCRAFT

This SNJ-4 was one of 2,401 built by North American in Dallas, Texas. Assigned S/N 88-13466 and Navy B/N 27780, it made a wartime career of training Navy pilots. Accepted into the Navy on May 11, 1943, the trainer served until it was stricken from the inventory in 1956 after completing 5,182.3 hours of flight time.

Upon its retirement, this airplane was sold to Ace Smelting Company on December 27, 1956, and it appeared its days were numbered. Five months later though, the plane was saved when it was sold to a private individual. Throughout the 1960s and early 1970s, the plane operated on the East Coast, mostly near New York.

During the mid-1960s, the airframe was reportedly altered for “weather modification” flights. These were performed to clear foggy runways at airports and were achieved by dropping dry ice pellets that froze the water droplets that formed the fog, making them heavy enough to fall to the ground. Sold again and restored to its original configuration, the SNJ-4 passed through numerous owners before coming to Evergreen in March 1986.

LOCATION: NL

North American T-28B Trojan

MAXIMUM SPEED	343 mph
CRUISING SPEED	247 mph
SERVICE CEILING	24,000 feet
ENGINE	Wright R-1820 1,425 hp.
RANGE	1,000 miles
CREW	Two



The North American Aviation T-28 *Trojan* is a piston-engine two-seat military trainer aircraft used by all the United States military services. Beginning in the 1950s, it replaced the T-6 trainer. It possessed higher performance than its forerunner and was easier to maintain. The tricycle landing gear and tailhook (on the –C models) taught US Navy aviators to take off and land on aircraft carriers in the same way as the high-performance aircraft they were going to fly.

The *Trojan* entered production in 1950. A Wright R-1300 800-hp engine powered the US Air Force version (T-28A). There were two naval variants, the T-28B (489 built) and the T-28C, equipped with a tailhook for carrier training (299 made.) They both used a 1,425-hp Wright R-1820 engine. When production ended in 1957, a total of 1,948 of the three versions had been built.

The powerful aircraft was an ideal intermediate trainer and in flight it was both responsive and docile and fully aerobatic. Cockpit instrumentation, although adequate for instrument flight, would be considered primitive by today's standards. It could be safely spun from relatively low altitudes and counted upon for a nearly instantaneous recovery. Control response was quick, despite the T-28's lack of hydraulically boosted controls. Slow fight, as necessitated for carrier operations, was particularly impressive, as was the power response of the large engine.

In 1962 the Air Force began a program to modify more than 200 -A models as T-28D *Nomad* tactical fighter-bombers for counterinsurgency use in Southeast Asia. Equipped with 1,425-hp engines and many other changes, the T-28Ds proved to be an effective close air support weapon. It was especially effective in night operations against targets not protected by radar-controlled anti-aircraft guns. The South Vietnamese, Royal Laotian and Royal Thai air forces flew American-supplied T-28s.

In the mid-1950s, the USAF replaced the T-28 with the Beech T-34 and the jet-powered Cessna T-37. *Trojans*, however, continued to be flown by the Air National Guard until the late 1950s, and by the Navy into the 1980s.

Trojans have served with nearly 30 nations around the world. France's Sud-Aviation converted over 240 T-28Ds into *Fennecs* and used them in North Africa. Many retired T-28s were sold to private operators, and due to their reasonable operating costs are often found flying today.

HISTORY OF THE MUSEUM'S AIRCRAFT

Evergreen's T-28 started its service life at Marine Corps Air Station Kaneohe Bay, Hawaii in the mid-1950s.It was transferred to the US Air Force late in 1969 and flew from Keesler Air Force Base, Biloxi, Mississippi. In 1977 it was sent to the Military Aircraft Storage and Disposal Center at Davis-Monthan AFB, Tucson, Arizona. It was purchased by Evergreen in 1989.

↑ Index

LOCATION: NL

North American T-2C

Buckeye

MAXIMUM SPEED	465 mph (sea level)
CRUISING SPEED	400 mph
SERVICE CEILING	45,200 feet
ENGINES (2)	GE J85-GE-4 turbojets 2,950 lbs. thrust each
RANGE	1,070 miles
CAPACITY	Two



In 1956 the US Navy issued a requirement for an all-purpose jet trainer that could be used to instruct student pilots from basic training through their carrier qualifications. North American Aviation won the contract based on a simple single engine design that utilized elements of their FJ1 *Fury* fighter and T-28C *Trojan* trainer.

Deliveries of the T-2B began in 1965. The name *Buckeye* refers to the state tree of Ohio where all T-2s were made. The two-place, high-performance *Buckeye* was used for a variety of pilot training, from the student's first experience in a jet fighter to full pilot qualification. The aircraft was used for teaching a wide range of skills including high-altitude, high-speed formation and aerobatic flights; basic and radio instruments; night and day navigation; and gunnery, bombing and carrier operations.

The T-2C, powered by a pair of GE J85 engines, possessed even better flight performance than -B model. The Navy purchased 231 T-2Cs starting in 1968; 273 aircraft were built during its production run.

Nicknamed the “Attack Guppy” and the “Trusty Tubbyjet”, the Buckeye never got much love for its looks, but entire generations of Naval and Marine Corps Aviators and Flight Officers—more than 11,000 of them with over 3.4 million fight hours—flew them before they were trusted with more advanced jet aircraft in the fleet.

The -C version has a tandem seating arrangement with the rear seat elevated to provide the student and the instructor pilot with excellent visibility. The front and rear cockpits had duplicate controls. It was equipped with underwing strong points to carry bombs, rockets or gun pods for armament training. It had a strong, wide-based tricycle landing gear, powered controls, large trailing-edge flaps, air brakes on both sides of the fuselage, and a retractable arrester hook, all of which were hydraulically actuated.

Thousands of American Navy and Marine Corps aviators received their basic jet training in the T-2. The *Buckeye* has been replaced in service by the T-45 *Goshawk.*

The Museum’s *Buckeye* is on loan from the National Museum of Naval Aviation, Pensacola, Florida.

LOCATION: NL

Northrop F-5E

Tiger II

MAXIMUM SPEED	1,200 mph (Mach 1.63)
CRUISING SPEED	640 mph
SERVICE CEILING	51,800 feet
ENGINES (2)	General Electric J85-GE-21B 3,500 lbs. thrust ea.
RANGE	1,543 miles
ARMAMENT	2 x 20-mm cannon, 2 x AIM-9 Sidewinders, + 7,000 lbs. ordnance
CREW	One



In 1962, the US Army expressed an interest in Northrop's prototype fighter aircraft, the N-156, for use in ground combat support. However, the US Air Force would neither relinquish its responsibility in operating fixed-wing aircraft, nor agree to operate the N-156.

With no market for its new fighter with the U.S. military, the Northrop Corporation found a niche for the aircraft through the Military Assistance Program. Through this avenue, the Kennedy Administration sought to distribute low-cost fighter aircraft to less-developed nations.

Northrop improved the N-156 and it subsequently became the F-5A. Receiving its first overseas order from the Royal Norwegian Air Force in February 1964, Northrop built 636 F-5A fighters before production for the –A models ceased in 1972. Additionally, Northrop produced 200 two-seat F-5B aircraft as trainers. Production ended in 1987 with the –E models.

In 1965, wishing to evaluate the F-5A's combat capability, the USAF began the *Skoshi Tiger* (little tiger) program during the Vietnam War. Northrop delivered 12 aircraft to the Air Force, redesignated as the F-5C. During the short-lived program, the 3rd Tactical Fighter Wing lost only two aircraft after flying more than 3,500 sorties from Bien Hoa airbase in South Vietnam. The Air Force of South Vietnam received the ten surviving aircraft, flying them for ground support.

In 1970 Northrop won a competition for an improved International Fighter Aircraft (IFA) to replace the F-5A. The resultant aircraft, initially known as F-5A-21, subsequently became the F-5E. It was lengthened and enlarged, with increased wing area with and more sophisticated avionics (the F-5A and -B had no radar).

The F-5E eventually received the official popular name *Tiger II*. First flown August 11, 1972, the *Tiger II* quickly became used as the aggressor aircraft at the USAF Fighter Weapons School, Nellis AFB in Nevada. Flying against the McDonnell Douglas F-4 *Phantom*, the aggressor pilots received training in Soviet tactics and used the *Tiger II* to simulate nimble Soviet fighters.

HISTORY OF THE MUSEUM'S AIRCRAFT

One of 792 F5-Es manufactured by Northrop Aviation in Hawthorne, California, the Museum's F5-E *Tiger II* (S/N 74-1566) was accepted by the USAF on March 19, 1976.

It then traveled around to several bases including McClellan AFB and the Sacramento Air Logistics Area. In 1976, the aircraft joined the 10th Tactical Reconnaissance Wing, United States Air Forces Europe and operated at RAF Alconbury in the United Kingdom. It was later deployed to Torrejon Air Base in Spain and returned to the UK, rejoining the 10th Tactical Fighter Wing.

In June of 1988, the USAF dropped the aircraft from its inventory and transferred it to the US Navy where it served as an adversarial trainer for Navy, Air Force, Marine Corps and Canadian forces. This aircraft is on loan from the National Museum of Naval Aviation.

LOCATION: NL

Northrop F-89

Scorpion

MAXIMUM SPEED	635 mph
SERVICE CEILING	49,200 feet
ENGINES (2)	Allison J35-A-35 afterburning turbojets 7,200 lbs. thrust each
RANGE	1,366 miles
ARMAMENT	Aerial rockets or 3,200 lbs. of bombs or a single MB-1 Genie nuclear rocket + up to four conventional Falcon air-to-air missiles
CREW	Two



The Northrop F-89 *Scorpion* was an American two-seat interceptor built during the 1950s and was the first jet-powered aircraft designed as such. With the radar operator guiding the pilot, the F-89 could locate, intercept, and destroy enemy aircraft by day or night under all types of weather conditions.

Though it had limited performance, it was among the first US Air Force jet fighters equipped with guided missiles and notably the first combat aircraft armed with an air-to-air nuclear weapon — the unguided *Genie* rocket.

Designed by Jack Northrop, it had a thin, straight, mid-mounted wing and a crew seated in tandem. An advantage of the straight wing was that it could accommodate heavy weights at the wingtips. The slim rear fuselage and the high-mounted horizontal stabilizer led Northrop employees to call it the *Scorpion* — a name later formally adopted by the Air Force.

The thin wing dictated tall, thin, high-pressure (200 psi) mainwheel tires, while the low height of the fuselage required the use of dual wheels for the nose gear. The elongated nose cone assembly housed a powerful radar system that would be utilized for the required interception sorties.

Production was authorized in January 1949, but only 18 F-89As were completed, which were mainly used for tests and trials. The –B type entered service with the 84th Fighter-Interceptor Squadron in June 1951. These had considerable problems with engines and other systems, and soon gave way to the F-89C.

The major production model was the F-89D, which first flew on October 23, 1951 and entered service in 1954. Armament was two pods of 52 2.75-inch *Mighty Mouse* rockets, for a total of 104. A total of 682 –Ds were built.

The subsequent F-89H, which entered service in 1956, had massive new wingtip pods each holding three *Falcon* air-to-air missiles and 21 FFARs, for a total of six missiles and 42 rockets.

The final variant was the F-89J. This was based on the F-89D but replaced the standard wingtip missile pod/tanks with 600-gallon fuel tanks and fitted a pylon under each wing for a single MB-1 *Genie* nuclear rocket (sometimes supplemented by up to four conventional Falcon air-to-air missiles). On July 19, 1957, in a test explosion, an F-89J became the only aircraft to fire a live nuclear warhead-equipped *Genie* missile.

There were no new build F-89Js, but 350 -Ds were modified to this standard. They served with the Air Defense Command through 1959 and with ADC units of the Air National Guard through 1969.

This version of the aircraft was extensively used within the Semi-Automatic Ground Environment (SAGE) air defense system.

A total of 1,050 *Scorpion*s of all variants were produced.

The Battle of Palmdale involved F-89s: In August of 1956, a remote-controlled World War II-era F6F Hellcat that was meant to be used for missile target practice was flying out of control over Los Angeles. The Hellcat had climbed to 30,000 feet and circled over Ventura and Los Angeles counties.

Two F-89 Scorpion interceptors were scrambled from Oxnard AFB. For the next two hours, the planes showered the Hellcat with Mighty Mouse air-to-air rockets, some 208 in all. Most of the rockets missed. The few that struck the drone failed to detonate.

The weapons did take a toll on the ground. A car driven by 16-year-old Larry Kempton with his mother as passenger was destroyed when a rocket exploded on the street in front of them. He and his mother were unharmed. House windows were shattered, roofs perforated. Multiple ground fires broke out, burning hundreds of acres.

After two hours, the Navy drone ran out of fuel and crashed, severing a power line and starting yet another fire. It took firefighters two days to extinguish all the blazes.

↑ Index

LOCATION: T

Northrop Grumman BQM-74C

Chukar III

SERVICE CEILING	40,000 feet
ENGINE	Williams J400-WR-402 turbojet, 180 lbf thrust
RANGE	About 520 miles
WINGSPAN	5 feet 9 inches
LENGTH	12 feet 11 inches
LAUNCH WEIGHT	About 514 pounds (ground launch)
SERVICE TIMEFRAME	1968–2000s
ACCESSION	2011.108.001



THE MODEL

The Northrop Grumman Chukar III UAV was developed as the latest evolution in the MQM-74 Chukar series of target drones, which had been in service since the 1960s. Designed to simulate enemy aircraft and missiles for air defense training, the Chukar III improved upon its predecessors with enhanced flight performance, extended range, and upgraded avionics. Entering service in the early 1980s, it was used by the U.S. military and allied forces for testing and training with surface-to-air missiles (SAMs), air-to-air missiles, and radar tracking systems. The Chukar III retained the compact design of earlier models but incorporated better maneuverability and more realistic threat simulation capabilities. Its reliability and adaptability made it a valuable tool for air defense training until it was gradually replaced by more modern UAV systems in the early 2000s.

The BQM-74C was a significant upgrade within the Chukar III series, featuring improved speed, endurance, and electronic countermeasures to better replicate the performance of advanced threats. It was capable of flying at speeds exceeding 500 mph (800 km/h) and had a service ceiling of over 40,000 feet (12,000 meters), making it a versatile and realistic aerial target. The BQM-74C could be launched from aircraft, ships, or ground-based catapults, providing flexibility for various training scenarios. Its programmable flight paths and evasive maneuvers allowed it to mimic the behavior of real enemy aircraft and cruise missiles, enhancing the effectiveness of missile defense training. The BQM-74C remained in service for decades, proving to be a durable and effective target drone until it was replaced by next-generation systems like the BQM-167 Skeeter and other advanced UAV targets.

NOTABLE PEOPLE

DR. JOHN CASHEN

An aerospace engineer who played a key role in the development of advanced UAV and stealth technologies at Northrop. Best known for his contributions to the B-2 Spirit stealth bomber, Cashen's expertise in aerodynamics, radar cross-section reduction, and missile defense systems influenced various Northrop projects, including target drones like the Chukar III. His work helped to improve UAV performance, making the Chukar III a more effective high-speed aerial target for military training and missile defense testing.

HISTORY OF THIS AIRCRAFT

This Chukar III was declared surplus when the production program ended, and was gifted to the Museum by the Northrop Grumman Corporation in 2012. It was restored by the Museum's volunteers.

LOCATION: T

Northrop Grumman RQ-4A

Global Hawk (mock-up of a Block 10)

MAXIMUM SPEED	391 mph
SERVICE CEILING	60,000 feet
ENGINE	Rolls-Royce AE 3007H turbofan, 7,600 lbf
WINGSPAN	116 feet
LENGTH	44 feet
HEIGHT	15 feet
MAXIMUM TAKEOFF WEIGHT	26,750 pounds
CREW	None (remotely piloted)
SERVICE TIMEFRAME	2001–Present



THE MODEL

The RQ-4A Global Hawk is a high-altitude, long-endurance (HALE) unmanned aerial vehicle (UAV) designed for reconnaissance and surveillance missions. First flown in 1998 and entering operational service in the early 2000s, the RQ-4A was developed to provide real-time intelligence, surveillance, and reconnaissance (ISR) capabilities over vast areas. With its ability to fly at altitudes exceeding 60,000 feet for up to 34 hours, the Global Hawk can monitor large swathes of terrain without risking pilot lives, making it an invaluable asset for both military and humanitarian operations.

Equipped with advanced sensors, including synthetic aperture radar (SAR) and electro-optical/infrared (EO/IR) cameras, the RQ-4A can capture detailed imagery and detect moving targets in all weather conditions, day or night. It played a crucial role in conflicts such as those in Iraq and Afghanistan, as well as in disaster response efforts, providing critical information for relief operations. Though initially developed for the U.S. Air Force, the Global Hawk has also been utilized by NASA and allied nations, highlighting its adaptability and importance in modern aerial reconnaissance.

NOTABLE PEOPLE

RANDY BROWN

A key figure in the development of the Global Hawk at Northrop Grumman, serving as the program manager during its early stages. Under his leadership, the team successfully designed and built a groundbreaking HALE (High-Altitude, Long-Endurance) unmanned aerial vehicle capable of redefining modern reconnaissance.

GENERAL JOHN P. JUMPER

A former Chief of Staff of the U.S. Air Force, Gen. Jumper played a pivotal role in the implementation of the Global Hawk into operational service. A strong advocate for modernizing U.S. military intelligence and reconnaissance capabilities, Jumper championed the integration of unmanned aerial systems like the Global Hawk into the Air Force's fleet.

HISTORY OF THIS AIRCRAFT

The Museum's RQ-4A Global Hawk is a mock-up of a Block 10, one of the earlier versions of the aircraft, and was donated by Northrop Grumman Corporation. Block 10 Global Hawks saw combat in

Afghanistan and Iraq, before being transferred to the U.S. Navy and NASA in 2011. Today, larger Global Hawk models, (the Block 20, 30 and 40) are in service all over the world with the U.S. Air Force, as well as the U.S. Navy's MQ-4C Triton, a maritime variant of the Global Hawk.

Transferred to the Museum's Permanent Collection. 2009.091.001

LOCATION: T

Northrop Grumman RQ-8A

Fire Scout (unmanned helicopter)

MAXIMUM SPEED	144 mph
SERVICE CEILING	20,000 feet
ENGINE	Rolls-Royce 250-C20W turboshaft, 420 shp
ENDURANCE	5 hours
ROTOR DIAMETER	27 feet 6 inches
LENGTH	22 feet 11 inches
HEIGHT	9 feet 5 inches
MAXIMUM TAKEOFF WEIGHT	2,650 pounds
CREW	None (unmanned)
SERVICE TIMEFRAME	2000–2006
ACCESSION	2010.128.001



THE MODEL

The Northrop Grumman RQ-8A Fire Scout was an unmanned aerial vehicle (UAV) designed for reconnaissance, surveillance, and target acquisition missions, primarily for the U.S. Navy and Army. Based on the Schweizer 330 light helicopter, the RQ-8A was developed as a rotary-wing UAV capable of autonomous takeoff, landing, and navigation. It was designed to provide real-time intelligence, surveillance, and reconnaissance (ISR) data to enhance battlefield awareness and maritime operations. First flown in 2000, the Fire Scout was equipped with electro-optical/infrared (EO/IR) sensors and laser designators, enabling it to support precision targeting and reconnaissance missions.

The RQ-8A underwent extensive testing aboard naval ships, demonstrating its ability to operate from small deck spaces, such as those on littoral combat ships (LCS) and destroyers. However, as requirements evolved, the U.S. Navy shifted to the MQ-8B, an upgraded version with improved endurance, payload capacity, and reliability. The RQ-8A program was eventually phased out in favor of more advanced MQ-8 variants, but it played a crucial role in proving the feasibility of unmanned rotary-wing reconnaissance in naval operations.

NOTABLE PEOPLE

DOUGLAS L. FRONIUS

Formerly Chief Engineer for Aircraft Programs at Northrop Grumman, Fronius played a key role in the development of the RQ-8A Fire Scout, helping to steer the project through critical challenges. Under his leadership, the Fire Scout successfully demonstrated its autonomous flight, surveillance, and reconnaissance capabilities, proving the viability of unmanned rotary-wing aircraft for military use. Fronius was instrumental in advocating for the program's continuation despite early funding cuts, emphasizing its potential for naval and battlefield intelligence operations. His efforts helped pave the way for the transition from the RQ-8A to the more advanced MQ-8B.

HISTORY OF THIS AIRCRAFT

A total of five RQ-8As were built as “proof of concept” vehicles; one of which was destroyed in an accident. This RQ-8A Fire Scout was acquired by the Museum in 2010, in a heavily damaged condition from the Navy. It was restored through the skill of the Museum’s volunteers, and benefited from donation of the main rotors by Appleby Aviation and a tail rotor from Mr. Michael Shults. The sensor turret is courtesy of FLIR Systems of Wilsonville, Oregon.

Transferred to the Museum’s Permanent Collection.

Northrop T-38A

Talon

MAXIMUM SPEED	812 mph (Mach 1.08)
CRUISING SPEED	578 mph
SERVICE CEILING	51,800 feet
ENGINES (2)	General Electric J85-GE-5A 3,850 lbs thrust ea.
RANGE	1,093 miles
CREW	Two



In the mid-1950s, to better prepare student pilots for the latest tactical aircraft that were then coming into service, the US Air Force required a trainer with higher performance than the Lockheed T-33. The aircraft chosen was the Northrop T-38A. The prototype first flew on April 10, 1959, with a total of 1,189 built before production ceased in 1972. Some were later modified for weapons training purposes.

Like other successful aircraft designs, the capable T-38 has performed a multitude of different roles for various services. When fuel was scarce in 1974, the Air Force Thunderbirds switched from the gas guzzling F-4 *Phantom II* to the *Talon* because four T-38s can fly for the price of one F-4. T-38s are small and maneuverable like Soviet MiG fighters. They were used in training by both Air Force "Red Flag" and US Navy "Top Gun" aggressor squadrons to simulate enemy aircraft in dogfights that taught pilots Air Combat Maneuvering (ACM). The T-38 is also NASA's aircraft of choice on "maintenance of proficiency" flights for astronauts, who use them to keep their flying skills sharp.

Nicknamed "White Rockets," T-38s have trained more than 42,000 pilots. The jet has been used for advanced pilot training, enabling student pilots to learn supersonic techniques, aerobatics, night and instrument flying and cross-country navigation.

They are inexpensive to maintain and have the best safety record of any airplane in the Air Force inventory. Two small single-shaft General Electric J85 turbojet engines are used in the *Talon*. Each weigh between 300 to 500 pounds and produces up to 2,950 pounds of thrust dry, (afterburning variants can reach up to 5,000 pounds), giving it the highest thrust-to-weight ratio of any production turbojet in the world. Because it is light and made primarily of riveted aluminum alloy it can take off with as little as 2,300 ft of runway, climbing to 30,000 ft in one minute.

T-38s are commonly used as chase planes or photo platforms on research and development aircraft tests. Jacqueline Cochran set eight performance records in the fall of 1961 flying a production T--38A. The F-5 fighter is the combat version of the *Talon.*

HISTORY OF THE MUSEUM'S AIRCRAFT

The Museum's T-38 was built in 1964 in Hawthorn, California. Accepted into Air Force service on September 14, 1964, this *Talon's* first assignment was with the 3550th Pilot Training Wing at McCoy AFB in Florida. Starting in 1965, the plane served the USAF in Texas for nearly 18 years at Randolph AFB and Reese AFB with various Air Training Command wings.

In 1993, the T-38 was assigned to the 4th Wing, Air Combat Command at Seymour Johnson AFB, North Carolina. The aircraft's final Air Force assignment was with the 49th Fighter Wing at Holloman AFB in New Mexico in 1995. In December of that year, the aircraft was stored at Davis-Monthan AFB in Arizona. The Museum acquired the *Talon* on loan from the National Museum of the United States Air Force in August of 1996.

↑ Index

LOCATION: T

Piasecki H-21C

Shawnee (“Flying Banana”)

MAXIMUM SPEED	127 mph
SERVICE CEILING	9,450 feet
RANGE	265 miles
ROTOR DIAMETER	44 feet (each of two rotors)
LENGTH	52 feet 6 inches
HEIGHT	15 feet 9 inches
GROSS WEIGHT	15,200 pounds
CREW	Three to five
CAPACITY	20 troops or 12 litters
SERVICE TIMEFRAME	1950s–1960s





THE MODEL

The Piasecki H-21C Shawnee, also known as the “Flying Banana” due to its distinctive upward-curved fuselage, was a tandem-rotor transport helicopter developed in the early 1950s for the U.S. Army and U.S. Air Force. Designed for arctic rescue operations, the H-21C proved highly versatile and was soon adapted for troop transport, cargo lifting, and medevac missions, particularly in rugged environments. Its twin-rotor design allowed for excellent lift capacity, and it became a key rotary-wing asset during the early years of the Vietnam War, marking one of the first large-scale uses of helicopters in combat troop deployment. Though eventually replaced by more modern helicopters like the UH-1 Huey, the H-21C played a crucial transitional role in the development of U.S. Army air mobility.

HISTORY OF THIS AIRCRAFT

This H-21C Shawnee is on loan from the National Museum of the United States Air Force.

On loan from the National Museum of the U.S. Air Force. 2020.001.008

↑ Index

LOCATION: T

Piasecki HRP-1

Rescuer (“Harp”, “The Flying Banana”)

MAXIMUM SPEED	105 mph
CRUISE SPEED	74 mph
SERVICE CEILING	8,530 feet
ENGINE	Pratt & Whitney R-1340-AN-1 Wasp, 600 hp
RANGE	300 miles
ROTOR DIAMETER	41 feet (two rotors)
CREW	Two
CAPACITY	Eight passengers or six stretchers
SERVICE TIMEFRAME	1947–1953





THE MODEL

As the world’s first successful tandem-rotor helicopter, the HRP-1 led to the Boeing Chinook family of aircraft development, which served in many nations into the 21st century. Approximately 32 HRP-1s were assigned to the Marine Corps, Navy, and Coast Guard to transport equipment and personnel. Although officially referred to as the HRP-1, or “Harp,” the helicopter’s distinctive curved fuselage, which provided rotor blade clearance, soon earned it the nickname “The Flying Banana.” The first HRP-1 Rescuer flew on August 15, 1947, and the final machine was delivered in 1949.

The Marine Corps used them to help develop vertical-assault tactics during operations. Navy squadrons flew the HRP-1 until 1953, primarily in developing antisubmarine warfare equipment and minesweeping experiments. HRP-1s were practical for many pioneering applications in standard military doctrine, including search and rescue, antisubmarine warfare, amphibious assault, heavy transport, and minesweeping.

NOTABLE PEOPLE

KILROY WAS HERE

If you thought memes only started with the internet, think again! “Kilroy was here” was a meme that appeared as graffiti art almost anywhere American soldiers went in Europe during World War II. The words “Kilroy was here” were accompanied by a cartoon drawing of a person looking over a wall. There are many myths about the character’s meaning, but they often center around a German belief that Kilroy was a superspy who could go anywhere they pleased. Kilroy has appeared in ship holds, bathrooms, bridges, and painted on the shells of Air Force missiles.

FRANK PIASECKI

A trailblazer in the development of helicopters, Frank Piasecki was an aeronautical designer, engineer, pilot and founder of the PV-Engineering Forum, which developed transport helicopters and vertical lift aircraft. He was the first person to qualify with the Civil Aeronautics Administration as a helicopter pilot prior to receiving his fixed wing pilot’s license and flew both the HRP-1 and the PV-2, the second successful helicopter to fly in America. He was awarded more than 20 patents and received numerous other awards, honors, and memberships. In 1986, President Reagan awarded Piasecki with the National Medal of Technology.

HISTORY OF THIS AIRCRAFT

We do not know much about our Rescuer's history. It came to the Museum in 2013 in a trade of restoration projects with the Classic Rotors Museum in Romona, California. The Museum's restoration volunteers restored it and made a special addition to the side window that depicts a classic World War II story: Kilroy.

Traded with the Classic Rotors Museum. 2021.028.002

Pietenpol

Air Camper

MAXIMUM SPEED	100 mph
RATE OF CLIMB	500 feet per minute
ENGINE	Ford Model-A automobile engine
RANGE	Varies with engine
CAPACITY	Two



Like many modern homebuilders, Bernard Pietenpol, a self-taught mechanic and tinkerer from Cherry Grove, Minnesota, had a dream to create an airplane that anybody with basic wood-working skills and some available, affordable supplies could build and fly. He published the drawings for his design in a 1932 edition of *Modern Mechanics and Inventions – Flying and Glider Manual*.

Pietenpol flew his original aircraft with an Ace four-cylinder water-cooled engine, but it was quickly replaced by the more readily available Ford Model-A engine modified for aviation. Over 30 different kinds of powerplants have been used to power *Air Campers.* Pietenpol modified the drawings in 1933 to improve the design. He later standardized his drawings in the 1960s to use the engine from a Chevy *Corvair* automobile which was smoother, more powerful, and lighter weight than the Ford.

The original plans for the *Air Camper* were sold by Fawcett Publications and were so popular that the editors asked Pietenpol for another design. This resulted in the single seat *Air Scout,* which was powered by the older, less expensive Ford Model-T engine.

Since the first *Air Camper* flew in 1928, thousands of these simple planes have be built and flown in what is probably the longest production run of any aircraft in history.

Builders today are attracted to the *Air Camper* for the same reason they were in the 1930s; it has graceful styling, easy construction, and predictable flying qualities. The *Air Camper* is inexpensive to build, since it was designed to use little “aircraft-rated” material and was designed to be stronger than necessary, which gives it a high safety factor. No Pietenpol aircraft has ever failed due to a design flaw.

HISTORY OF THE MUSEUM’S AIRCRAFT

Today, the Pietenpol family continues the tradition of cheap, slow, fun, home-built flights as Bernard’s son and grandson maintain the B.H. Pietenpol & Sons Air Camper Aircraft Company, LLC. Through their website, they continue to sell plan sets for both the *Air Camper* and *Air Scout*, keeping alive the dream of any airplane for everybody.

Evergreen’s *Air Camper* was started by C. Vernon Snider of Tangent, Oregon, who completed the fuselage frame and wing structure before he died in 2010. Originally equipped with a Chevrolet *Corvair* engine, it was completed with a vintage engine to reflect its heritage of a “Golden Age” design.

↑ Index

LOCATION: H

Piper J-3

Cub

MAXIMUM SPEED	85 mph
CRUISING SPEED	75 mph
SERVICE CEILING	11,500 feet
ENGINE	Continental A-65-8 65 hp.
RANGE	190 miles
CAPACITY	Two (455 lbs. total)



William T. Piper and C. Gilbert Taylor formed a partnership in 1931 when “light plane” manufacturing was considered financial suicide. The E-2 Taylor *Cub* was their first successful airplane. In January of 1933, the two partners hired a young designer named Walter Corey Jamouneau.

William T. Piper bought his partner out in 1935 and asked Jamouneau to “clean up” the E-2 design, which he did and the new company’s, new airplane was now christened the Piper J-3 *Cub* (the ”J” stood for Jamouneau).

The organization of the Civilian Pilot Training Program (CPTP) before the entry of America into World War II spurred sales of the J-3. By 1939 over 5,000 *Cubs* had been sold into the civilian market. Seventy-five percent of all pilots in the CPTP were trained on *Cubs*, many going on to more advanced training in the military. At the wartime peak, a new J-3 emerged from the factory every twenty minutes. Piper sold 19,073 J-3s between 1938 and 1947, the majority of them L-4s and other military variants.

The J-3 is distinguished from its successors by the exposed cylinder heads. There are very few other examples of “flat” aircraft engines (as opposed to radial engines) in which the cylinder heads are exposed.

When the J-3 is flown solo, the lone pilot normally occupies the rear seat for proper balance, to compensate for the weight of the fuel tank which is located at the firewall.

HISTORY OF THE MUSEUM’S AIRCRAFT

NA6471 was built in 1942 by Piper Aircraft Corporation as a US Army Air Force pilot training glider with a designation of TG-8. It had a counterbalance on the nose and a different landing gear and sat much lower to the ground. Little is known of its history until the conclusion of World War II when it was converted to an airplane.

In 1988 Evergreen discovered this rare “cub\glider” in a barn in Pennsylvania where it had been stored for many years. After the aircraft had been purchased, a complete and total renovation requiring over a year was undertaken. Although classified as a J-3 *Piper Cub*, this airplane, which still carries its original glider serial number of G31, is more than likely the only one of its kind left in existence.

LOCATION: H

Piper L-4H

Grasshopper

MAXIMUM SPEED	87 mph
CRUISING SPEED	75 mph
SERVICE CEILING	11,500 feet
ENGINE	Continental A-65-8 65 hp.
RANGE	191 miles
CAPACITY	Two



The *Grasshopper* was a modified J-3 Piper *Cub* used extensively in World War II and Korea for reconnaissance, transporting supplies, artillery spotting, and medical evacuation. Over 5,700 were built.

When the Second World War began, the military contracted for *Cubs* as observation airplanes, but subsequently transferred the airplane into the “liaison” category which changed its designation to the L-4 series, named *Grasshoppers*.

Variously designated as the O-59 (1941), L-4 (after April 1942), and NE (US Navy), the L-4 was mechanically identical to the J-3 but was distinguishable by the use of a Plexiglas greenhouse skylight and rear windows for improved visibility; the side windows were enlarged as well.

The L-4's slow cruising speed and low-level maneuverability made it an ideal observation platform. For these operations, the pilot generally carried both an observer/radio operator and a 25-pound communications radio, a load that often exceeded the plane's specified weight capacity. Several were armed with bazookas and used to attack German tanks.

The *Grasshopper* was so influential to ground battles and the war that the Luftwaffe awarded twice as many points towards combat medals for L-4 kills as they did for Allied fighter aircraft.

During the Korean War, the *Grasshopper* saw service in many of the same roles it had performed during World War II. Some L-4s were fitted with a high-back canopy to carry a single stretcher for medical evacuations.

HISTORY OF THE MUSEUM’S AIRCRAFT

Evergreen’s L-4H was restored by Colin Powers in honor of one assigned to the 200th Infantry Division of the First US Army operating from Omaha Beach immediately after the Normandy invasion. 25 is the unit code number {2nd Infantry Division) and C is the individual aircraft ID number.

This airplane was the Oshkosh 2007 Reserve Grand Champion Warbird. It was acquired by the museum in 2007.

LOCATION: H

Pitts S-1S

Special

MAXIMUM SPEED	203 mph
SERVICE CEILING	21,000 feet
ENGINE	Lycoming AEIO-360-B4A, 180 hp
WINGSPAN	17 ft 4 in
SERVICE TIMEFRAME	1973–present
CAPACITY	One



The Pitts S-1S Special is a single-seat, high-performance aerobatic biplane that became one of the most iconic stunt aircraft in aviation history. Designed by Curtis Pitts in the 1940s, the Pitts Special series was built for tight, precise maneuvers, featuring short wingspans, lightweight construction, and a powerful engine. The S-1S variant, introduced in the 1970s, is powered by a 180-horsepower Lycoming engine and boasts a symmetrical airfoil design, which enhances its agility and inverted flight capabilities. Its compact size and responsiveness have made it a favorite among competitive aerobatic pilots.

The S-1S quickly gained a reputation for dominating aerobatic competitions and airshows around the world. Its performance characteristics allow it to execute complex stunts such as snap rolls, hammerhead turns, and tumbles with unmatched precision. Despite its small size, the aircraft demands a high level of skill to master, making it both a thrilling and respected platform in the aerobatic community. The Pitts S-1S has left a lasting legacy and continues to inspire new generations of pilots drawn to the art of aerobatics.

NOTABLE PEOPLE

CURTIS PITTS

The visionary designer behind the Pitts Special series, which became one of the most iconic aerobatic aircraft of the 20th century. Introduced in the 1970s, the S-1S was a refined version of earlier single-seat models, featuring a symmetrical airfoil and stronger structure for high-performance maneuvers. Pitts' engineering and passion for aerobatics led to a lightweight, agile aircraft that dominated airshows for decades. His contributions earned him lasting recognition in the aviation community and a place in the National Aviation Hall of Fame.

DANNY CLISHAM

Affectionately known as "SkyTalker," Clisham is a renowned airshow announcer and aviation personality whose dynamic commentary has captivated audiences for decades. His enthusiastic narrations have brought the thrilling aerobatics of Pitts pilots to life, enhancing the spectator experience and promoting the aircraft's legacy. Clisham's contributions to the airshow community have been recognized with prestigious accolades, including the Art Scholl Memorial Showmanship Award.

HISTORY OF THIS AIRCRAFT

This Pitts S-1S Special was built from a kit and flown by airshow performer and announcer Danny Clisham, and was assisted by his uncle, Jimmy Mynning. Earlier in his career, Clisham had flown L-188 Electras and DC-8s for Evergreen International Airlines. Clisham placed the Pitts on loan to the Museum after it was fully restored by Joe Schumacher of Schumacher Aero in Wisconsin.

This aircraft is on loan from Danny Clisham.

LOCATION: H

Pitts S-2B

Special

MAXIMUM SPEED	210 mph
CRUISE SPEED	140 mph
SERVICE CEILING	21,000 feet
ENGINE	Lycoming AEIO-540-D4A5, 260 hp
WINGSPAN	20 ft
RANGE	319 miles
SERVICE TIMEFRAME	1981–2008
CAPACITY	Two



Around the world, the Pitts name is synonymous with aerobatics. In 1945 Curtis Pitts built the first of a line of aircraft that was to dominate aerobatic competition throughout the 1960s and 1970s — the Pitts *Special*. Rather than the larger pre-war biplanes, Pitts wanted something smaller that would climb, roll, and change attitude much more quickly.

Instead of a large radial engine, Pitts built his swept winged aircraft around the new smaller and lighter horizontally opposed engines. The resulting Pitts *Special* was revolutionary because of its small size, light weight, short wingspan, and extreme agility. The sweep of the wings made snap rolls snap more sharply.

A few Pitts *Specials* were built by Pitts himself and others in the 1950s, but the airplane remained a minor type until the early 1960s when interested amateurs convinced him to produce a set of construction drawings. The popular homebuilt version of the airplane was the model S-1C, with two ailerons, M-6 airfoils, and any engine from 85-hp up to 180-hp, the most popular being 125 to 150-hp Lycomings.

By the late 1960s the Pitts *Special* was a common sight at U.S. air shows and fly-ins. When fitted with a 180-hp engine, the 690-pound Pitts had an amazing power-to-weight ratio, and the airframe itself was tremendously strong.

While most of the *Specials* were flown in the U.S., their international reputation grew quickly. In 1966, Bob Herendeen became National Aerobatic Champion in his S-1C. In the same year he competed in the World Championships in Moscow in that plane, arousing considerable interest in Europe.

The diminutive Pitts is the most successful and recognized American-built aerobatic design. The *Special* S-2B has two seats and can perform stunts with both pilot and passenger on board or for aerobatic training flights. It is generally regarded as a more capable aerobatic aircraft due to its larger size, heavier weight, more power and aerodynamic changes.

HISTORY OF THE MUSEUM'S AIRCRAFT

The Aviat Aircraft factory in Afton, Wyoming built this aircraft in July 1986. It was purchased by Evergreen on October 1, 1987, and flown predominantly by museum founder Captain Michael K. Smith at various air shows.

LOCATION: T

Qasef-1 Drone

THREAT LEVEL 3: Heavy military drones with high payload

DEPLOYED BY	Houthis in Yemen
COUNTRY OF ORIGIN	Iran (assembled locally in Yemen)
ROLE	Kamikaze/suicide drone for precision strikes
FRAME	10.5 ft wingspan, rectangular wings, V-shaped tail, tubular fuselage
NUMBER OF PROPELLERS	1 (rear-mounted pusher propeller)
RANGE	Approximately 93 miles
ARMAMENT	Up to 100 lb warhead (anti-personnel or high-explosive, exact type unclear)
TYPICAL TARGETS	Saudi-led coalition radar systems (e.g., Patriot), military bases, airfields
HOW CONTROLLED	Pre-programmed with open-source GPS coordinates, limited real-time control for navigation
MANEUVERABILITY	Moderate, designed for direct impact, not highly agile, relies on GPS



The Museum gratefully acknowledges the generous support of Dr. Stephen and Marge Brenneke and The Laney Family Foundation, whose contributions made this exhibit possible.

LOCATION: HO

Quickie Q2

MAXIMUM SPEED	180 mph
CRUISE SPEED	140 mph
SERVICE CEILING	15,000 feet
ENGINE	Revmaster 2100-DQ 64 hp.
RANGE	550 miles
EMPTY WEIGHT	400 lbs.
CAPACITY	Two



The Quickie Q2 is kit-plane designed by Canadian Garry LeGare and the founders of the Quickie Aircraft Corporation, Tom Jewett, and Gene Sheehan.

The prototype Q2 was constructed by LeGare at his Leg-Air Aviation, Ltd., facility in Langley, British Columbia. It is a side-by-side two seat version of the unique Rutan Quickie, produced in kit form of composite construction. Unlike the original single-seat Quickie, Rutan was not involved with the building of the Q2.

It appears to be a canard design but is actually a tandem wing aircraft. The front wing carries the elevators and provides approximately 60 percent of the lift. The rear wing acts as a horizontal stabilizer.

The absence of a tailplane both reduces drag and allows the aft fuselage to be slender since it has less to support. Combining elevators, ailerons, and flaps into just one pair of control surfaces also reduces drag. The absence of separate landing gear reduced both weight and drag as well.

The proximity of the engine/propeller to the forward wing made for a powered lift effect with instantaneous climb response to power inputs. However, props were a little more prone to chipping or breakage being so close to the ground. Q-2 pilot controls included a central sidestick controlled by the right hand and a throttle controlled by the left hand. As the pitch and roll control linkages were via a pushrod, the aircraft was very responsive.

The Q-2 was created to be an attractive, exciting, simple design for the first-time home builder. Kit production commenced in 1980 and over 2,000 kits were manufactured before the Quickie Aircraft Corporation ceased operations in the mid-1980s.

HISTORY OF THIS AIRCRAFT

This Quickie Q2 was built by Greg Kelsey and Amos Carrison of Boise, Idaho and flown by the pair for 25 years before being donated to the Museum in 2009.

↑ Index

LOCATION: HO

Republic F-105G

Thunderchief / Wild Weasel

MAXIMUM SPEED	1,372 mph
CRUISING SPEED	596 mph
SERVICE CEILING	48,500 feet
ENGINE	Pratt & Whitney J75-P-19W 26,500 lbs. thrust
RANGE	1,500 miles
ARMAMENT	1 x M61 20-mm Vulcan cannon, 2 missiles + 12,000 lbs. of ordnance
CREW	Two



Commonly known as the “Thud” by its crews, the F-105 was developed as a replacement for the F-84. It was designed as a single seat tactical fighter-bomber capable of delivering a nuclear weapon flying at supersonic speeds at low altitudes. The first F-105 *Thunderchief* flew in 1955 and Republic delivered the first production aircraft to the US Air Force in 1958.

The F-105 was the largest single engine fighter ever built that could achieve Mach 2 speed. Takeoffs and landings were often performed around 230 mph. The primary version, the F-l05D, was converted from the nuclear to conventional bomb configuration for use during the Vietnam War.

The two seat F-105F trainer version was converted into the F-105G *Wild Weasel* where its mission was to destroy surface-to-air missile (SAM) sites. It was equipped with radar receiving equipment and armed with HARM anti-radiation missiles. The dangerous missions often required the *Weasels* to be the “first in, last out”, suppressing enemy air defenses while strike aircraft accomplished their missions and then left the area.

A total of 833 Thuds were built before production ended in 1964. During the Vietnam War 382 F-105Ds were lost. Of the 143 F-l05Gs built, 47 were lost. By the early 1980s, the F-105s had been phased out of USAF and Air National Guard units.

HISTORY OF THE MUSEUM’S AIRCRAFT

This F-l05G is on loan from the National Museum of the United States Air Force and was restored at the Evergreen Air Center. It is painted to represent the 57th Fighter Wing, Nellis AFB, Nevada.

It is dedicated to Lt. Col. Leo K. Thorsness and his Electronic Warfare Officer, Capt. Harry Johnson. For his heroic actions on April 19, 1967, then- Capt. Thorsness received the Medal of Honor. Capt. Johnson was awarded the second highest decoration - the Air Force Cross. On a later mission, they were shot down and remained POW's for six years. They received credit for destroying 20 SAM sites and shooting down two MiG-17s.

Republic F-84F

Thunderstreak

MAXIMUM SPEED	695 mph
CRUISING SPEED	475 mph
SERVICE CEILING	46,000 feet
ENGINE	Wright J65-W-3 7,220 lbs. thrust
RANGE	810 miles
ARMAMENT	6 x M3 .50 caliber machine guns + 6,000 lbs. of ordnance
CREW	One



The F-84 was developed by Republic as a jet fighter-bomber after World War II. The first models were F84-E *Thunderjets* manufactured with straight wings. Although underpowered, they were used during the Korean War.

In 1954 a redesigned F-84 with swept wings was introduced and designated as the F-84F *Thunderstreak*. It sported six .50 caliber machine guns and could carry up to 6,000 lbs. of rockets and bombs.

But the *Thunderstreak* suffered from the same poor takeoff performance as the straight-wing *Thunderjet* despite having a more powerful engine. On a hot day, 7,500 feet of runway were required for a takeoff roll. Almost ten percent of total thrust was lost because the J65 engine was installed at an angle and its exhaust had a prominent kink. However, the *Thunderstreak* excelled at cruise and had predictable handling characteristics within its performance envelope.

The RF-84F *Thunderflash* was a reconnaissance version of the *Thunderstreak*. Engine air intake ducts were located in the wing roots of the RF-84F rather than in the nose section. The elongated and enclosed nose contained 15 cameras.

In 1955, Lt. Col. Robert R. Scott, flying a *Thunderstreak*, set a 3-hour, 44-minute and 53-second record for the 2,446-mile flight from Los Angeles to New York.

Republic built 2,112 -F models while General Motors fabricated 599 more. Of these, 1,301 were delivered to NATO air forces. Production of the RF-84F totaled 718 aircraft, among them 386 for Allied countries.

F-84Fs were gradually turned over to Air National Guard units when they were replaced by supersonic F-100 *Super Sabres* in the late 1950s. However, some were called back to temporary USAF duty in the early 1960s due to the Berlin Crisis. The F-84F was retired from active service in 1964.

HISTORY OF THE MUSEUM'S AIRCRAFT

The history of this aircraft is not known. It was originally loaned to the Hawkeye Technical Institute in Iowa by the GSA and when it was surplus to their needs, was then acquired from the GSA by Evergreen. It was restored at the Evergreen Air Center and is painted to represent the 84th Fighter Bomber Wing, RAF Bentwaters, UK.

LOCATION: H

Republic RC-3

Seabee

MAXIMUM SPEED	117 mph
CRUISING SPEED	103 mph
SERVICE CEILING	12,000 feet
ENGINE	Franklin 6A8-215-B8F 215 hp.
RANGE	560 miles
CAPACITY	Four



In the late 1940's aircraft manufacturers hoped that military pilots returning from the war would want to continue flying civilian aircraft for pleasure and sport. This never occurred to the extent the companies imagined, as most wartime pilots returned home never to fly again.

Keen to enter the market with a lightweight sporting amphibian, Republic acquired the plans of an aircraft in this category from P. H. Spencer, a well-known designer of single-engine amphibians.

The resulting Republic RC-1 prototype was first flown during 1945. In production form, like the RC-3 *Seabee*, this airplane had four-seat accommodation and was powered by a Franklin flat-six engine.

Demand for the *Seabee* was enormous, primarily because the company had underpriced it and when production ended in late 1947, more than 1,000 airplanes had been built. The company's order book was even then far from satisfied, but Republic could not afford to sell each airplane at a considerable loss and, in any event, the buyers would soon have disappeared had the *Seabee* been given a realistic price tag.

In the late 1940s and throughout the 1950s, the *Seabee* became one of the most popular bush planes and air ambulances in countries such as Canada, Norway and Sweden as well as the U.S.

Many life-saving missions were flown by *Seabee* pilots rescuing seriously ill people from remote islands and vast wilderness. *Seabee* pilots learned to make "impossible" takeoffs and landings from small lakes to deliver supplies to hunters and trappers.

In 2006 over 250 *Seabees* were still registered and flying, a number that is increasing yearly as new aircraft are assembled from parts and wrecks. A few *Seabees* are even still operating commercially as bush planes and air taxis.

HISTORY OF THE MUSEUM'S AIRCRAFT

Art Carnahan of Carnahan Flying Service, Bloomington, Illinois, purchased the Museum's RC-3, S/N 736, on April 24, 1947. The aircraft went through a series of owners before Jerry Scheffels purchased it on May 15, 1989.

On June 8, 2004, while on a landing approach, pilot Vern Ziegler accidentally dropped the landing gear, flipping the *Seabee* into Newton Lake near Coeur d'Alene, Idaho. Ziegler escaped uninjured and the plane floated upside down about 500 yards from shore before it was salvaged. Scheffels donated the *Seabee* to the Museum in April 2005.

Beginning the restoration process a year later, Museum volunteers drained the remaining Newman Lake water out of the aircraft and restored every detail of the little flying boat, completing the process in March 2007.

LOCATION: NL

Rockwell Sabreliner 50 / T-39

MAXIMUM SPEED	550 mph
CRUISING SPEED	500 mph
SERVICE CEILING	45,000 feet
ENGINES (2)	Pratt & Whitney JT12A 3,300 lbf. thrust each
RANGE	2,500 miles
MAXIMUM WEIGHT	20,172 lbs.
CREW	Two



In the 1950s, as America went through a business boom, many companies decided that they could not wait for slower means of transportation to get their executives to important meetings; they needed a corporate jet.

To cash in on this idea, North American Aviation started an in-house project to build a small, fast passenger jet using the wing and tail design from their famous F-86 *Sabre* fighter.

At the same time the US Air Force was looking for a new utility trainer aircraft and found what they were looking for in what would be called the *Sabreliner*. Under the designation T-39, the Air Force also wanted the aircraft as a fast transport, much like the private industry wanted, for carrying high ranking officers. The Air Force order for the *Sabreliner* was quickly followed by one for the US Navy and Marine Corps who needed the aircraft as a radar and navigation trainer. Over 200 military T-39s would be built.

In its original role as an executive jet the *Sabreliner* 40 entered the civilian market in 1963. It was able to carry 11 passengers in comfort, with more speed and a roomier cabin than its military counterpart. Although not as fast as the later *Lear Jet* and *Jet Commander* business jets, the *Sabreliner* had more head room and a more robust construction than its competitors.

Throughout the 1960s and 70s, North American (which became Rockwell International in 1973) continued to upgrade the aircraft to meet its customers' demands. The Model 60 added 3 feet, 2 inches and six more windows to the cabin, while the Model 70 added to the cabin height for more comfort. The addition of a supercritical wing design and turbofan engines made later models far more efficient and cost effective to operate.

Over 600 civilian *Sabreliners* were built in a production run that lasted from 1959 to 1982 and many are still flying around the world.

HISTORY OF THE MUSEUM'S AIRCRAFT

Because of the systems tested on this *Sabreliner,* millions of airline passengers and general aviation pilots fly safely each year.

It was first operated by the Autonetics Division of North American Aviation in 1964, as a test bed for many electronics, avionics and radar systems on military aircraft including the B-47, F-4, F-111 and F-15. At one point it was even fitted with racks to carry and drop practice bombs as part of an Electo-Optical bombing system.

In 1976, it was transferred to the Collins Division of Rockwell International and was used for testing of avionics for commercial aircraft including:

the MultiScan Threat Detection System which helps spot wind shear, turbulence, and other weather threats,

the Traffic Collision Avoidance System (TCAS) that helps pilots avoid mid-air collisions,

satellite communications systems,

autopilot systems, and

GPS systems.

Many of these features are now standard on airliners worldwide.

The strange bulbous nose on the aircraft was used for testing the larger airliner radar antennas and could be replaced with a standard *Sabreliner* nose for smaller radar receivers.

This *Sabreliner* 50 was generously donated by and flown to the Museum by Rockwell Collins Corporation when it was retired from service in January 2013. It is unique in that it was the only *Sabreliner* 50 built. Starting life in 1964 as a Navy T-39D, it incorporated many features of the later civilian Model 60 — making it a hybrid amongst the *Sabreliner* family.

Ryan New York to Paris (replica)

“Spirit of St. Louis”

MAXIMUM SPEED	133 mph
CRUISING SPEED	100 mph
SERVICE CEILING	16,400 feet
ENGINE	Wright J-5C 223 hp.
RANGE	4,100 miles
CAPACITY	One



The *Spirit of St Louis* was a custom-built single engine, single seat monoplane that was flown by Charles Lindberg on May 20-21, 1927, on the first non-stop transatlantic solo flight from New York to Paris. The flight took 33 hours 30 minutes and covered approximately 3,600 miles.

Lindbergh won the $25,000 Orteig Prize for the effort. Not until the Apollo 11 moon landing in 1969 was the entire world again as enthusiastic about an aviation event as it was when Lindbergh landed in Paris.

The *Spirit* was developed from the Ryan M-2 mail plane. For the Paris flight it had a total fuel capacity of 450 U.S. gallons to give it the required range. An 88-gallon fuel tank was placed in front of the pilot. This required a periscope to be installed to provide a forward view. The remaining fuel was distributed in the main tank holding 209 gallons and three wing tanks with a total of 153 gallons. The *Spirit* was one of the most advanced and aerodynamically streamlined designs of its era.

The fuselage was made of treated fabric over a metal tube frame, while the wings were made of fabric over a wood frame. Lindbergh sat in a cramped cockpit which was only 36-inches wide, 32-inches long and 51 inches high.

Officially known as the "Ryan NYP" (for New York to Paris), the monoplane was designed by Lindbergh and Ryan Airlines and was named in honor of Lindbergh's supporters from the St. Louis Raquette Club of St. Louis, Missouri.

After returning to America, Lindbergh flew the *Spirit* for 10 months on promotional and goodwill tours across the United States and Latin America. It made 174 flights for a total of 489:28 hours of flying time on the aircraft.

On April 30, 1928 Lindberg flew the *Spirit* on its last flight—from St. Louis to Bolling Field in Washington, DC. He then presented the aircraft to the Smithsonian Institution and today it hangs in the National Air and Space Museum.

HISTORY OF THE MUSEUM’S AIRCRAFT

This replica was built by Century Aviation of Wenatchee, Washington. This replica is on loan from McMinnville Properties, LLC.

LOCATION: H

Ryan PT-22 (ST3KR)

Recruit

MAXIMUM SPEED	125 mph
CRUISING SPEED	100 mph
SERVICE CEILING	15,400 feet
ENGINE	Kinner R-540 160 hp.
RANGE	300 miles
CAPACITY	Two



The Ryan Model ST-3KR, U.S. Army Air Corps PT-22 *Recruit*, evolved out of the design of the popular Ryan ST or “Sport Trainer.” It incorporated refinements that resulted in a rugged and easy to maintain military trainer.

The *Recruit* was a wire-braced, low-winged monoplane, with open cockpit seating for two in tandem and a futuristic aluminum monocoque fuselage. It was the first purpose-built monoplane trainer bought by the military. The Ryan was challenging and made for a smooth transition to more demanding low wing fighters during World War II. The Navy version was designated NR-1.

The aircraft was capable of just about anything a pilot was willing to try, but it demanded certain practices. The most important factor in the flight regime was to keep up the flying speed, otherwise it came down like a ton of bricks. Snap rolls, however, were the PT-22’s forte. But it was an aircraft very unforgiving of mistakes and it quickly acquired a reputation as a killer of inattentive pilots.

The Kinner engine’s unusual 5-cylinder configuration and relatively low operating RPM resulted in a distinctive engine sound – even when running at maximum power. To many cadets, this sound was like mom’s new gasoline powered Maytag washing machine, back on the farm. Thus, the *Recruit* became affectionately known as the “Maytag Messerschmitt”.

1,048 were built and were used by the Navy and the Army as well as other countries as part of Lend/Lease contracts with American allies. Used to train literally thousands of young pilots for World War II, over 500 were bought after the war by civilians. It was retired in 1945.

Today there are flying examples to be found across North America, in the UK and Australia.

HISTORY OF THE MUSEUM’S AIRCRAFT

In 1941 the Museum’s PT-22 was taken on Strength/Charge with the United States Army Air Force with s/n 41-20952. In February of 1956 it began its civilian life with a Certificate of Airworthiness and an FAA registration number of N53438. From 1976 to 1997 it was registered to Gerald J. Weiler, of Port Angeles, Washington. It was restored by Colin Powers and placed on display at the Museum in 2008. This aircraft is on loan from McMinnville Properties, LLC.

LOCATION: H

Schweizer SGS 2-32 Glider / X-26A

WINGSPAN	57 feet
LENGTH	26 feet 9 inches
BEST GLIDE RATIO	35:1
NEVER-EXCEED SPEED	157 mph
EMPTY WEIGHT	831 pounds (857 pounds for X-26A)
MAXIMUM WEIGHT	1,430 pounds
CAPACITY	Pilot and two passengers



The three Schweizer brothers built their first glider in 1930 and incorporated the company that bears their name in 1939.

The SGS 2-32 was conceived as a mass-produced sailplane of modest performance to act as a step-up from the SGU 2-22 trainer then in common use in North America. The company decided to produce a higher performance sailplane with a greater wingspan instead.

The 2-32 design was started in 1961 and completed with certification under type certificate G1EA on June 19, 1964. It is widely used in the commercial rider business.

Nicknamed the “Cadillac of Gliders,” the Schweizer SGS 2-32s wingspan is 57 feet and when empty, weighs only 831 pounds. The design features an all-moving horizontal tail with anti-balance tab and a semi-monocoque aluminum fuselage. It has a remarkably effective spoiler and dive brakes that will not allow the craft to exceed 85 mph when in a steep dive.

The 2–32's wingspan provides a glide ratio of 34 to 1, which meant that at an altitude of 1 mile, the plane could glide 34 miles. The interior is luxurious and comfortable for a sailplane. It has dual flight controls, and though technically a two-seater, it could carry two people in the rear in addition to a pilot in the front. A large bubble canopy provides excellent visibility.

The 2-32 was once the world’s highest-performance production multi-seater and has been a prolific record-setter. The design held many world and national records for speed over 100, 300 and 500 km courses, as well as a variety of distance, out-and-return, and altitude records for both men and women.

In 1975 it set the women’s multi-place world and national records for absolute altitude (35,463 ft.) and altitude gain (24,545 ft.) set by Babbs Nutt.

Prior to becoming a wholly owned subsidiary of Sikorsky in September 2004, Schweizer Aircraft was the oldest remaining privately-owned aircraft company in the United States.

Schweizer Aircraft has produced 2,160 sailplanes, 2,650 agricultural airplanes, more than 60 special purpose fixed-wing aircraft and unmanned vehicles, and more than 850 helicopters.

HISTORY OF THE MUSEUM’S AIRCRAFT

This Schweizer on display is on loan from the National Soaring Museum.

LOCATION: T

Shahed-136 Drone (Russian designation: Geran-2)

THREAT LEVEL 3: Heavy military drones with high payload

DEPLOYED BY	Russia
COUNTRY OF ORIGIN	Iran (designed by HESA); Russia mass-produces its own version (Geran-2)
ROLE	Loitering munition (kamikaze/suicide drone) for long-range strikes
FRAME	11.5 ft wingspan, cropped delta-wing, composite fuselage
NUMBER OF PROPELLERS	1 (rear-mounted, two-bladed pusher propeller)
RANGE	Up to 1,243 miles
ARMAMENT	88–110 lb high-explosive warhead
TYPICAL TARGETS	Critical infrastructure (power plants, grids), military bases, urban areas
HOW CONTROLLED	Pre-programmed flight path with GPS/INS navigation, limited real-time control
MANEUVERABILITY	Limited, follows pre-set routes, low-altitude flight for stealth, low radar signature



The Museum gratefully acknowledges the generous support of Dr. Stephen and Marge Brenneke and The Laney Family Foundation, whose contributions made this exhibit possible.

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LOCATION: TO

Sikorsky CH-37B

Mojave

SERVICE TIMEFRAME	1956–1960s
ROTOR SPAN	72 ft
TOP SPEED	130 mph
SERVICE CEILING	8,700 ft
ENGINES	Two Pratt & Whitney R-2800-54 Double Wasp piston engines



THE MODEL

The Sikorsky CH-37B Mojave was a heavy-lift transport helicopter used by the U.S. Army in the late 1950s and 1960s. As one of the last piston-engine helicopters before the widespread adoption of turbine-powered designs, the CH-37B was powered by two Pratt & Whitney R-2800 radial engines, giving it impressive lifting capability for its time. It was primarily used for cargo transport, troop deployment, and aircraft recovery, including retrieving downed U.S. spy planes in Vietnam. Though quickly phased out in favor of more advanced turbine helicopters like the CH-47 Chinook, the CH-37B played a crucial role in early heavy-lift operations.

HISTORY OF THIS AIRCRAFT

Delivered to the Army in 1960 as an H-37A, this Mojave saw redesignation as a CH-37 in 1962 as part of the effort toward uniform designation across the armed services. Exiting military service in 1978, the CH-37 transitioned to a commercial heavy-lift role for Aircrane Inc., of Pennsylvania. Acquired by the Museum in 2009, the Museum's team restored the Mojave in Marana, Arizona.

Transferred to the Museum's Permanent Collection. 2009.089.001

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LOCATION: T

Sikorsky H-19D

Chickasaw

SERVICE TIMEFRAME	1950–1960s
ROTOR SPAN	53 ft
TOP SPEED	101 mph
SERVICE CEILING	10,500 ft
ENGINE	Pratt & Whitney R-1340-57 air-cooled radial piston engine





THE MODEL

The Sikorsky H-19 Chickasaw was an early post–World War II utility helicopter developed for the U.S. Air Force, becoming one of the first helicopters designed with a nose-mounted engine to improve balance and cabin space. The H-19D was a refined variant of the original H-19 series, built specifically for the U.S. Army with improvements tailored for frontline utility missions. Introduced in the mid-1950s, the H-19D featured a more powerful radial engine, larger doors for easier troop and cargo loading, and upgraded avionics to enhance operational versatility. It was used extensively for medevac, troop transport, cargo delivery, and search-and-rescue operations, particularly during the early stages of U.S. involvement in Southeast Asia. The H-19D's adaptability and rugged design made it a key stepping stone in the evolution of Army helicopter doctrine, bridging the gap between early rotary-wing concepts and the arrival of the more advanced Huey series.

HISTORY OF THIS AIRCRAFT

This Chickasaw was purchased from aircraft collector Jack Lenhardt.

Transferred to the Museum's Permanent Collection. 2015.056.014

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LOCATION: T

Sikorsky H-3 Sea King

S-61

MAXIMUM SPEED	166 mph
SERVICE CEILING	14,700 feet
RANGE	621 miles
ROTOR DIAMETER	62 feet
LENGTH	54 feet 9 inches
CREW	Four
ACCESSION	ICL2005.011.001



THE SEA KING

The Sikorsky S-61, better known by its military designation, H-3 Sea King, is the official helicopter of the President of the United States. But it may be best known as a recovery helicopter for Gemini and Apollo missions. First flown in 1959, the Sea King was designed for shipboard operations, as its five main rotor blades and five-blade tail rotor can be folded for easy stowage. It was used primarily for anti-submarine warfare. In its spaceflight recovery role, it ferried astronauts to the safety of the nearby recovery ship. This aircraft is on loan from the National Museum of Naval Aviation.

Above is an actual H-3 Sea King.

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LOCATION: T

Sikorsky HO3S-1G

S-51 — Coast Guard rescue variant

MAXIMUM SPEED	107 mph
CRUISE SPEED	85 mph
SERVICE CEILING	14,800 feet
ENGINE	Pratt & Whitney R-985 Wasp Junior, 450 hp
RANGE	275 miles
ROTOR DIAMETER	48 feet
CREW	One pilot
CAPACITY	Pilot plus up to three passengers
SERVICE TIMEFRAME	1940s–1950s



THE MODEL

The Sikorsky HO3S was a light utility helicopter developed in the late 1940s, derived from the civilian Sikorsky S-51. Compact and versatile, it was powered by a Pratt & Whitney R-985 Wasp Junior radial engine and featured a three-bladed main rotor and a tailwheel landing gear arrangement. The HO3S became one of the earliest helicopters to see widespread military use, serving with the U.S. Navy, Marine Corps, Air Force, and Coast Guard. Its ability to take off and land in confined spaces made it invaluable for transport, observation, and search-and-rescue duties.

The U.S. Navy employed the HO3S extensively for utility transport, plane guard missions, and as an early platform for rescue operations from aircraft carriers. It also played a role during the Korean War, where it evacuated wounded troops from the front lines to field hospitals, demonstrating the lifesaving potential of helicopters in combat environments. Its relatively simple design and reliable performance allowed it to serve as a training aircraft as well, helping establish the foundation for more advanced rotary-wing operations in the decades that followed.

A notable variant of the series was the Sikorsky HO3S-1G, developed specifically for the U.S. Coast Guard. This model was outfitted with specialized equipment such as rescue hoists and flotation gear, enhancing its ability to perform open-water rescues and humanitarian missions. The HO3S-1G proved essential in extending the Coast Guard's operational reach, making it possible to save lives at sea in situations where conventional boats or fixed-wing aircraft could not respond quickly enough. Its service solidified the helicopter's place as a critical asset in maritime search-and-rescue operations.

NOTABLE PEOPLE

LT. CMDR. FRANK A. ERICKSON

Often called the "Father of Coast Guard helicopter aviation," Erickson was designated Coast Guard Aviator #32 in 1935, and was the first Coast Guard aviator to qualify in helicopters—becoming Coast Guard Helicopter Pilot #1 in 1943. He championed their potential for search and rescue, tested them extensively, and famously flew a Sikorsky HNS-1 during the rescue of survivors from the USS Turner explosion in January 1944, delivering blood plasma under storm conditions when no other aircraft could fly. His advocacy and demonstrations were crucial in proving helicopters' lifesaving value.

HISTORY OF THIS AIRCRAFT

This HO3S-1G was originally built as a civilian S-51 and was sold to Helicopter Air Transport (HAT); the first commercial helicopter company in the U.S. After HAT ceased operation, the aircraft was sold to the Coast Guard and modified for rescue work. It later went through several civilian owners before being restored to its Coast Guard configuration by Jack Lenhardt.

Transferred to the Museum's Permanent Collection. 2015.056.015

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LOCATION: T

Sikorsky UH-34D

Seahorse

MAXIMUM SPEED	122 mph
CRUISE SPEED	97 mph
SERVICE CEILING	9,500 feet
ENGINE	Wright R-1820-84, 1,525 hp
RANGE	245 miles
ROTOR DIAMETER	56 feet
CREW	Two
CAPACITY	12 troops or eight stretchers
SERVICE TIMEFRAME	1955–1970s
ACCESSION	2009.090.001





THE MODEL

The Sikorsky UH-34 Seahorse was a versatile, piston-engine helicopter developed in the 1950s for use by the U.S. military. Initially designated the H-34, it served across the Army, Navy, Marine Corps, and Air Force in various roles including transport, search and rescue, and anti-submarine warfare. Known for its reliability and rugged construction, the UH-34 featured a nose-mounted radial engine that gave it a distinct silhouette. It saw extensive service during the Cold War and in conflicts such as the Vietnam War, where it proved essential in moving troops and supplies into difficult terrain.

The UH-34D was the Marine Corps' primary variant, optimized for assault and utility missions. It featured improvements over earlier models, such as upgraded avionics and better lift capacity, making it well-suited for the demanding conditions of the Vietnam War. UH-34Ds were heavily used for medevac operations, troop insertions, and resupply missions in combat zones. Their performance in these roles earned the helicopter a respected place in Marine Corps aviation history, with many considering it a workhorse of the era.

NOTABLE PEOPLE

COLONEL WESLEY L. FOX

A U.S. Marine Corps officer and Medal of Honor recipient. During the Vietnam War, Fox relied on UH-34 helicopters for crucial troop insertions and medical evacuations under fire. His firsthand experience with the aircraft's capabilities highlighted the UH-34's vital role in combat operations, particularly in rugged terrain and hostile conditions.

HISTORY OF THIS AIRCRAFT

When the U.S. Marines replaced their Seahorses with the Boeing Vertol CH-46 Sea Knight and Sikorsky CH-53 Sea Stallion in 1968, the remaining UH-34s were turned over to the South Vietnamese Air Force (VNAF). This UH-34D was one of those given to South Vietnam. Its unique history was discovered during restoration and the decision was made to restore it as it appeared during its service with the VNAF.

LOCATION: H

Sopwith F.1 (replica)

Camel

MAXIMUM SPEED	140 mph
CRUISING SPEED	115 mph
SERVICE CEILING	21,000 feet
ENGINE	Gnome 9N rotary engine 160 hp.
ENDURANCE	2 hours, 30 minutes
ARMAMENT	2 x .303-cal. Vickers machine guns
CREW	One



Most historians regard the Sopwith *Camel* as the finest British fighter of World War I. A favorite of many English aces, thanks to its amazing maneuverability, a skilled pilot could quickly make a kill.

Building upon the success of earlier fighter designs, the nimble *Camel* was the primary Allied fighter of the final years of the war. Nearly 6,000 of the type were produced by Sopwith and several sub-contractors.

Designer Herbert Smith intended these planes to be faster and more heavily armed than the earlier Sopwith fighters yet remain highly maneuverable. The aircraft had two.303-caliber Vickers machine guns mounted in the cowl, firing forward through the propeller disc. A fairing surrounding the gun installation created a hump that led to the airplane's nickname, *Camel*.

The *Camel* entered service with both the Royal Navy Air Service (RNAS) and Royal Flying Corps (RFC) in the spring of 1917. Within two weeks of receiving their first F.1 aircraft, No. 4 (Naval) Squadron downed a pair of German bombers over the Belgian coast—the first of a record 1,294 aircraft shot down by the *Camel*. The RNAS also operated the *Camel* 2 F.1, a purpose-built naval version of the standard F.1

By the end of 1917, the RFC had deployed *Camel*s to France, Italy and in Home Defense units in England. In this role, specially modified F.1s patrolled the night skies over England to fight German Zeppelins and bomber aircraft.

In addition to serving with both the RFC and RNAS, *Camel*s also equipped American, Belgian, and Greek units. Perhaps the most well-known *Camel* pilot was Capt. A.R. Brown, a Canadian, who on April 21, 1918 is reputed to have shot down Baron Manfred von Richthofen, the famous "Red Baron."

HISTORY OF THE MUSEUM'S AIRCRAFT

Mr. John D. Rinaldi, owner of a steel fabrication shop in Eugene, Oregon started construction of this replica in 1989. A life-long World War One aviation enthusiast, but not a licensed pilot, Rinaldi was determined to construct an exacting replica of a 1917 *Camel* F.1 using original plans and as many original components as possible.

His passion for authenticity led Rinaldi to design and build all his own tooling and construction forms. Unfortunately, with his replica nearly finished, John Rinaldi died in 1999.

Three years later his son, Ron, restarted the project as a tribute to his father and completed building the aircraft on September 3, 2004. It is fitted with an original *Gnome* monosoupape (single valve) 9N rotary engine, a pair of original Vickers machine guns and several original flight instruments. This replica, though airworthy, has never flown. The aircraft is on loan to the Museum from the Rinaldi family.

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LOCATION: H

Taylor Auster-Bullock MK-6

AOP (Air Observation Post)

MAXIMUM SPEED	100 mph
CRUISING SPEED	86 mph
SERVICE CEILING	15,000 feet
ENGINE	De Havilland Gipsy Major 145 hp.
RANGE	300 miles
CAPACITY	Three



The *Auster* was a British military liaison and observation aircraft produced by the Taylorcraft Aeroplanes (England) Ltd. Company during WWII. It was an upgraded model of the Taylorcraft *Model A*, redesigned to meet the British more stringent Civil Aviation standards and was named the Taylorcraft *Plus C*.

The designer, Clarence Gilbert Taylor, a self-taught aeronautical engineer from Nottingham, England, can be called the father of private aviation in America, as he designed the original Taylor *Cub* (later manufactured by Piper) in 1931.

During World War II, light aircraft were used for training, liaison, and observation purposes. Taylorcraft's DCO-65 model was called the L-2 by the US Army Air Forces and served alongside the military version of the Piper *Cub*, the L-4, in World War II.

The robust *Auster I* entered service in August 1942. It performed air observation duties and casualty evacuation roles. It was flown by the Royal Air Force, Royal Canadian and Australian air forces. It also served in the Korean War. A total of 1,604 were built.

The *Auster* was ideally suited. It could operate from ploughed fields, enabling it to keep up with the rapidly moving front lines. Its slow speed allowed it to linger over the battlefield and was also its best defense if attacked by the much faster German fighters. The standard defensive tactic was to fly in tight circles very close to the ground, which made the Auster much harder to hit on a single short pass.

The Auster "K" version designated Mk VI, and in some places referred to as an *Auster 6,* was sold to Australia, Canada, Pakistan and used in Great Britain for military purposes.

HISTORY OF THE MUSEUM'S AIRCRAFT

This aircraft was restored by Mr. Herman Bullock, who first loaned it to the Museum and then donated it in 2012. It is now Museum property.

LOCATION: T

Teledyne Ryan AQM-34N

Firebee

MAXIMUM SPEED	420 mph
SERVICE CEILING	70,000 feet
ENGINE	Teledyne J69-T41A turbojet
RANGE	More than 2,400 miles
WINGSPAN	32 feet
LENGTH	30 feet
WEIGHT	3,830 pounds
CREW	None (unmanned)
SERVICE TIMEFRAME	1952–Present
ACCESSION	ICL2020.001.004



THE MODEL

The Ryan Firebee is a family of jet-powered unmanned aerial vehicles (UAVs) originally developed in the 1950s as a target drone for military training and weapons testing. Produced by Ryan Aeronautical, later acquired by Teledyne and Northrop Grumman, the Firebee evolved into one of the most successful and widely used UAV platforms. The baseline model, designated BQM-34, was designed for use by the U.S. Air Force and U.S. Navy as a high-speed target for air-to-air and surface-to-air missile testing. Over time, the Firebee series expanded into reconnaissance and electronic warfare roles, leading to the development of more than 20 specialized variants equipped with advanced surveillance systems, jamming equipment, and extended endurance capabilities.

One of the most notable variants, the Teledyne Ryan AQM-34N, was developed in the 1960s for high-altitude reconnaissance missions. Derived from the BQM-34, the AQM-34N was optimized for operations above 70,000 feet, enabling it to evade enemy air defenses while capturing critical intelligence. Used extensively during the Vietnam War, it was launched from modified C-130 aircraft and later recovered mid-air by helicopters or via parachute descent. The AQM-34N carried advanced cameras, sensors, and electronic surveillance payloads, making it a valuable asset for strategic reconnaissance and electronic warfare. Its success influenced the development of modern high-altitude UAVs, paving the way for platforms like the RQ-4 Global Hawk.

NOTABLE PEOPLE

T. CLAUDE RYAN

Aviation pioneer and founder of Ryan Aeronautical Company, Ryan played a crucial role in advancing unmanned aerial vehicle (UAV) technology with his company's Firebee series in the early 1950s. Under his leadership, Ryan Aeronautical became a leading innovator in remotely piloted aircraft, laying the groundwork for modern UAV systems.

HISTORY OF THIS AIRCRAFT

Because of the secretive nature of the AQM-34N Firebee's missions, there is no information available on the history of this particular airframe. Restored by Museum volunteers in 2011, this AQM-34N is on loan from the National Museum of the U.S. Air Force.

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LOCATION: HO

Thorp T-18

Tiger

MAXIMUM SPEED	200 mph
CRUISING SPEED	180 mph
SERVICE CEILING	18,000 feet
ENGINE	Lycoming O-360 180 hp.
RANGE	500 miles
CAPACITY	Two



The T-18 is a very historic aircraft. The *Tiger* was designed by John Thorp in 1963 as the first generation, all-metal homebuilt aircraft. The two-place side by side design was first envisioned as an open cockpit, uncowled, simple to build sport plane. The T-18 was the first homebuilt aircraft to fly around the world. It was also the first homebuilt airplane to fly to both the geographic and magnetic north poles.

It was designed to be easily constructed from twelve 4-foot by 12-foot sheets of aluminum. Ribs and fuselage frames were designed to be hand formed with a mallet over plywood form blocks. Simple aluminum angle extrusions are used for stringers and longerons. Thorp aircraft come together much like an Erector set: Pre-punched parts are matched up and Clecoed together so that they can be easily riveted, and large assemblies can be made in no time.

The *Tiger* is strong with excellent take-off and climb performance. The landing gear is a simple "A" frame of heavy wall steel tubing. The engine mount is also attached to the "A" frame so that landing stresses will not be transmitted directly to the fuselage. This landing gear system has proven to be rugged and durable.

The T-18 was the first homebuilt to use the stabilator or all-flying-tail. The stabilator allowed for the horizontal tail surfaces to be as much as 25% smaller than traditional horizontal tail surfaces while having the same pitch effectiveness. This design also incorporates a sliding bubble canopy, like a fighter.

No other homebuilt has done all the things that have been done by this airplane. It is no doubt one of the best designed aircraft in the world. By 2011 over 1600 sets of plans had been sold and 400 examples were flying.

HISTORY OF THE MUSEUM'S AIRCRAFT

This aircraft was constructed by Dr. Robert G. Furrer over a 14-year time span and was donated to the Museum in July 2008.

LOCATION: H

Van’s Aircraft RV-6

MAXIMUM SPEED	196 mph
CRUISE SPEED	187 mph
SERVICE CEILING	19,300 feet
ENGINE	Various – 150 to 180 hp
RANGE	775 miles
RATE OF CLIMB	1,710 feet per minute
CAPACITY	Two



Following a tradition of home building and experimenting in Oregon aviation that began in the 1930s, Richard “Van” VanGrunsven set out in the 1970s to create a high-performance home-built airplane. The result was the RV-3; a sleek, single-seater that was nimble, had great short field performance and was fast.

Recognizing that many people were willing to do their own work to build an airplane like his, Van started offering partial kits and the Van’s Aircraft Corporation was born.

Van's RV series of aircraft, from the single-seat RV-3 to the latest RV-14, are all-aluminum, low-wing monoplanes of monocoque construction. From the RV-3, the design evolved to the RV-4; a two passenger, tandem design, and then because of demand, in 1985, to the RV-6 with side-by-side seating.

While Van was concerned that widening the fuselage to accommodate that arrangement would cause a loss in performance, it turned out that the RV-6 was only three miles per hour slower than the sleeker RV-4. The wider fuselage also allowed for baggage stowage and increased fuel capacity for longer range. Always listening to the input of the pilots and builders, Van’s later added the option for tricycle landing gear and a sliding canopy.

The RV-6 has a rare distinction in the world of kit-built aircraft – as a military trainer. Searching for a suitable aircraft that could be assembled in Nigeria using local labor, the government of that country settled on the RV-6A. Van's produced 60 kits to fulfill the order and these were assembled and test flown in Nigeria, entering service with the Nigerian Air Force in 1989 as elementary training aircraft under the name "Air Beetle".

The RV series of airplanes has been extremely successful, and by the end of 2012, about 8,000 RV kits had been completed and flown, and thousands more were under construction.

HISTORY OF THE MUSEUM’S AIRCRAFT

This aircraft is RV-6 serial number #1 and was retained as an engineering prototype by Van’s Aircraft in Aurora, Oregon. It was refurbished and donated by Richard VanGrunsven himself.

LOCATION: H

Vultee BT-13A

Valiant

MAXIMUM SPEED	180 mph
CRUISE SPEED	140 mph
SERVICE CEILING	21,650 feet
ENGINE	Pratt & Whitney R-985-AN-1 450 hp.
RANGE	725 miles
CAPACITY	Two



The Vultee BT-13 was the intermediate trainer flown by most American pilots during World War II. It was used in the second phase of the three-phase pilot training program. An identical version for the US Navy was known as the SNV and was used to train naval aviators for the Navy, the Marine Corps and the Coast Guard.

After primary training in PT-13, PT-17, or PT-19 trainers, the student pilot moved to the more complex Vultee for continued flight training. The BT-13 had a more powerful engine and was faster and heavier than primary trainers. It required the student pilot to use two-way radio communications with the ground and to operate landing flaps and a two-position controllable-pitch propeller. It had an enclosed cockpit for the instructor and student, integral wing fuel tanks, but it did not have retractable landing gear nor a hydraulic system. The flaps were operated by a crank-and-cable system.

The prototype flew on March 24, 1939, as a cantilever low-wing monoplane of all-metal construction with fabric-covered control surfaces. The first aircraft was delivered to the US Army Air Corps in June 1940.

Once in service, the aircraft quickly got its nickname as "Vibrator." There are several explanations given for this: 1: Because it tended to shake quite violently as it approached its stall speed. 2: During more adventurous maneuvers the canopy vibrated. 3: On takeoff, the aircraft caused windows on the ground to vibrate. 4: The two-position propeller had an irritating vibration in high pitch.

The Navy declared the SNV obsolete in May 1945 and replaced it in the basic training role with the SNJ (AT-6). The Army also replaced the BT-13 with the AT-6 before the end of the war.

Seven thousand and thirty-seven BT-13As were produced. 1,125 units designated BT-13B were then produced; they differed from the -A model in replacing the 12v electrical system with a 24v system.

After World War II, virtually all were sold as surplus for a few hundred dollars each. Many were purchased just to obtain their engines, which were mounted on surplus biplanes (such as Stearmans) to replace their less powerful engines for use as crop-dusters.

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LOCATION: H

The 1903 Wright Flyer (replica)

SPEED	9.8 mph
ENGINE	Taylor-Wright 12 hp.
DISTANCE	852 feet
WEIGHT	605 pounds
CAPACITY	One





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Brothers Orville and Wilbur Wright spent over four years carefully studying and calculating all aspects of flight. They built a wind tunnel, designed, and flew many gliders and analyzed the problems of flight from every angle.

The *Flyer* was constructed of spruce and ash covered with muslin (a cotton fabric of plain weave). The framework “floated” within fabric pockets sewn inside, making the muslin covering an integral part of the structure. This ingenious feature made the aircraft light, strong, and flexible. It was powered by a simple four-cylinder engine of the Wrights’ own design.

To fly the airplane, the pilot lay prone with his head forward, his left hand operating the elevator control. Lateral control was achieved by warping the wing tips in opposite directions via wires attached to a hip cradle mounted on the lower wing. The pilot shifted his hips from side to side to operate the mechanism, which also moved the rudder.

The right wing was four inches longer than the left to compensate for the heavy engine being mounted to the right of the pilot. The wings were rigged with a slight droop to reduce the effects of crosswinds.

On December 17, 1904, with Orville as pilot, their airplane was launched down a rail and flew for 12 seconds for 120 feet (about the distance from the Goose’s float to the fuselage) into a 27-mph wind. This is considered to be the first powered, controlled, and sustained airplane flight in history: the aircraft flew forward without losing speed and landed at a point as high as that from which it started. Three more flights were made that day, with Orville and Wilbur alternating as pilots. The longest flight, with Wilbur at the controls, was 852 feet and lasted 59 seconds.

The Smithsonian Institution refused to give credit to the Wright Brothers for this historical event. Instead, they honored the former Smithsonian Secretary, Samuel Pierpont Langley, whose 1903 tests of his own *Aerodrome* were unsuccessful.

In 1925, Orville attempted to shame the Smithsonian into recognizing his accomplishment by threatening to send the *Flyer* to the Science Museum in London. The threat did not have its intended effect and the *Flyer* went on display in the Museum in 1928. During the Second World War, it was moved to an underground vault 100 miles from London where England’s other treasures were kept safe during the conflict.

In 1942 the Smithsonian Institution published a list of the Curtiss modifications to the *Aerodrome* and a retraction of its long-held claims for the craft. The next year, Orville agreed to return the *Flyer* to the United States. It stayed at the Science Museum until a replica could be built for exhibition in London. Since 1949 the Smithsonian has displayed the original *Flyer* as the world's first piloted powered airplane.

HISTORY OF THE MUSEUM'S AIRCRAFT

This replica was built by Century Aviation of Wenatchee, Washington. It was constructed from plans provided by the Smithsonian National Air and Space Museum. The Wright Brothers destroyed the original plans for fear their design might be copied by their rivals.

The engine on this craft is a non-functioning, detailed replica of the original Wright and Taylor 12-horsepower machine flown on December 17, 1903.

LOCATION: H

Yakovlev Yak-50

MAXIMUM SPEED	200 mph
CRUISING SPEED	124 mph
SERVICE CEILING	26,600 feet
ENGINE	Vadeneyev M-14P 360 hp.
RANGE	288 miles
CAPACITY	One



The Yak-50 was designed by Sergei Yakovlev, son of the famed Soviet designer Alexander Sergeevich Yakovlev, of the Yakovlev Design Bureau. Sergei designed several successful aircraft, one being the Yak-3, one of the prominent fighters of WW II. Though the Yak-50 was never introduced directly into the Russian Air Force, it was used to train Soviet pilots through state-sponsored aviation clubs. It was also used to train pilots of several other nations.

Powered by a single Vadeneyev (Ivenchenko) 14P nine-cylinder, air-cooled radial engine rated at 360 hp., the Yak-50 emerged as a complete redesign, but with a similar configuration to that which preceded it, the Yak-18. Put into series production in 1975 as a metal skinned semi monocoque airframe, the Yak-50 was smaller, lighter and featured a revised wing section to enhance inverted flight.

It first achieved fame at the World Aerobatic Championships in 1976 where it carried the Soviets to first, second and third places in the men's division as well as the top five places in the women's division. In the 1978 and 1982 Championships, it again proved its capabilities with similar top finishings. Altogether the Yak-50, along with its predecessor, the Yak-18, set over 50 European and world acrobatic records.

The introduction of the Yak-50 coincided with a much more brutal way of competition flying with remarkably high G. Yak-50s were being flown at plus 11 G or more, which led to four airframe failures. Consequently, Yakovlev produced a series of airframe modifications.

Today, Yak-50s provide the looks, flying qualities and performance of a WW II fighter, together with a relative economy of operation (10 gallons an hour at economical cruise.) For those who lust after a piston-engine fighter, but are unable to afford $500,000 or more, the Yak-50 is the obvious answer. The price varies according to age and hours on the original aircraft. Moreover, the operating costs of the Yak-50 are very affordable when compared to more modern type aerobatic and sport aircraft.

HISTORY OF THE MUSEUM'S AIRCRAFT

Build in 1983, this Yak-50 was used as a standby aircraft for the Soviet National Aero Team. In 1991, air show performer Bill Reesman purchased this aircraft for his aerobatic act, "YAK ATTACK." In 1993, Reesman changed his aerobatic act to "MiG Magic", and the Yak 50 was placed on display at the Oregon Air and Space Museum in Eugene until October 2001 when it found a home here at the Museum.