From the Avenger torpedo bomber, a stalwart from *Intrepid*’s World War II service, to the A-12, the spy plane from the Cold War, this collection reflects some of the GREATEST ACHIEVEMENTS IN MILITARY AVIATION.
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- Bombers / Attack
- Fighters
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BOMBERS/ATTACK

The basic mission of the aircraft carrier is to project the U.S. Navy’s military strength far beyond our shores. These warships are primarily deployed to deter aggression and protect American strategic interests. Should deterrence fail, the carrier’s bombers and attack aircraft engage in vital operations to support other forces.

The collection includes the 1940-designed Grumman TBM Avenger of World War II. Also on display is the Douglas A-1 Skyraider, a true workhorse of the 1950s and ‘60s, as well as the Douglas A-4 Skyhawk and Grumman A-6 Intruder, stalwarts of the Vietnam War.
GRUMMAN/EASTERN AIRCRAFT
TBM-3E AVENGER
TORPEDO BOMBER

First flown in 1941 and introduced operationally in June 1942, the Avenger became the U.S. Navy’s standard torpedo bomber throughout World War II, with more than 9,836 constructed. Originally built as the TBF by Grumman Aircraft Engineering Corporation, they were affectionately nicknamed “Turkeys” for their somewhat ungainly appearance.

In 1943 Grumman was tasked to build the F6F Hellcat fighter for the Navy. To meet the war-time production quotas for both aircraft types the manufacturing of the Avenger was moved to the former automotive facilities of General Motors near Trenton, New Jersey. Under the Navy’s designation system at the time, the Avengers produced by General Motors’ Eastern Aircraft Division were therefore designated TBMs.

Avengers were the heaviest single-engine aircraft to fly during World War II (1939–1945) and served on Intrepid throughout the war. In the

FAST FACTS

LENGTH

40ft 11.5in

HEIGHT

15ft 5in

MAX WEIGHT

17,893 lbs

TOP SPEED

253 mph

WINGSPAN

54ft 2in

This aircraft is on loan from the National Naval Aviation Museum at Pensacola, Florida. The Mark 13 torpedo is on loan from the U.S. Navy.

Avengers were considered to be extremely rugged. In February 1945, this Avenger suffered major damage to the top of the fuselage and left wing by anti-aircraft fire over the Japanese help island of Chichi Jima. The severely damaged aircraft flew 100 miles back to its ship, the USS Bennington (CV-20). After crash landing in the water, all crew members were rescued. Photo: Naval History & Heritage Command, NH 89380

Pacific theater, Avengers participated in the sinking of many of the most powerful warships in the Japanese fleet. Avengers from Intrepid participated in the sinking of the super battleships Yamato and Musashi.

The standard crew on the Avenger included the pilot, a radioman in the lower compartment, and a gunner that manned an electrically powered rotating ball turret, which housed a single .50 caliber machine gun. Besides its primary mission of attacking targets with torpedoes, the Avenger was also a very capable dive bomber and medium-to-high altitude level bombing aircraft.

Perhaps the most famous Avenger pilot was President George H. W. Bush who flew from the escort carrier USS San Jacinto (CVL-30) in 1944. Despite aircraft damage and the loss of both his crewmen, Bush successfully attacked the Japanese radio station on the strategic central-Pacific island of Chichi Jima, before parachuting to safety over the sea.

Outstanding reliability and load-carrying capacity made the Avenger ideal for fighting forest fires. Between 1958 and 2012 military surplus Avengers continued to fly in the forests regions of New Brunswick, Canada as water and fire retardant bombers. Avengers did not serve this function in the United States because federal law requires firebombers to have two or more engines.
DOUGLAS XBT2D-1 DAUNTLESS II (AD-1 SKYRAIDER)

CARRIER-BASED ATTACK AIRCRAFT

The Skyraider is a single-seat, carrier-borne attack bomber designed, but not flown, during World War II (1939–1945). It applied the operational lessons learned from the wartime service of Curtiss Helldivers and Grumman Avengers. The Skyraider served in the Korean War (1950–1953) and in the Vietnam War (1955–1975).

The Skyraider served at a time when jet-powered aircraft were taking over the attack duties. The piston-engined Skyraider seemed like a throwback to an earlier age of military aviation. It earned the nickname “Spad,” after the rugged French airplane from World War I (1914–1918).

Power was provided by the Wright R-3350 Duplex-Cyclone radial engine, one of the most powerful radial engines produced in the United States at

![DOUGLAS XBT2D-1 DAUNTLESS II (AD-1 SKYRAIDER)](image)

This aircraft is on loan from the National Museum of the Marine Corps.
At that time, it had 18 cylinders in a twin-row configuration and was supercharged for improved performance.

The Skyraider was not designed to be a dogfighter, so air-to-air combat was rare. However, on October 9, 1966, in the most famous mission involving an *Intrepid* Skyraider, Lt. (j.g.) William T. (Tom) Patton shot down a MiG-17 over Vietnam. This victory was an unusual instance where a propeller-driven airplane prevailed over a jet-powered fighter.
DOUGLAS
A-4B (A4D-2) SKYHAWK

CARRIER-BASED ATTACK AIRCRAFT

In the early 1950s, the U.S. Navy sought a jet-powered replacement for the large, piston-engined AD-1 Skyraider. Noted aircraft designer Edward Henry “Ed” Heinemann and his team at Douglas Aircraft Company designed the versatile A-4 Skyhawk.

The Skyhawk’s key feature was its small delta-shaped wing. With a span of only 27.5 feet [8.4 m], the wings did not require folding for hangar deck storage. Eliminating heavy and complex wing-folding mechanisms saved weight. All ordnance, as well as extra fuel, was carried externally on racks under the wings and central fuselage. The Skyhawk could also be configured as a “buddy tanker.” Carrying extra fuel tanks and a central pod with a retractable hose system, the Skyhawk refueled other aircraft in flight.

Seven different squadrons flew Skyhawks from Intrepid during its three combat deployments to Vietnam between 1966 and 1969. Typical missions

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**FAST FACTS**

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This aircraft is on loan from the National Naval Aviation Museum in Pensacola, Florida.
for the Skyhawk included lightly armed surveillance and heavily loaded strikes on strategic targets. Some large strikes on high-priority targets, called alpha strikes, included aircraft from multiple aircraft carriers, which flew in coordination with U.S. Air Force bombers. On these missions, some of the Skyhawks served as flak suppressors. Flak suppressors attacked the anti-aircraft emplacements around the primary target rather than the target itself.

The A-4B Skyhawk displayed here flew with attack squadron VA-95 during Intrepid’s first deployment to Vietnam in 1966. It has been restored to its original appearance.
GRUMMAN
A-6E INTRUDER

CARRIER-BASED ALL-WEATHER ATTACK AIRCRAFT

The first version of the A-6 Intruder entered fleet service in 1963 as the world’s first all-weather attack aircraft. It was capable of operating at night and in all conditions. The Intruder required more sophisticated bomb targeting systems than other attack aircraft, such as the Douglas A-4 Skyhawk. A second crew member, the weapons system officer, operated the Intruder’s targeting systems. The crew members sat side by side in the large cockpit.

The Intruder carried 18,000 pounds (8,165 kg) of ordnance, almost as much as the largest heavy bombers of World War II (1939–1945). The Intruder had no internal armament. All weapons were carried externally on four pylons mounted on the wings and one pylon mounted on the centerline under the fuselage. All external attachments were capable of carrying fuel tanks.

This aircraft is on loan from the National Naval Aviation Museum in Pensacola, Florida.
In 1966, during the early stages of Operation Rolling Thunder in Vietnam, the U.S. Navy experimented with jungle camouflage on aircraft. The green colors were similar to the U.S. Air Force’s practices, but their effectiveness was inconclusive. The paint schemes were short-lived in Navy service. Photo: U.S. Navy National Museum of Naval Aviation, 1996.253.7030.018

Grumman A-6A Intruders of attack squadron VA-196 from USS Constellation (CVA-64) drop a large load of 500-pound (227-kg) bombs on strategic targets over North Vietnam in late 1968. Photo: U.S. Navy National Naval Aviation Museum, NNAM.1996.253.7047.013

Grumman built a total of 687 Intruders. Ninety of them were converted to in-flight refueling tankers. Intruders were used extensively throughout the Vietnam War (1955–1975) and flew from the new larger supercarriers. The Intruder was too large and heavy for use aboard smaller Essex-class carriers like Intrepid.

The attack aircraft versions of the A-6 were retired in 1997. A variant used for electronic countermeasures, the EA-6B Prowler, will remain in service until 2019. The Intruder on display is one of a handful of existing A-6Es. In 1988, it was used to test prototypes of new, more sophisticated radar and avionics.
FIGHTERS

To most visitors, the fighter aircraft represent the epitome of military aviation. The characteristics of a great fighter are speed, agility and superior firepower. These attributes are essential to its functionality and the mystique in air-to-air combat.

The Museum’s collection of fighters is wide ranging and represents an evolution of U.S. Navy fighter design, from the 1950’s North American FJ-3 Fury and McDonnell F3H Demon, to the supersonic Vought F-8 Crusader of the 1960s. Also represented are the formidable opponents to Intrepid pilots during the Vietnam War, the Soviet-designed Mikoyan-Gurevich MiG-17 and MiG-21.
North American Aviation, builder of the famed P-51 Mustang propeller-driven fighter aircraft, built the XFJ-1 Fury for the Navy. It conducted carrier trials on Intrepid’s sister ship USS Boxer in 1948. The Air Force ordered a modified swept-wing version of the Fury that became famous during the Korean War (1950-1953) as the F-86 Sabre.

After the success of Sabres, the Navy ordered a carrier-based version of the F-86, the FJ-2, which incorporated an arresting hook and reinforced landing gear for carrier landings, folding wings for easier storage, and four 20mm cannon. This new aircraft was quickly superseded by the purpose-built FJ-3. The “dash 3” version had a more powerful jet engine and other performance improvements. By 1957, 21 carrier-based fighter squadrons were equipped with the FJ-3, including one assigned to Intrepid.

**Fast Facts**

- **Length**: 37ft 7in
- **Height**: 13ft 8in
- **Max Weight**: 21,024 lbs
- **Top Speed**: 681 mph
- **Wingspan**: 37ft 1in

This aircraft is on loan from the National Naval Aviation Museum in Pensacola, Florida.
FJ-3s were originally equipped with movable high lift devices on the wing leading edges called slats. These slats were abandoned in later production aircraft and replaced with a fixed leading edge extension on each wing. These leading edge extensions enlarged the wing area and provided usable interior space that was used to accommodate an additional 124 gallons of fuel. Many earlier production FJ-3s were retrofitted with this extended wing leading edge.

Between 1957 and 1960, several FJ-3s were modified to serve as drone control aircraft. These Furies were used during the testing program of the Vought SSM-N-8 Regulus missiles. The Regulus was an early type of submarine and ship-launched cruise missile that carried a nuclear warhead. A Regulus is on display on the Museum’s Growler submarine.

During the mid-1950s, the U.S. Navy developed a mirror system to replace the paddle-waving Landing Signal Officer in guiding a pilot’s approach to a carrier landing. The first mirror landing was made by Cdr. Robert D. Dose on August 22, 1955, when he landed his FJ-3 aboard USS Bennington (CV-20).

The FJ-3 Fury displayed here is painted in the colors of fighter squadron VF-33, which flew from Intrepid in 1957 during a NATO exercise codenamed “Strikeback.”
The Demon was a swept wing all-weather fighter equipped with both cannons and air-to-air missiles. Ordered in 1949, the first flight of the prototype took place on August 7, 1951. It was designed and built by the McDonnell Aircraft Corporation (now Boeing) of St. Louis, Missouri. It was primarily intended to counter the Russian’s new swept-wing fighter, the MiG-15, which was being supplied to North Korea.

The early 1950s was a period of rapid design growth and experimentation in airframes and engines. Initially, the Demon was powered with a single Westinghouse J40 jet engine. The J40 never lived up to expectations in both power-output and reliability, and was deemed totally unacceptable by the U.S. Navy. Demons were then redesigned to accept the Allison J71 jet engine, delaying the type’s entry into service until 1956 and thereby missing the Korean War (1950–1953). The J71 was an improvement but performance still never lived up to expectations.

This aircraft is on loan from the National Naval Aviation Museum in Pensacola, Florida.
However, the pilots that flew it took great pride in the aircraft and called themselves “Demon Drivers.” The maintenance crews shared this pride and referred to themselves as “Demon Doctors.” The Demon remained in service until 1964.

In addition to the internally mounted 20mm cannons, Demons were fitted to carry AIM-9 Sidewinder and AIM-7 Sparrow air-to-air missiles. Two 262-gallon drop tanks could also be carried, extending the aircraft’s range. Though never used in actual combat, the Demon was deployed during the Cold War (1949–1990) when a show of force was required.

Most notably, the Demon was a design link to its eventual replacement, McDonnell’s phenomenal F-4 Phantom II which became operational in 1960. The Phantom II started as a major redesign of the Demon, adding a second engine and aerodynamic refinements that would allow it to reach speeds of 1,500 mph (2,414 kph). Though the Phantom II is a vastly superior airplane but the family resemblance to the Demon is unmistakable.

Three fighter jets in flight, circa 1959 and all from McDonnell Aircraft, illustrate the evolution of design. The F3H-2 Demon, in the center, is flanked by the older F2H-3 Banshee at top and a new F4H-1 (F-4) Phantom II at bottom. Photo: U.S. Navy National Museum of Naval Aviation, 1996.253.7250.027

The Demon has large broad wings that provide generous lift at low speed for safe carrier landings while giving the aircraft smooth handling at high speeds and altitudes. Photo: U.S. Navy National Museum of Naval Aviation, 1996.253.7257.033
MIKOYAN-GUREVICH / PZL-MIELEC
MiG-17 / LIM-5
(NATO CODE NAME FRESCO)

FIGHTER

The MiG-17 built on the success of the Soviet MiG-15 in the Korean War (1950–1953). The single-seat MiG-17 fighter had thinner wings that swept back more sharply, a longer fuselage and a redesigned tail. The Klimov VK-1 engine also had an afterburner, which allowed for greater speed and improved handling. Variants of the MiG-17 served in approximately 20 air forces worldwide. More than 6,000 examples were fabricated by the Soviet Union alone until production ended in 1958.


This aircraft is on loan from the National Naval Aviation Museum in Pensacola, Florida.

**FAST FACTS**

- **LENGTH**: 36ft 6in
- **HEIGHT**: 12ft 5in
- **MAX WEIGHT**: 31,379 lbs
- **TOP SPEED**: 711 mph
- **WINGSPLAN**: 31.5ft

This aircraft is on loan from the National Naval Aviation Museum in Pensacola, Florida.
MiG-17’s “Silver Swallows” and the camouflaged versions “Snakes.” The first squadron of pilots received training in the People’s Republic of China; others received training in the Soviet Union.

Late in the war, a handful of MiG-17s were modified to carry bombs for use in anti-shipping strikes. One mission was launched against the U.S. Navy. Two MiG-17s attacked a U.S. destroyer and a light cruiser, causing minimal damage and no casualties.

This aircraft is a Polish-built PZL-Mielec Lim-5, painted in the same camouflage as a MiG-17 of the North Vietnamese Air Force.

North Vietnamese MiG-17 pilots walk past their aircraft during the Vietnam War. The MiG-17 was the first modern jet in the North Vietnamese Air Force. Photo: U.S. Air Force 110330-F-DW547-006

Underside view of an Egyptian aircraft. Photo: Department of Defense, DF-ST-85-03637
The F11F Tiger was a supersonic, carrier-based fighter jet developed in the 1950s for the U.S. Navy. The Tiger’s fuselage implemented an aerodynamic principle called the area rule. The pinched-waist shape of the fuselage made the airplane narrower in the middle and wider forward and aft. This special shape reduced drag and enabled the Tiger to attain supersonic speed.

Tiger production was short-lived. Only 201 examples were built between 1954 and 1958. Newer designs with superior performance made the Tiger obsolete as a frontline fighter. By 1959, Tigers began to be relegated to training and reserve squadrons.

Grumman developed an improved Tiger with a more powerful engine. Only two prototypes of the F11 F1F Super Tiger were built. The Super Tiger

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<tr>
<td>47ft</td>
<td>13ft</td>
<td>23,459 lbs</td>
<td>727 mph</td>
<td>31ft 7in</td>
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This aircraft is on loan from the National Naval Aviation Museum in Pensacola, Florida.
set speed and altitude records, but engineers questioned the structural strength of the aircraft, and the project was canceled.

The Tiger continued to serve in another way. The Navy’s flight demonstration team, the Blue Angels, flew Tigers from 1957 through 1968. The airplane on display served as Blue Angel number 5 from 1961 through 1963. It was flown by just one pilot, Lt. Lew Chatham.

During a Tiger test flight in September 1956, a Grumman pilot shot himself down. During a dive, he caught up to his own cannon fire, which damaged his plane. The pilot survived the ensuing emergency landing.

Tigers were flown from Intrepid from 1959 through 1960.
VOUGHT (F8U) F-8K CRUSADER

CARRIER-BASED FIGHTER

The Crusader was the first supersonic fighter designed for service on an aircraft carrier. It was the fastest aircraft ever flown from Intrepid. Popular with U.S. Navy and Marine Corps pilots, the Crusader saw extensive combat during the Vietnam War (1955–1975). It served primarily as an escort fighter, protecting ground attack aircraft from North Vietnamese MiG fighter jets.

The most innovative feature of the Crusader was the variable-incidence wing. The entire wing pivoted up to seven degrees. This capability provided greater flight control at low speeds and improved visibility for the pilot during carrier landings. The Crusader was the last Navy fighter designed with internally mounted cannons. For this reason, Crusader pilots like to call themselves the “Last of the Gunfighters.”

FAST FACTS

- LENGTH: 54ft 3in
- HEIGHT: 15ft 9in
- MAX WEIGHT: 29,000 lbs
- TOP SPEED: 1,322 mph
- WINGSPAN: 35ft 8in

This aircraft is on loan from the National Naval Aviation Museum in Pensacola, Florida.
During the Vietnam War, Intrepid participated in Operation Rolling Thunder (March 1965–November 1968), an aerial bombing campaign against North Vietnam. Intrepid’s primary mission was to bolster the ground attack. Fighter aircraft like the Crusader were deployed in small units of four aircraft, called detachments. Detachments of fighter squadron VF-111 flew Crusaders from Intrepid during its second and third deployments to Vietnam.

On September 19, 1968, Intrepid pilot Lt. Tony Nargi fired a Sidewinder missile from his Crusader and shot down a North Vietnamese MiG-21. The Crusader on display is painted to look like the airplane flown by Nargi.
The F-8 Crusader RAT

The F-8K Crusader has a backup power source for its engine-driven hydraulic pumps and electrical generators. The ram air turbine, or RAT for short, generates power from the airstream while the aircraft is in flight. The RAT is a small wind turbine mounted to a hinged access panel on the right side of the aircraft. It is installed internally but can be deployed by the pilot when needed. The RAT on this Crusader had been sealed over for initial museum display. The Aircraft Restoration team exposed the mechanism during the last repainting and corrosion control cycle and it can now be deployed and used in education and tour guide programs.
MIKOYAN-GUREVICH
MiG-21PFM (FISHBED F)

FIGHTER

The single-seat MiG-21 entered service in 1959. It was the Soviet Union’s first Mach 2 fighter. Powered by a Tumansky turbojet, this small delta-wing fighter was built in greater numbers than any other fighter aircraft since the Korean War (1950–1953). Approximately 13,000 were constructed by the Soviet Union and licensed by other countries. The MiG-21 has flown in 56 air forces—more than any other fighter—and has been involved in more conflicts than any other aircraft in history.

During the Vietnam War (1955–1975), the North Vietnamese Air Force was first supplied with the modern MiG-21 by the Soviet Union in April 1966. U.S. forces felt the impact immediately, as losses soon increased. The MiG-21 lacked long-range radar but proved to be a dangerous adversary when flown by experienced pilots. Using a ground-based control system, the North Vietnamese employed high-speed hit-and-run attacks against

**FAST FACTS**

- **LENGTH**: 51ft 8in
- **HEIGHT**: 13ft 5in
- **MAX WEIGHT**: 20,723 lbs
- **TOP SPEED**: 1,385 mph
- **WINGSPAN**: 23ft 5in

This aircraft is a gift from the Polish people to the Intrepid Sea, Air & Space Museum.
formations of U.S. bombers. The MiG-21 intercepted strike groups and was effective in downing U.S. aircraft or forcing them to jettison their bomb loads before reaching the target.

The MiG-21 threat exposed shortcomings in the training of U.S. pilots. As a direct response, the U.S. Navy created the Navy Fighter Weapons School, known as Top Gun, in March 1969. The objective of the school was to teach aerial dogfighting techniques and tactics and return the advantage to U.S. pilots.

This MiG-21 PFM fighter flew with the Polish Air Force’s Tenth Fighter Interceptor Regiment, which was charged with the defense of Warsaw. This aircraft is similar to those used by North Vietnam. It is painted to represent a MiG-21 of the 921st Fighter Regiment of the North Vietnamese Air Force.
MULTIROLE

Since World War II, advancements in performance and complexity have made aircraft more costly. In addition, aircraft carriers can accommodate a limited number of aircraft, so single-purpose types compete for deck space. The best compromise are multiple-mission types. Today, multirole types, which have continuously evolved since the 1940s, are the norm. Designers incorporated functional capabilities giving new types a dual purpose.

The collection represents six decades of evolution. It includes the Grumman F9F Cougar, McDonnell Douglas F-4 Phantom II, Grumman F-14 Tomcat, Israel Aircraft Industries Kfir, British Aerospace AV-8C Harrier, and General Dynamics F-16 Falcon.
GRUMMAN
F9F-8 (AF-9J) COUGAR
CARRIER-BASED FIGHTER

At the end of World War II (1939-1945) jet powered aircraft technology was just beginning to come to the forefront of fighter plane design. The Grumman Aircraft Engineering Corporation developed a jet-powered fighter for the US Navy, the straight-winged F9F Panther. The Panther was slower and less maneuverable than its main adversary during the Korean War (1950–1953), the Soviet designed, swept-wing MiG-15. Aircraft that used the swept back wing design proved to be faster and more maneuverable. The Navy asked Grumman for a swept-wing modification of the F9F Panther design, with the result being the F9F-6 Cougar. This was soon followed by the much improved F9F-8 version.

The first Cougars were delivered in November 1951 but they never saw combat in Korea. The Cougar was far superior to its straight-winged predecessor the Panther and became such a successful design that total of 1,988 were built.

**FAST FACTS**

- **LENGTH**: 44ft 5in
- **HEIGHT**: 12ft 3in
- **MAX WEIGHT**: 24,763 lbs
- **TOP SPEED**: 714 mph
- **WINGSPAN**: 34ft 6in

This aircraft is on loan from the National Naval Aviation Museum at Pensacola, Florida.
In addition to the four AIM-9 Sidewinder air-to-air missiles, the Cougar carried external fuel tanks under the wings that extended its cruising range to 1,363 miles (2,193.5 km). All versions of the Cougar had the inflight refueling probe extending from the tip of the nosecone. Photo: National Naval Aviation Museum, 2011.003.286.037

The Cougar was a versatile design and different versions were used for a variety of missions. An unarmed reconnaissance version had a specialized nose cone that replaced the 20mm cannons with cameras. Others were adapted to carry early versions of the Sidewinder air-to-air missiles. The last of the Cougar variants, an advanced two seat trainer version, remained in service until 1974. All versions had the inflight refueling probe extending from the tip of the nosecone.

This Cougar was built at Grumman’s Bethpage, New York factory and delivered to the Navy in 1955. It served with fighter squadrons VF-111 and VF-94 at Moffett Field in California. In 1957, it was transferred to Naval Air Training Center in Kingsville, Texas. The aircraft wears the colors of fighter squadron VF-61, the Jolly Rogers, which flew from Intrepid in 1956.

This aircraft was retired from active service in 1965 and loaned to the town of Wall Township, New Jersey where it was displayed at a children’s playground called Airplane Park. The aircraft was restored by Intrepid Museum staff in 2011 and many of the children that played on it, now adults, were present for the roll-out ceremony. The park in Wall Township still bears the name, Airplane Park.
Although developed for the U.S. Navy, the Phantom was one of the first fighters to be adopted by multiple armed services. Because of its speed and maneuverability, the Phantom was extraordinarily popular with pilots. More than 5,000 were produced and flown by American and foreign armed forces.

Originally, the Phantom did not carry guns or cannons. Designers felt confident that cannons were unnecessary because the Phantom would carry longer-range Sparrow III and shorter-range Sidewinder missiles for air-to-air combat. The Phantom’s close encounters with North Vietnamese MiGs during the Vietnam War (1955–1975) sometimes proved them wrong. These experiences laid the groundwork for the next generation of dogfighters, such as the F-14 Tomcat and F/A-18 Hornet, which were designed with internally mounted cannons.

This aircraft is on loan from the National Naval Aviation Museum in Pensacola, Florida.
The Phantom attained legendary status during the Vietnam War. It served with U.S. Air Force, Navy and Marine Corps squadrons, but it was too large and heavy for use aboard smaller Essex-class carriers like Intrepid. The actual air-to-air success rate of the Phantom is unclear. Both sides make vastly different claims regarding victories and losses. The U.S. Navy officially claims 40 victories to 7 losses in air-to-air combat. On May 10, 1972, pilot Lt. Randy Cunningham and radar intercept officer Lt. (j.g.) William Driscoll shot down three North Vietnamese MiG-17 fighters. These victories, combined with two previous kills, made Cunningham and Driscoll the first aces of the Vietnam War.

This Phantom served with Marine squadron VMF-323 on combat standby during the failed Iranian hostage rescue mission of April 24, 1980. The aircraft is painted
BRITISH AEROSPACE
AV-8C HARRIER

LIGHT ATTACK/CLOSE AIR SUPPORT AIRCRAFT

Vertical/Short Take-Off and Landing aircraft, called “VSTOL”, are considered a crucial asset on the modern battlefield. The ability for aircraft to fly from improvised runways or from small ships offers a tactical advantage. Likewise, an aircraft with the ability to convert vertical lifting power to high-speed horizontal flight, while carrying a useful payload, is extremely desirable. Very few aircraft have achieved this feat; the Harrier accomplished all of this.

The Hawker Siddeley Aviation (now British Aerospace) Harrier was the result of 10 years of research, testing and refinement. The Harrier uses vectored-thrust from a single engine to take off, hover, maneuver and fly forward at high speeds. The Rolls-Royce Pegasus turbo-fan engine, buried within the wide fuselage, has its thrust diverted to four ducts, two on each side, forward and aft below the wing. These ducts rotate in unison from

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| MAX WEIGHT         | 25,200 lbs | 50 ft
| TOP SPEED          | 730 mph | 11 ft
| WINGSPAN           | 25 ft 3 in |

The Harrier is on loan from the National Museum of the Marine Corps.
an angle of 0° for forward level flight, to 90° for vertical hovering flight. The ducts can actually be rotated forward beyond vertical to 98°, allowing the aircraft to fly in backwards. Small nozzles in the nose, tail, and wing tips use thrust that is tapped off the main engine to control the aircraft attitudes of pitch, yaw, and roll while hovering or translating between vertical and horizontal flight.

The Harrier GR Mk. 1 first flew on December 28, 1967 and was first used in combat by the British Royal Navy during the Falklands War in 1982. The U.S. Marine Corps realized the Harrier’s potential much earlier than this and purchased 110 AV-8A Harriers from England in 1970–1971. These aircraft were updated with a radar warning receiver, a chaff-dispensing countermeasures system and structural upgrades, extending the types service life. These modified Harriers were re-designated AV-8C and re-entered service in May 1979.

U.S. Marine Harrier units suffered an appalling accident record during the first decade of use with the loss of 55 aircraft to peacetime mishaps. Improved training procedures led to a drastic reduction in losses.

The aircraft on display is dedicated to Cpt. Manuel Rivera, USMC. Rivera flew
GRUMMAN F-14D SUPER TOMCAT

CARRIER-BASED FIGHTER/INTERCEPTOR

The F-14 Tomcat was the U.S. Navy’s first-line fighter from 1972 to 2006. It is perhaps the most widely recognized of all Navy fighters thanks to its starring role in the 1986 film *Top Gun.*

The Tomcat has distinctive variable-sweep wings. In full forward position, the wings provided the lift needed for slow-speed flight—essential for landing on an aircraft carrier. In swept-back position, the wings blended into the aircraft and gave the F-14 Tomcat a dart-like silhouette for supersonic flight.

The F-14 was specifically designed to carry the AIM-54 Phoenix missile. Powerful onboard targeting systems allowed a single Tomcat to simultaneously fire up to six Phoenix missiles at six different targets, at ranges exceeding 100 miles. Navy Tomcats flew combat missions during the Gulf War and missions over Iraq and Afghanistan from 2001 until its retirement in 2006.

FAST FACTS

- **LENGTH:** 62 ft 9 in
- **HEIGHT:** 16 ft
- **MAX WEIGHT:** 74,350 lbs
- **TOP SPEED:** 1,544 mph
- **WINGSPAN:** 64 ft

This aircraft is on loan from the National Naval Aviation Museum in Pensacola, Florida.
The only other nation to use the Tomcat was Iran. The aircraft were supplied prior to the Islamic Revolution in 1979. Accurate statistics are not available, but the Iranian military claims that Tomcats were highly successful in combat against Iraqi forces during the Iran-Iraq War (1980–1988). Iranian Tomcats were known to be engaged in war against the Islamic State (formerly known as ISIS or ISIL) as recently as November 2015.

The aircraft on display was the seventh Tomcat built by Grumman. It served as the prototype for all improvements to the series.
In the early 1960s, the Israeli Air Force was equipped with the French built Dassault Mirage III fighter jet. The Mirage III was an excellent air-to-air fighter but lacked the ground attack capabilities the Israelis required. At the request of the Israeli Air Force the French designed a new version dubbed the Mirage V, but a French arms embargo in the wake of the Arab-Israeli Six Day War (1967) halted the aircraft’s delivery. Israel launched a special operation to create its own fighter. By acquiring technical details through industrial espionage, the Israelis created the Nesher, an unlicensed version of the Mirage V. The Nesher saw action in the Yom Kippur War in 1973.

By 1975 an improved version was deployed powered by a license built General Electric J79 jet engine, the same engine used in the American F-4 Phantom. This new aircraft was named Kfir, meaning “lion cub” in Hebrew. On June 27, 1979 the Kfir saw action near the port of Sidon in Lebanon.

The aircraft on display is a gift of the Government of Israel to the Intrepid Sea, Air & Space Museum. Its tail carries the markings 144 Squadron of the Israeli Air Force as well as VF-43 of the U.S. Navy and VMFT-401 of the U.S. Marine Corps.
On that day Kfirs, along with F-15 Eagles, were assigned to cover an aerial attack on terrorist targets. A dogfight with Syrian MiG-21s resulted in five MiGs being shot down, and the Kfir registering its first and only air-to-air victory. Kfirs served in several more anti-terrorists actions and was eventually withdrawn from front line service in 1995.

Twenty-five modified Kfirs were leased to the U.S. Navy and U.S. Marine Corps from 1985 to 1989, for use as “aggressor” aircraft in dissimilar air combat training.

The Kfir C1 received the U.S. Navy designation F-21A. It simulated the most challenging enemies that naval aviators could expect to encounter. Six Kfirs are still in use by Airborne Tactical Advantage Company, a civilian defense contractor that provides tactical adversary training to the U.S. military. Kfirs have also served in the Air Forces of Columbia, Ecuador and Sri Lanka.
The U.S. Air Force learned many operational lessons during the Vietnam War (1964–1975). The most important was a continued need for a small nimble dogfighter with an onboard gun for air-to-air combat. This prompted the development of a new fighter airplane for the U.S. Air Force, the single seat F-16 Fighting Falcon. The F-16 entered service in 1978 and is a single-engine, compact, highly maneuverable fighter. Its frameless bubble canopy affords the pilot unobstructed visibility in every direction. The ejection seat is fixed at an angle of 30 degrees, placing the pilot in a semi-reclined position. This position increases the pilot’s ability to tolerate the physical demands of intense combat maneuvers. Pilots can experience as much as 9Gs, or nine times the force of gravity, on their bodies.

The F-16 is intentionally designed to be aerodynamically unstable. This instability gives the F-16 the capability to execute extreme maneuvers. Traditional aircraft flight controls would not be able to compensate for

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This aircraft is on loan from the National Museum of the United States Air Force.
this instability; therefore positive control is achieved through a sophisticated computer-assisted system called “fly-by-wire”. The F-16 has gone through many upgrades over time and is still in production, now by Lockheed Martin. Due initially in part to its economical maintenance costs, well over 4,500 F-16s have been built and were or are now flown by 27 nations around the world. The F-16’s nickname “Viper” came from a group of pilots who likened the plane to the “viper” fighters in the 1970s science-fiction television series Battlestar Galactica.

In 1991, this F-16A was assigned to the 138th Tactical Fighter Squadron, part of the 174th Tactical Fighter Wing of the New York Air National Guard in Syracuse, NY. The 138th was deployed to the Persian Gulf in support of Operation Desert Storm (1990-1991). This aircraft was flown by Col. Brent Richardson on the first day of Desert Storm. Col. Richardson went on to fly a total of 47 combat missions during the Gulf War in the F-16. This added to his total of 224 combat missions over North Vietnam during the Vietnam War.
Invented during the early days of aviation, helicopters did not attain genuine dependability until the closing days of World War II (1939–1945). Helicopters were introduced in large scale during the Korean War (1950–1953) and used extensively during the Vietnam War (1955–1975). Vertical flight allows helicopters to perform roles like troop transport, medevac, gunships, airborne cranes, air-sea rescue and anti-submarine warfare. The Piasecki HUP Retriever, Bell UH-1A Iroquois, and Sikorsky HRS Chickasaw are historic examples of general support types. The Coast Guard’s rescue workhorse, the Sikorsky HH-52 Seaguard, and the Marine Corps AH-1J Sea Cobra gunship, round out the collection.
Talented aeronautical engineer Frank Piasecki, one of America’s early helicopter pioneers, perfected the use of tandem, or twin main rotors, for helicopters in 1945. His earliest type, the HRP Rescuer, could carry up to 10 passengers and was nicknamed the “Flying Banana” due its elongated and curved shape and the fact that the standard Navy helicopter paint scheme at the time was overall yellow.

Piasecki designed the HUP Retriever specifically for the Navy in 1948. The Retriever was smaller than its predecessor the HRP and carried two pilots and four passengers. Its rotors overlapped, making it compact enough to fit on aircraft carrier flight deck elevators without having to fold the rotor blades. However, the blades could easily be folded in just a few minutes for extended storage in carrier hangar decks.

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</tr>
<tr>
<td>HEIGHT</td>
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This aircraft is the property of the Intrepid Sea, Air & Space Museum.
The Retriever was used for utility duties that included liaison, search and rescue, supply replenishment and for plane guard duty when aircraft carriers were launching or landing aircraft. At the heart of the Retriever was an electric hoist mounted internally above the pilots. A large floor hatch opened below the right side pilot’s seat which needed to be folded up in order to lower the cable from the hoist. This system enabled a pilot to easily lift downed aviators but compromised safety when the right side pilot had to fold up his seat to operate the hatch and hoist. To overcome this shortfall, a basic autopilot system was developed, the first such system ever used on a helicopter. This autopilot system aided the lone pilot in hovering during rescue operations. Retriever production for the U.S. Navy and Army, as well as the Canadian and French navies, totaled 339 helicopters.

The HUP displayed here is painted to resemble one that flew from Intrepid between 1954 and 1961. It was painted with the support of the USS Intrepid Former Crew Members Association.
SIKORSKY HRS (H-19) CHICKASAW

UTILITY HELICOPTER

With the civilian designation S-55, the Chickasaw made its first flight on November 7, 1949. Later versions were developed for the military. The Chickasaw carried a crew of two pilots and up to 10 passengers or 8 stretchers when configured for medical evacuation duties. The flight crew compartment is situated above the engine. Large fuel tanks under the floor enable long, multi-hour flights.

The design introduced innovative solutions to the common problems inherent to helicopters of the day, primarily maintaining balance while carrying a load. Placing the heavy engine in the front ahead of the cockpit allowed for a large cargo area directly in line with the main rotor and center of gravity. This gave the Chickasaw a substantial internal payload carrying capability as well as the ability to lift externally slung cargo without upsetting the balance of the aircraft. This engine location also gave easy

---

**FAST FACTS**

- **MAX WEIGHT**: 7,500 lbs
- **TOP SPEED**: 101 mph
- **ROTOR DIAMETER**: 53ft
- **LENGTH**: 42ft 4in
- **HEIGHT**: 13ft 4in

This aircraft is the property of the Intrepid Sea, Air & Space Museum.
maintenance access to the 700 horsepower Wright R-1300-3 radial engine through two large clam-shell doors.

During the Korean War (1950–1953) U.S. Marine Corps HRSs pioneered the use of helicopters in warfare. For the first time in history, helicopters participated in major assaults and troop supply missions. The every first of these missions on September 13, 1951 would see nearly 19,000 pounds (8,618 kg) of ammunition and supplies delivered to an embattled Marine division in just 3 hours. A week later, 224 Marines and 18,000 pounds (8,164 kg) of cargo would be rushed to the front line using HRSs during “Operation Summit,” the first ever helicopter-borne landing of a combat unit in history.

Civil versions of the Chickasaw were the first helicopters to be used by commercial services in Europe in 1952–53 and, soon after, by American carriers. A total of 1,281 Chickasaws were produced for military use, designated HRS by the U.S. Navy and Marine Corps, H-19 by the U.S. Army and Air Force, and HO4S by the U.S. Coast Guard. Several hundred were built for commercial customers, and 447 were license-built in England, France and Japan.

On July 9, 1953 New York Airways establish regular service between the three major New York metropolitan area airports, becoming the first scheduled helicopter airline to carry passengers in the United States. Service was later expanded to include the Heliport at West 30th Street on the Hudson River, just several blocks from the location of the Intrepid Museum. Photo: Collection of Ed Coates
BELL
UH-1A IROQUOIS (HUEY)

UTILITY HELICOPTER

The UH-1’s official name is Iroquois, following the U.S. Army tradition of using Native American names for helicopters. However, it is more commonly known by the nickname “Huey,” which stemmed from the original designation HU, later UH-1.

The Huey was the first Bell helicopter equipped with a turbine engine. It first flew in 1955 and entered military service in 1959. The Huey first saw combat in the Vietnam War (1955–1975) in 1962. It served as a troop transport and life-saving medevac helicopter. Later in the war, the Huey was adapted to serve as an armed assault helicopter, used to protect troop transports and ground combat support.

Because the Huey was used throughout the Vietnam War, it is considered the most iconic aircraft of the conflict. It served with all branches of the U.S. armed forces. The U.S. Navy used the Huey as an armed escort during the

FAST FACTS

LENGTH
38ft 5in

HEIGHT
12ft

MAX WEIGHT
9,500 lbs

TOP SPEED
141 mph

ROTOR SPAN
44ft

This aircraft is the property of the Intrepid Sea, Air & Space Museum.
war. When flown alongside small river patrol boats, the Huey’s primary role was to deny use of inland waterways to the Viet Cong, the Communist rebels in South Vietnam. The rugged helicopter survived Viet Cong ambushes, rescued trapped soldiers and civilians, and intercepted enemy watercraft loaded with weapons and supplies.

This Huey is one of the original 182 “A” models. It is believed to be one of only two still in existence.
In 1962, the U.S. Coast Guard selected a modified commercial helicopter, the Sikorsky S-62 as a replacement for its older H-19 Chickasaw and H-34 Choctaw helicopters, then used for search-and-rescue operations. The S-62’s development time and costs where significantly reduced because it utilized many already proven and reliable parts, such as rotors and gearboxes, from these predecessors. The S-62, which the Coast Guard named HH-52A Seaguard, has the distinction of having rescued over 15,000 people in a twenty-six year career, more than any other helicopter in the world to date.

The Seaguard was the Coast Guard’s first turbine-powered helicopter. It used a single General Electric T58 jet engine, or gas-turbine, which was extremely reliable. It was the first gas-turbine certified by the FAA for civilian helicopters. The underside is shaped like a boat hull and was watertight. This and partially retractable landing gear in the two side mounted

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This aircraft is the property of the Intrepid Sea, Air & Space Museum.
floats, called sponsons, made the Seaguard fully amphibious. The Seaguard was also equipped with several other features unique to the search and rescue role, including a folding platform along the side of the fuselage and an external hydraulic winch mounted above the large side door. The aircraft was capable of deploying rescue swimmers, and lifting survivors from the water or the decks of ships even in severe weather conditions. A total of 99 aircraft of this version were built.

Igor Sikorsky was noted for his development of large, multi-engine aircraft in Russia during the early 1900s. After immigrating to the United States, he became a noted designer of flying boats for trans-oceanic flights. Later he turned his genius to vertical flight, designing and building the first practical helicopter in the United States, making the first flight in September of 1939.

This particular aircraft is painted as one that was stationed at Floyd Bennett Field in Brooklyn, New York and was donated to the Intrepid Sea, Air & Space Museum by the U.S. Coast Guard.
Bird-brained rescue

During the late 1970s the U.S. Coast Guard tested the idea of using pigeons to aid in open ocean search missions. Their extraordinary vision and superior field of view allowed pigeons to scan large areas faster than a human being. The birds rode in a specially designed pod on the underside of HH-52 helicopters. The pigeons, trained to find brightly colored objects in the ocean, would peck a button in the direction of the object. This action rewarded the bird with a food pellet and alerted the pilot to the direction of the sighting. Testing on helicopters determined that the pigeons spotted targets 90% of the time as opposed to humans finding the target only 38% of the time. In tests where both pigeons and humans spotted the target, the pigeon spotted it first 84% of the time. The program was discontinued in 1981 when advances in ocean searching technology put the pigeons out of a job.
Sea Cobra attack helicopters were based on the successful Bell UH-1 Huey, also displayed on the Intrepid Museum’s flight deck. The Sea Cobra took only six months to develop and made its combat debut during the Vietnam War (1955–1975).

The Sea Cobra has the same turbine engine, transmission and rotor system as the Huey, but the Sea Cobra’s fuselage was redesigned and streamlined. Tandem seating placed the pilot behind and above the gunner. The three-barreled cannon, located in a chin-mounted turret under the gunner, was devastating when used against ground targets. Marine Corps “J” variants of the Sea Cobra had twin engines and carried larger guns than the U.S. Army Cobras did. Marine aviators welcomed the additional firepower and appreciated the greater safety provided by the two jet engines.

**FAST FACTS**

- **LENGTH**: 44ft
- **MAX WEIGHT**: 9,979 lbs
- **HEIGHT**: 13ft 6in
- **TOP SPEED**: 219 mph
- **ROTOR SPAN**: 44ft

This aircraft is on loan from the National Museum of the Marine Corps.
The first AH-1J Sea Cobras were deployed to South Vietnam for combat evaluation in February 1971. The new attack helicopter proved invaluable while escorting CH-53 heavy-lift helicopters and during fierce fighting along the Ho Chi Minh Trail in Laos.

Short winglets on either side of the fuselage functioned as pylons for a variety of weapons, including the TOW missile. TOW stands for a tube-launched, optically tracked, wire-guided missile.

The Sea Cobra on display here is a veteran of Operation Desert Storm. This Sea Cobra was the last flying "J" model to be retired. It made its final landing on Intrepid on October 29, 1993, flown by Maj. Warren Fox, USMC, of Marine Aircraft Group 42.

The U.S. Marine Corps adapted the AH-1J Sea Cobra for varied mission requirements. It was a potent ground attack helicopter, and it protected itself from other aircraft by using the AIM-9L Sidewinder air-to-air missile, seen here mounted on the weapons pylon. Photo: US Navy National Museum of Naval Aviation, Photo No. 1996.488.022.045

The U.S. Army also used a version of the Sea Cobra attack helicopter. Shown here is an AH-1G, a single-engine version flown by the 334th Helicopter Company of the 145th Aviation Battalion in South Vietnam in 1969. Photo: United States Army Heritage and Education Center
Possibly the most important component of modern warfare is information—especially the knowledge of the capabilities and intentions of potential adversaries. Intelligence gathering comes in many forms but the eye-in-the-sky remains one of the most reliable. What amounts to a high-tech game of “cat and mouse,” rivals will continuously develop more sophisticated methods of concealment, while inventing better ways to monitor the opponent. The Lockheed A-12, a product of Project Oxcart in the late 1950s, is still the record holder for speed. The Grumman E-1B Tracer introduced technologies that are still used in follow-on generations of carrier-borne early warning aircraft.
In 1954, the U.S. Navy began to develop a carrier-based aircraft that would provide early-warning surveillance and airborne control functions for the fleet. The result was the Grumman E-1B Tracer. The most distinctive feature of the Tracer was the radome, the aerodynamic structure over the wing. The radome concealed a massive dish-type radar system called the APS-82, which had a search radius of 250 miles (402 km).

The Tracer was a derivative of the Grumman S-2 Tracker anti-submarine aircraft and C-1 Trader transport aircraft. The Tracer had a deeper fuselage, which accommodated a crew of radar operators. It also had a new tail unit, with twin fins and rudders, and a central fin to support the radome.

Flying above a carrier task force, the Tracer and its crew of four provided an electronic bird’s eye view of the surrounding airspace. The radar extended the view of the task force hundreds of miles over the horizon. Detachments

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**FAST FACTS**

- **LENGTH**: 51ft 8in
- **HEIGHT**: 13ft 5in
- **MAX WEIGHT**: 20,723 lbs
- **TOP SPEED**: 1,385 mph
- **WINGSPAN**: 23ft 5in

This aircraft is on loan from the National Naval Aviation Museum in Pensacola, Florida.
of two Tracers along with aircrews and supporting personnel were deployed on Intrepid for operations off the coast of Vietnam. Tracers provided F-8 Crusaders with information on enemy MiG fighter activity and monitored alpha strikes over North Vietnam.

The Tracer entered service in 1958 and served aboard Intrepid until the ship’s retirement in 1974. The Tracer remained in service with the fleet until 1976 when it was replaced by Grumman E-2 Hawkeyes.
Prior to 1962 the E-1B Tracer’s official designation was WF-2. The “W” stood for airborne early warning, the “F” was the code for the Grumman Corporation. Crews who flew and maintained the WF-2 called it the “Willy Fudd,” an obvious play on the designation WF. This was usually shortened to just “Fudd.” Another nickname comes from the Tracer’s similarity to the S2F Tracker, anti-submarine aircraft. Pilots and crewmen of the Tracer slurred the term S2F into one simple word, pronounced as Stoof (rhymes with spoof). Since the basic airframe of the Tracer was similar to the S2F “Stoof,” the nickname evolved into “Stoof with a roof,” the roof being the large structure above the fuselage that housed the search radar.
LOCKHEED A-12

HIGH-SPEED RECONNAISSANCE AIRCRAFT

The A-12 was the product of Project Oxcart, a secret military program to develop a high-speed, high-altitude reconnaissance aircraft. First flown in 1962, the A-12 was built by Lockheed’s Advanced Development Projects office, now known as Skunk Works. The A-12 was capable of performing sensitive intelligence-gathering missions while flying at speeds over Mach 3, or three times the speed of sound. The Central Intelligence Agency (CIA) used A-12s for surveillance missions until 1968. Later versions, known as the SR-71 Blackbird, served in reconnaissance and test missions for the U.S. Air Force and NASA through the 1990s.

Flown by CIA pilots, the A-12 was used for strategic reconnaissance over North Vietnam between May 1967 and March 1968. Its primary objective was to look for suspected surface-to-surface missile (SSM) sites. Evidence of SSM facilities was never found, but the A-12 did determine the location...

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<tr>
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This aircraft and its starter cart are on loan from the National Museum of the United States Air Force.
of many surface-to-air missile (SAM) sites and other strategically important targets. In total, A-12s were flown on 24 missions over Hanoi and the port city of Haiphong. SAMs were fired at the A-12s on two occasions. Other than some minor shrapnel damage to one aircraft, the A-12s survived unscathed.

The A-12 on display, code-named Article 122, served as a radar-test example early in 1962 at the secluded test site known as Area 51, near Groom Lake, Nevada. A special radar signature, lowering paint covered the mostly titanium airframe, also incorporated radar-absorbing materials. Massive Pratt and Whitney J58 turbo-ramjet engines powered the plane. These engines were used only in the A-12 and the SR-71 Blackbird.

The adjacent yellow starter cart used a connecting drive shaft to spin the engines at up to 3,200 revolutions per minute and initiate the ignition cycle of the turbo-ramjet engines. The cart uses two Buick 401 cubic-inch “Wildcat” V-8 automobile engines of 350 horsepower, similar to those used in American “muscle cars” and racing cars of the era.
The Pueblo Incident

Some historians argue that the A-12 can be credited with preventing a war. In January of 1968, the government of North Korea captured a U.S. Navy surveillance ship, the USS Pueblo, in what they claimed to be their territorial waters. A-12s were already in the region conducting reconnaissance missions over North Vietnam. Three missions would be flown over North Korea between January 26th and May 6th of 1968. These missions gathered important information regarding the location of the captured ship and its imprisoned crew. More importantly, the photographic data showed that the North Korean military was not mobilizing for a feared retaliatory ground assault on the South. This information averted the need for a preemptive military strike and allowed for a diplomatic solution and the release of the Pueblo crew. The ship however remains in North Korea to this day.
Learning to fly fulfills the ambitions of many would-be aviators. For many pilots, their favorite aircraft is often their first, the one that taught them basic mastery of the air. The term “trainer” evokes images of slow, forgiving, easy-flying aircraft. True to some extent but many trainers, like the Northrop T-38 Talon, are capable of supersonic flight and high G-force maneuvers. The Italian Aermacchi MB-339 can instantly change from its basic role as a jet trainer to formidable ground attack aircraft. Rounding out the collection is the Beech T-34 Mentor, which has trained new aviators for more than six decades.
**BEECH T-34 MENTOR**

**BASIC TRAINER**

The T-34 Mentor is a military basic flight training aircraft developed from the Beech Aircraft Company’s famous four seat civilian light-plane, the Model 35 V-tailed Bonanza. The Bonanza first flew in 1945 and production aircraft were delivered in 1947. Its all-metal construction, retractable landing gear and speed made the plane popular for the higher-end general aviation market.

Company founder Walter Beech speculated that the military would need a new trainer and developed the Model 45 as a private venture, without a direct request from the military. The Bonanza’s wide four-passenger cabin was replaced with a narrower fuselage and a two seat dual-control cockpit, placing the student and instructor in tandem, one behind the other. The Model 45 was also structurally stronger to withstand mild aerobatics and the rigors of student pilots in training. Beech’s gamble paid off and after

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The T-34 on display is painted as a T-34B used by the Navy. It is a gift of the Taylor Family in memory and honor of Thomas M. Taylor, 1942–2006.
competitive testing the U.S. Air Force ordered 60 T-34As in 1953. The following year, the U.S. Navy ordered the T-34B version of the trainer. The Navy “B” model had several differences from the Air Force type to better match the systems of the more advanced aircraft that pilots would fly in their Navy career. These differences included differential braking on the main wheels for steering instead of nose wheel steering, and adjustable rudder pedals instead of an adjustable height seat.

In 1978, the Navy upgraded its basic training aircraft to include the T-34C Turbo-Mentor, a turboprop engine version of the Mentor. The Navy’s T-34Bs and Cs continued to serve as basic trainers until 2002. More than 1,900 Mentors were built in the U.S. and under license overseas including 125 in Canada, 173 in Japan and 75 in Argentina. Mentors have trained many U.S. Air Force and Navy pilots as well as military pilots of 21 other countries.

Easily identified with the longer nose which houses a turbo-prop engine, the more advanced T-34C Turbo-Mentor had four underwing weapon pylons. These enabled the aircraft to carry 1,200 pounds (540 kg) of practice weapons such as flares, incendiary bombs, gun pods and small rockets. Photo: U.S. Navy, ID 050622-N-5329B-017
In the mid-1950s, the Northrop Corporation developed a small supersonic fighter that could be operated from the U.S. Navy’s escort carriers. The Navy abandoned the use of these outdated ships in favor of larger supercarriers so the Navy had no need for the small fighter. Meanwhile, nations allied with the United States during the height of the Cold War (1947–1991) wanted the latest in military equipment. Northrop began developing a lightweight fighter for this export market. At the same time, the U.S. Air Force wanted a new supersonic jet trainer. Northrop demonstrated that a smaller design, using two small jet engines, was more economical than the larger types produced by other manufacturers. The resulting T-38A Talon met the needs of the export market and the U.S. Air Force and went into service in 1961 and still serves today.

The Talon proved to be reliable and highly maneuverable. It was adopted by the Air Demonstration Squadron of the U.S. Air Force, better known as the

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<td>12,500 lbs</td>
<td>858 mph</td>
<td>25ft 3in</td>
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Thunderbirds. Between 1974 and 1981, Talons flown by the Thunderbirds thrilled millions of air show enthusiasts around the world.

The Talon was the primary training jet at the U.S. Naval Test Pilot School. It has also been used by the air forces of Germany, Portugal, Turkey and the Republic of China.

NASA has used the Talon since the beginning of the manned spaceflight programs in the early 1960s. The Talon was primarily used for astronaut proficiency training, aerial photography and crew transport, and as a flight-test chase plane.
AERMACCHI
MB-339
JET TRAINER

First flown in 1976, the MB-339 was designed to meet the training requirements of the Italian Air Force. The two-seat aircraft allows pilots to develop their skills before moving up to more advanced frontline aircraft. The MB-339 has a simple and sturdy design. These qualities make it an ideal training aircraft and a stable weapons platform, effective in training pilots to manage air-to-ground munitions delivery systems. Armed with a wide range of guns, missiles, rockets and bombs on six underwing hard points, the MB-339 can be deployed in a light attack role against ground targets.

The MB-339 is powered with a single Rolls-Royce Viper MK 632 turbojet engine. Over 220 of these aircraft are in service today with air forces around the world. The latest version of the MB-339 is used to train European pilots destined to fly the more sophisticated Eurofighter.

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This aircraft is a gift from the Italian government to the Intrepid Sea, Air & Space Museum. The Italian Air Force dedicated the aircraft in memory of Lt. John Miglio, a Frecce Tricolori pilot who died in a training accident in February 1985.

Photo: Liam Marshall
The MB-339 displayed here is shown in the colors of the Frecce Tricolori [Tricolored Arrows], the aerial demonstration team of the Italian Air Force. Established in 1961, the Frecce Tricolori is one of the only aerobatic teams in the world that uses 10 aircraft at the same time in its air shows.

The MB-339AP is an advanced combat trainer of the Peruvian Air Force. It has modernized flight controls, advanced avionics and space for addition fuel in the tanks mounted on the wing tips. Photo: Sergio de la Puente
In 2012, the Intrepid Museum welcomed Enterprise to its new home in the Space Shuttle Pavilion on the flight deck. Enterprise’s arrival was a major milestone in the history of the Museum. Nowhere else can visitors experience a spacecraft, listed on the National Register of Historic Places, displayed atop an aircraft carrier, itself a designated National Historic Landmark. NASA’s orbiter fleet numbered six in all and Enterprise was the first. It was used to test the concept of a reusable spacecraft that could land like an airplane. Plans to modify it for spaceflight were never realized. Instead, five other orbiters were built.
ROCKWELL
OV-101 ENTERPRISE

PROTOTYPE SPACE SHUTTLE ORBITER

The orbiter Enterprise rolled out of its assembly building in Palmdale, CA in 1976. It was the prototype for all shuttle orbiters to follow. Its most significant contribution to the shuttle program was the Approach and Landing Test program of 1977. The Shuttle Carrier Aircraft (SCA), a specially modified Boeing 747, carried the orbiter aloft. The SCA released Enterprise for a gliding approach, proving the concept of a winged spacecraft returning from orbit could successfully make a conventional runway landing. Enterprise flew five such missions, each lasting only a few minutes; since Enterprise was an atmospheric test vehicle, it did not have the thermal tiles and reinforced carbon-carbon components of the other orbiters. Nor did Enterprise carry larger systems such as engines, radar, and outfitted crew compartment.

This aircraft is the property of the Intrepid Sea, Air & Space Museum.
After flight tests were completed, the rest of the orbiter fleet were constructed and missions to orbit began in 1981. *Enterprise* was originally considered for upgrading to orbital capability, but this plan was abandoned when it was determined it was structurally heavier than the other vehicles. *Enterprise* was used for ground tests after the disasters of the shuttles *Challenger* (1986) and *Columbia* (2003). However, most of its career has involved static display, from the Paris Air Show in 1983 to the New Orleans World's Fair in 1984, and from 1985–2011 where it was part of the National Air and Space Museum's collection at the Udvar-Hazy Center in Chantilly, VA.
No other aircraft met Concorde’s specifications for altitude and speed. Designers invented new materials and innovative aerodynamic features to create the revolutionary airliner. Concorde was the benchmark of luxury airline service. Passengers enjoyed inflight amenities such as gourmet food, wine and champagne. Best of all, they arrived at their destination in half the time of conventional airliners. The Museum’s Concorde, Alpha Delta, set a world speed record for passenger in 1996, flying from New York to London in 2 hours, 52 minutes and 59 seconds. This record still stands today.
Concorde was the most specialized aircraft ever used for commercial passenger service. It flew faster and higher than other commercial aircraft.

The aircraft was developed under an Anglo-French treaty signed in November 1962. It was jointly manufactured by Aérospatiale in France and the British Aircraft Corporation in the United Kingdom. The name Concorde, which means harmony or union, reflects the cooperation of the two nations on the groundbreaking project. Air France and British Airways started commercial operations with Concorde in 1976. The aircraft remained in service until its retirement in 2003.

Reaching an altitude of 60,000 feet (18,288 m), Concorde flew at over two times the speed of sound, or 1,350 miles per hour (2,170 kph). At this speed, it could fly from London to New York City in just over two hours.

Concorde is on loan from British Airways.
Passengers enjoyed the finest in personal service during their high-speed journey.

Photo: Adrian Meredith, concordephotos.com

The Jubilee flight, celebrating the 50th anniversary of the coronation of Queen Elizabeth II on June 4, 2002.

Photo: Adrian Meredith, concordephotos.com

At the high angle of attack required for takeoff and landing, the forward half of the wind screen retracted, and the entire nose section tilted downward to give the pilots a better view. Photo: Adrian Meredith, concordephotos.com

At supersonic speed, Concorde made the trans-Atlantic flight from New York to London in about three hours—less than half the time of conventional jetliners, even to this day.

This particular aircraft, G-BOAD, was nicknamed “Alpha Delta.” It first flew on August 25, 1976, and served with British Airways until November 2003. Alpha Delta set a world speed record for passenger airliners on February 7, 1996. It flew from New York to London in just 2 hours, 52 minutes and 59 seconds. This record still stands today.
The Museum’s aircraft collection is one of the most varied and unique of all collections in the nation. All our armed services are represented, as well as aircraft from around the world. From the Avenger torpedo bomber, a stalwart from Intrepid’s World War II service, to the A-12, the formidable spy plane from the Cold War, the collection reflects some of the greatest achievements in military aviation. The collection also boasts six helicopters, a Harrier vertical take-off and landing jet, Vietnam War-era fighters, Gulf War veterans, and the famous Concorde SST.

Most of this collection is displayed outdoors and therefore subjected to the damaging effects of adverse weather and forces of natural deterioration. The maintenance and care of the outdoor display aircraft is an enormous challenge. The process of preservation can be as easy as a fresh coat of paint or as complicated as manufacturing entire aircraft components from scratch. The Aircraft Restoration Team, a small staff of dedicated professionals and volunteers, performs most of their work in a 5,000 square-foot hangar, built directly on the ship’s flight deck. The aircraft in our collection cycle through an inspection-repair-repaint process every 5 to 8 years.

The Museum restoration staff applies a range of techniques that have evolved through the years. Each project is unique, but all involve meticulous attention to detail—including precision craftsmanship in sheet metal fabrication and paint application—to maintain an unwavering concentration on the aircraft’s original history.

In addition to the ongoing restoration projects in the hangar, the staff also maintains the rest of the collection on a daily basis. Small repairs, touch-ups, washes and corrosion inspections are performed continuously. This essential work continues year-round and on your next visit, you will likely see our crew diligently working in the aircraft restoration hangar on the flight deck.
The Intrepid Sea, Air & Space Museum is a non-profit, educational institution featuring the legendary aircraft carrier Intrepid, the space shuttle Enterprise, the world’s fastest jets and a guided missile submarine. Through exhibitions, educational programming and the foremost collection of technologically groundbreaking aircraft and vessels, visitors of all ages and abilities are taken on an interactive journey through history to learn about American innovation and bravery.

The Intrepid Museum fulfills its mission to honor our heroes, educate the public and inspire our youth by connecting them to history through hands-on exploration while bridging the future by inspiring innovation.