

The National Naval Aviation Museum

By Robert G. Waldvogel



The birth of naval aviation at Pensacola started with the establishment of a seaplane base with tent hangars in 1914. (Naval History and Heritage Command)



By the end of WWI the base had expanded with more permanent facilities stretching over a mile along the coastline and staffed by almost 6,000 officers and enlisted personnel. (Naval History and Heritage Command)

No single facility can more thoroughly trace the historical development of U.S. naval aviation and the diverse, ever-advancing aircraft that were integral to it than the National Naval Aviation Museum in Pensacola, Florida, located at the very Naval Air Station Pensacola where it all began.

Naval Air Station Pensacola

Because of its dual advantages of the harbor and the abundant timber resources for shipbuilding, President John Quincy Adams and Secretary of the Navy Samuel Southard elected to construct a Navy yard on the southern tip of Escambia County in 1825 on a Pensacola Bay site, which, four years earlier, had been established as a naval squadron support location for operation in the Gulf of Mexico and the Caribbean.

Construction, commencing in 1826, soon demonstrated the value of the facility, whose wet basin, floating dry dock and building capability, gave birth to the stream frigate, the *USS Pensacola*, which was instrumental in two major Civil War battles — the Battle of Mobile Bay and the Battle of New Orleans.

However, the base's strength was subsequently tested in 1862, when Confederate troops captured New Orleans and demolished it and again in 1906 when a hurricane and tidal wave destroyed what had proven to be a valiant and resilient effort to rebuild. The Pensacola yard was itself decommissioned five years later.

Nevertheless, the Navy's aviation arm was literally waiting to take flight and became an integral part of its traditional water realm.

After civilian pilot Eugene Ely landed on the makeshift wooden deck erected atop the cruiser *USS Pennsylvania* moored in San Francisco Bay in 1911 in his Curtiss Model D Pusher biplane, complete with arresting hook, the Navy Department witnessed the possibilities of this extension to ocean-plying ships. They urged Congress to include a provision for aeronautical development.

Toward this end, Captain W.I. Chambers contracted for three fledgling aircraft and pilots, including one from the Wright Brothers and two from Glenn H. Curtiss.

Aviation's capabilities, through demonstration, were immediately apparent: an aircraft was successfully catapult-launched in 1912 and its aerially scouting capabilities, evidenced during experiments the following year, helped assure its position in the Navy.

Prior to the outbreak of WWI, an aviation training station, the first of its kind in the U.S., was established in 1914 on the site of the abandoned Navy yard in Pensacola. The initial facility, manned by nine officers and 23 mechanics, encompassed eight aircraft and 10 beach-erected tent hangars, each water-accessed by a wooden ramp.

When WWI's match was finally lit, personnel dramatically increased — to 163 enlisted men and 38 naval aviators who flew a 54-strong fleet.



Entrance to the National Naval Aviation Museum is guarded by a Grumman F-14 Tomcat. (NNAM)

“Naval aviation has...been at the cutting edge of aerospace expeditions, from the first successful crossing of the Atlantic by an aircraft, exploration of the Arctic and Antarctic, and journeys of discovery into outer space,” according to the National Naval Aviation Museum’s website. “The common denominator for those who participated in this exciting history was their training in a sleepy little southern city on the Gulf of Mexico -- Pensacola, Florida, the site of the nation’s first naval air station. Since 1914, it was here that the fledglings tested their mettle against the demands of flying aircraft. They learned the unique skills required to fly from ships at sea, find distant targets and return to their moving, rolling, and pitching ‘airfield,’ often in bad weather and frequently at night.”

By the close of WWI, the station had swelled to include 438 officers and 5,538 enlisted men, and its size had exponentially increased. Indeed, its wooden and steel hangars, housing seaplanes, dirigibles, and free kites, stretched a solid mile down the beach.

Although activity significantly decreased after the armistice was signed, long-term expansion was always envisioned. An auxiliary field, named in honor of Lt. Cmdr. V.M. Corry, Pensacola’s 23rd flight student, was constructed five miles northwest of the current station.

The expansion of the cadet training program initiated in 1935 continued. Saufley and Ellyson fields were respectively

added to the roster in 1935 and 1941.

Their need was once again mandated by war — in this case, WWII — and when President Franklin D. Roosevelt stipulated 126,000 aircraft to fight in it, Naval Air Station Pensacola, bursting at the seams, trained 1,100 monthly cadets to fly them.

The dramatic growth from its initial 10 tents to the U.S.’s premier Naval Aviation Center was echoed by Senator Owen Brewster when he stated, “The growth of naval aviation during WWII is one of the wonders of the modern world.”

At its peak in 1944, the station trained 12,010 men who collectively flew some two million hours, and U.S. Naval superiority was reflected by the conflict’s statistics: Navy airplanes shot down 6,444 Japanese planes with a corresponding loss of 450 of their own in a 14-to-1 ratio.

Paralleling technological advances, pure-jet types were integral to the training syllabus in 1948, after the Naval Air Basic Training Command (NABTC) relocated its headquarters from Corpus Christi, Texas, to Pensacola.

The Korean and Vietnam conflicts continued the need for pilot training, resulting in 6,000 aviators between 1950 and 1953 and 2,552 in 1968 alone being processed through NAS Pensacola.

“NAS Pensacola today has myriad activities, including the headquarters and staff of the Chief of Naval Education and Training,” according to the museum’s website; “Training Air Wing 6 and subordinate squadrons; Naval Aviation Schools



Diagram for the current primary building of the National Naval Aviation Museum. (NNAM)

Command; Center for Naval Technical Training; Center for Information Dominance; Marine Aviation Training Support Group; Naval Air Technical Training Center; Naval Operational Medicine Institute; Naval Recruiting Orientation Unit; and the world-renowned Blue Angels Flight Demonstration Squadron. A continuing attraction to the southeast is the National Museum of Naval Aviation.”

National Naval Aviation Museum

The seed for a museum devoted to naval aviation was planted in 1955 when Magruder H. Tuttle, a Navy captain and Chief of Staff to the Commander who had first taken to the skies in Pensacola, identified a deficiency in the training curriculum — there was no information or course that traced the history of this segment of aviation.

Although both time and financial resources were too sparse for a bona fide unit of study, the alternative of creating a small museum was explored, enabling young aviators to attain a sense of pride in the service’s past. Fund raising, to support it, was undertaken by active duty personnel in the Pensacola area, and on December 14, 1962, Assistant Secretary of the Navy, Paul Fay, announced the establishment of the envisioned facility, charging it with the selection, collection, preservation and display of appropriate memorabilia that represented the development and heritage of naval aviation.

While the 8,500-square-foot renovated wood frame building constructed during WWII that housed its initial eight airplanes and opened six months later, on June 8, was modest by any standards, it served as the foundation for a growing collection and expanded facilities, which, throughout the years, never ceased to evolve.

With 37 acres of outdoor grounds and more than 350,000 square feet of internal exhibit space, the National Naval Aviation Museum, located at Naval Air Station Pensacola and accessed by the visitor gate, is the world’s largest devoted to this segment and one of Florida’s most visited attractions. It received the American Association of Museums accreditation in 2002. Although most of the 700 aircraft are displayed in the 11 other official naval facilities throughout the country, the 150 pristinely restored ones in the museum are significantly representative.

“They are biplanes of the Great War, record-setters, experimental platforms, and survivors of epic aerial battles,” according to the museum. “In service they splashed through Pacific swells, slammed down on the pitching decks of aircraft carriers, flew through hails of gunfire, and blasted to the stars.”

“(The museum’s exhibits) seek to capture the human element of the enduring history of naval air power. Each represents a chapter of that story — stirring tales of combat, scientific discovery, technological achievement, and triumphs of the human spirit.”

The importance of naval aviation is not to be underestimated.

“During the twentieth century...few military organizations played a more crucial role than naval aviation,” the museum’s website continues. “In war at sea, eclipsing the battleship as the decisive weapon, aircraft carriers projected their powerful air wings over vast expanses of water, striking with surprise at enemy fleets and land bases, then disappearing with equal swiftness. In times of peace, the carrier and her battle group provided American political leaders a flexible, always-ready and potent way to respond to regional crises wherever and whenever American vital interests were threatened.”

Aside from the aircraft, there are displays of the more than 4,000 uniforms, flight gear, weapons, medals and decorations.

Other exhibits include cockpit sections, simulators and the Emil Buehler Naval Aviation Library, a significant, research-facilitating repository of personal and official papers, squadron records, and some 350,000 photographic images.

For the visitor, there are complementary guided tours; multiple films projected onto the laser-powered, seven-story-high Naval Aviation Memorial Giant Screen Theater, complete with a candy and popcorn counter; two extensive Flight Deck Store gift shops; and the Cubi Bar Café, which replicates the Cubi Point Officers’ Club in the Republic of the Philippines that provided enjoyment for the Navy and Marine Corps squadrons whose ships passed through the Western Pacific. Since it contains the extensive plaque collection that once adorned its Plaque Bar, it is both an exhibit and a restaurant.

The museum consists of its main building, which is subdivided into the South Wing, the West Wing, the Mezzanine and Hangar Bay One.



Curtiss A-1 Triad being tested in San Diego Bay in 1911. (AAHS photo archives, Gerald Balzer collection)

South Wing

Representative of Navy Aviation's beginnings is the lobby ceiling-suspended A-1 Triad that greets visitors as soon as they enter the museum. So designated because of the three environments in which it operated—air (wings), land (wheels) and water (floats)—it was ordered on May 8, 1911, only months after Eugene Ely successfully demonstrated the flexibility of (makeshift) carrier-borne operations. Because it was built by the Curtiss Aeroplane and Motor Company, it became the first in a series of early seaplane designs and facilitated training and experimentation, including the first catapult launch of a winged machine.

Powered by a single, 75-hp Curtiss V-8 engine and able to accommodate both a pilot and a passenger, it had a 28.7-foot overall length and 37-foot wingspan. Its weights increased from its 925-pound empty to its 1,575-pound maximum and speed, even during its incubational time, was a respectable 60 mph.

It proved invaluable for early trials, including those entailing the first night water landing, the testing of wireless communication and the completion of a 112-mile cross-country flight in slightly over two hours. Although several minor accidents never restricted its return to the sky, a major one, on October 6, 1912, took it beyond repair. The A-1 had made 285 flights by then.

The museum's example is one of two replicas built by the

Institute of Aerosciences in San Francisco to commemorate the Golden Anniversary of U.S. Naval Aviation in 1961.

The first era represented in the museum's South Wing is that of WWI.

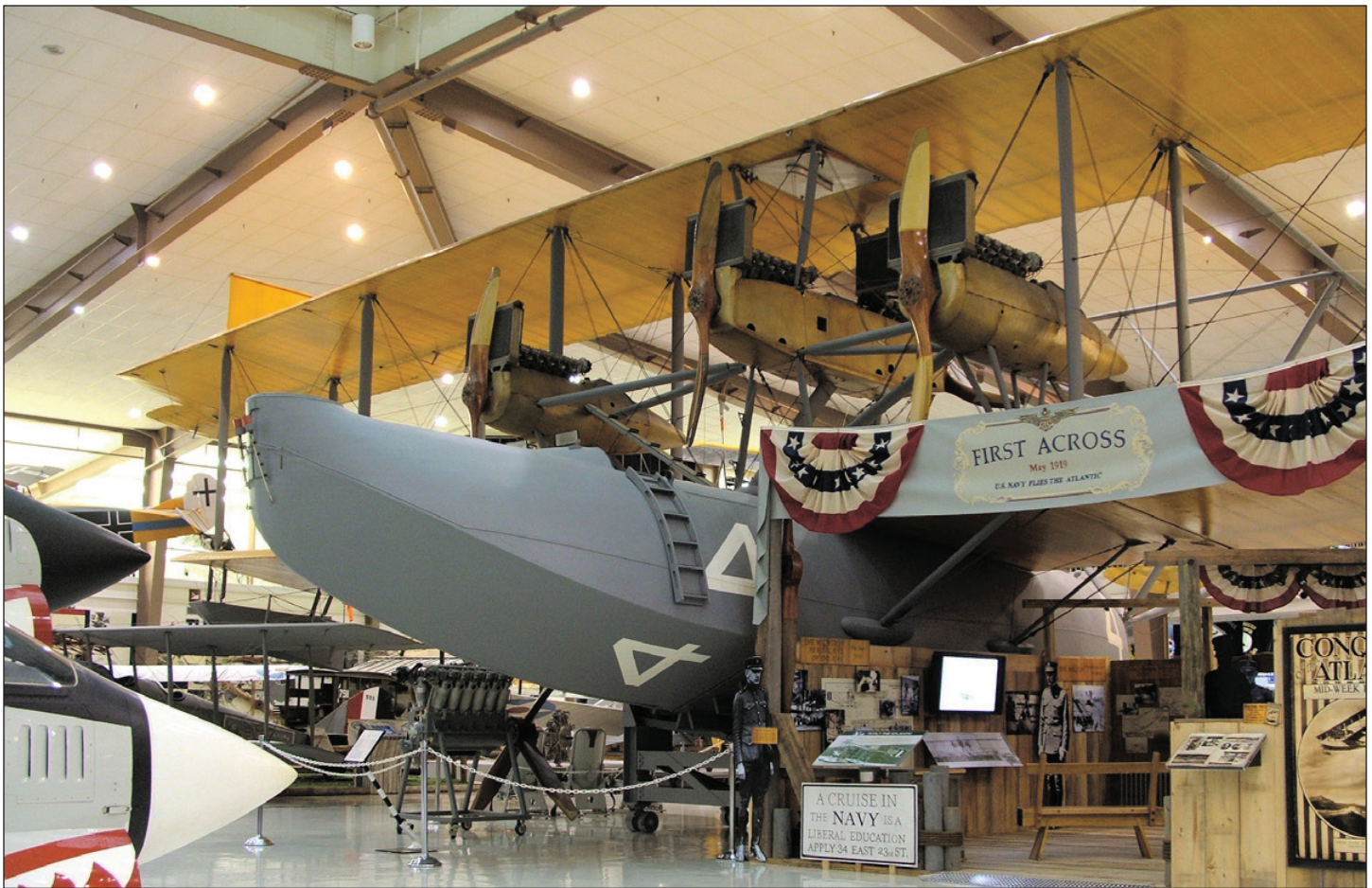
"The WWI exhibit depicts life as an aviator during the Great War," according to the National Naval Aviation Museum's website. "The first Aeronautic Detachment, led by Lieutenant Kenneth Whiting, naval aviator number 16, was the first American combat unit to arrive in France following U.S. entry into the war. Training and serving with foreign aviators, U.S. Navy pilots, both enlisted and officers, entered the fray in myriad roles, but most importantly operated from Naval Air Stations established in the United Kingdom and the continent. From these bases they attacked and damaged a dozen German U-boats and flew as part of the Northern Bombing Group."

There are several significant-era aircraft on display in this wing.

The first of these is the Curtiss MF-Boat. After the A-1 Triad had demonstrated its capabilities to the Navy, Curtiss himself shifted his focus to the design of true flying boats, the first of which, as the C-series, made significant naval aviation contributions.

The AB-3 became the first American military aircraft to fly a combat mission during the Vera Cruz insurrection and the AB-2 was successfully catapult-launched the following year.

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Curtiss NC-4 that made the first crossing of the Atlantic by an aircraft. (NNAM)

Successors were the Navy procured F- and MF-Boats, which respectively accounted for 144 and 102 orders.

The museum's example of the later, constructed at the Naval Aircraft Factory at a \$5,821 cost in 1918 dollars, excluding the engine, introduced hull-jutting sponsons to facilitate training. After its military service, which occurred between 1918 and 1922, the aircraft, powered by a 100-hp Curtiss OXX-3 engine and featuring a 49.9-foot wingspan and 2,488-pound gross weight, was operated civilly, affording passengers aerial tours of Atlantic City.

Another influential aircraft on display is the Hanriot HD-1. Because the British Royal Navy made great strides in operating airplanes from ships during WWI, Navy officers realized that wheel-provisioned designs offered greater speed and capability, resulting in the procurement of several foreign types in order to conduct experiments with them from ship-erected decks.

Of the 26 HD-2 seaplanes obtained, 10 were converted to land-plane configuration and designated HD-1s.

Another European design was the Nieuport 28. Twelve acquired from the Army were equally subjected to carrier-borne trials when they operated from turret-supported wooden platforms installed on battleships. Like other throttle-devoid types of the era, speed was controlled by altering the number of engine cylinders fired by means of a blip switch.

From the 142 Fokker D.VIIs the Army brought back to

the United States as a result of Versailles Treaty stipulations, a dozen were obtained by the Navy in May 1920 to facilitate metal construction study and development. An example is on display in the museum.

Other era aircraft include the Curtiss JN-4 Jenny, the Sopwith Camel, the Curtiss F6C-1 "Hawk," and the Vought VE-7.

Taking center stage and serving as the threshold to the Golden Age of Aviation is the mammoth Navy-Curtiss NC-4 Flying Boat, a biplane of astronomical proportions. Constructed of wood, fabric, and metal, and powered by four 400-hp Liberty 12 engines — of which three were in tractor configuration and the center one was in pusher arrangement — the triple vertical tail design, considered "the mightiest aeroplane of the day," sported a 68.3-foot length and a 126-foot wingspan. Operated by a commander, a pilot, a copilot, a radio operator, and two flight engineers, it had an 85-mph speed, a 4,500-foot service ceiling, and a 1,470-mile range.

Although it was conceived as a long-range anti-submarine warfare platform intended to patrol the European coast in search of German U-boats, it was delivered too late for WWI application. Nevertheless, Commander John H. Towers proposed that it be used to regain American aviation prestige by demonstrating its capability of crossing the Atlantic, a challenge the Navy Department ultimately embraced.

It was not to be achieved alone, however. A triplet of aircraft, designated NC-1, NC-3, and NC-4, departed Naval Air Station Rockaway, Long Island, N.Y., for the dual-stop flight on May 8, 1919. One was forced to land because of engine trouble, while the other two completed the nine-hour sector to Halifax, Nova Scotia, without incident.

Reunited at Trepassy, Newfoundland, the three took off on the evening of May 16 for the actual, 1,200-mile oceanic traverse to the Azores Islands. But cloud and rain closed in until NC-1 and NC-3 were choked from the sky and forced down into the water. The crew of the NC-1 was rescued by a Greek freighter. NC-4 was the only one to reach its destination by air the following day after a 16.49-hour flight. NC-2 also achieved this milestone, but “sailed” the remaining 205 miles to its destination.

Another Golden Age aircraft design on display, although hailing from the following decade, is the Ford RR-5 Tri-motor. Contrasted with the NC-4, it was an all-metal, cantilever monoplane of high-wing configuration.

One of the few museum exhibits that had more commercial than military application with operation by some 100 worldwide airlines, the aircraft, affectionately called the “Tin Goose” because of its corrugated metal construction, traces its origins to the 3-AT designed by William B. Stout. The design was reconfigured into its 4-AT (Navy designations JR-n & RR-n) iteration after Henry Ford purchased the Stout Aircraft Company.

Powered by three, wing- and nose-installed, 450-hp Pratt & Whitney R-1340-88 radial engines, the airliner, which first flew in June of 1926, featured a 77.10-foot wingspan, an 835-square-foot area, and a 13,499-pound maximum weight. Piloted by a crew of two and accommodating up to 15 passengers, it had a 122-mph cruise speed, 505-mile range, and 18,000-foot service ceiling.

Designated XJR-1, the example the Navy ordered was operated between 1928 and 1930 as a passenger and cargo transport, and led to the nine Tri-motors in five versions both the Navy and the Marine Corps flew between 1927 and 1935.

The Ford Tri-motor and the Curtiss-Wright Condor, perhaps predecessors of the Boeing B-247 and Douglas DC-3, spurred significant passenger acceptance and U.S. airline growth during the 1920s.

The museum’s RR-5, powered by three 450-hp, nine-cylinder, air-cooled, supercharged R-985 radial engines, features nine passenger seats. Note the ceiling panel that covers the cabin-traversing wing spar.

Other era, but military designs on display, include the Grumman F3F-2 and the Boeing F4B-4, both of which are biplanes.

Sharing space with these aircraft are numerous designs from the Cold War.

“The main floor of the South Wing is home to the museum’s WWI exhibit and aircraft collections from two great eras of experimentation: the Golden Age of the 1920s and 1930s and the early Cold War of the 1950s and early 1960s,” according to the museum’s website. “During the Golden Age that followed WWI and the record-breaking flight of the NC-4, naval aviation

became a formidable force...just in time for its ultimate test during WWII. The Bureau of Aeronautics was formed in 1921, led by RAdm. William Moffett, and under his leadership, the Navy’s early aircraft carriers were built, aircraft procurement and aviation training expanded, and naval aviation successfully developed into a potent, fleet-deployed weapon of war.”

That did not necessarily happen in a seamless manner, however, since the era was characterized by the technological teething troubles of transition from WWII’s piston-powered fights to the era’s rapid development of high-performance, swept-wing, minimal airfoil-area pure-jets.

One of these links was the McDonnell F2H-4 Banshee, which was developed at the close of WWII and served as a step toward modern carrier-borne aviation. What it lacked in speed, at 532 mph, it excelled in altitude at 44,800 feet.

The North American FJ-2 Fury, the swept-wing, more streamlined successor to the original FJ-1 requested by the Navy in 1951 at the height of the Korean War, was almost 100 mph faster than jet fighters otherwise flown during that conflict. Although it appeared too late for actual combat, it became the first of a long line of Fury versions that served frontline naval squadrons until 1962.

Era-representing Russian designs take form in the museum as the MiG 15. Powered by a single 5,955 thrust-pound VK-1 centrifugal-flow turbojet fed by a nose-mounted air intake, the swept-wing and -tail fighter, with noted airfoil-mounted anhedral, first flew on December 30, 1948. It had a 641-mph speed and almost 50,000-foot service ceiling. Nevertheless, most of those plying Korean skies were shot down by Navy and Marine Corps pilots.

Yet the Chance-Vought F7U-5M Cutlass, based on the *USS Lexington* (CV-16) and first provisioned with Sparrow missiles, experienced growing pains, and the McDonnell F3H-2M Demon never fired an anger-motivated shot and experienced its own development difficulties. Although the swept, foldable wing aircraft, powered by a 10,000 thrust-pound Allison J71-A-2 turbojet, demonstrated superior performance, with a 727-mph speed and a 42,650-foot service ceiling, it served as the foundation of McDonnell’s next fighter, the F4H/F-4 Phantom II.

Capable, but short-lived can describe other era aircraft, such as the Grumman F11F Tiger and the F4D Skyray. Nevertheless, they all led to the development of the Vietnam War’s fighter and attack types, particularly the aforementioned F-4 Phantom II and Chance-Vought F-8 Crusader.

West Wing

Cornerstone of the West Wing is the *USS Cabot* (CVL-28) island, paired with a replica of its flight deck. One of nine light aircraft carriers to have engaged in combat during WWII, it operated fighters and torpedo bombers alongside the large-deck Essex class carriers in the Pacific Theater.

The West Wing is otherwise devoted almost exclusively to WWII.

“Naval aviation and the nation’s greatest test came with the onset of WWII,” according to the museum. “After the Japanese attack on Pearl Harbor on December 7, 1941, the United States was thrust into the global conflict and the Navy took the fore



Grumman F11F Tiger. (NNAM)

in the Pacific War. Naval aviation was a key component of victory, whether in the great carrier battles with the Imperial Japanese Navy, supporting the island-hopping campaign, or combating U-boats in the Battle of the Atlantic. By 1945, the ranks of naval aviation personnel numbered over 430,000 men and women. The museum's WWII exhibit chronicles naval aviation's role through displays mounted along the walls of the West Wing..."

More important, however, are its numerous aircraft.

The first of these is the carrier-based Grumman F4F-3 Wildcat. Designed to succeed the F3F-2, a biplane, it was also envisioned as having a dual-wing configuration, but this was rejected when the Navy ordered the Brewster F2A Buffalo instead, itself a monoplane.

Significantly re-dimensioned and first flying in February of 1939, it was powered, in its F4F-3 guise, by a single 1,200-hp, three-bladed Pratt and Whitney R-1830-76 engine, which, with its 38-foot, single-wing span, gave it an 8,152-pound gross weight, 328-mph speed at 21,000 feet, and 37,500-foot service ceiling. Armament consisted of two 100-pound bombs and six .50-inch machine guns.

Quickly eclipsing the Buffalo it replaced, this rugged monoplane became the premier fighter of both the Navy and the Marine Corps until 1942, enabling them to achieve a nine-

to-one kill ratio over the Japanese, despite the reputation of the A6M Zero it fought. By the war's end, F4F-4 versions had devoured 1,006 enemy aircraft and produced 56 aces of the pilots who had flown them. It became the first in a line of successful Grumman "Cats," including the F6F Hellcat, the F7F Tigercat and the F8F Bearcat, all of which are on display.

Another significant WWII naval aircraft is the Vought-Sikorsky FG-1D(F4U) Corsair. Packaged into a "design solution" to accommodate Pratt & Whitney's new R-2800 Double Wasp engine, yet provide sufficient ground clearance for its three-bladed, 13-foot-diameter propeller, it appeared with a 33.8-foot overall length and 41-foot wingspan, whose inverted gull configuration facilitated the use of a shorter undercarriage strut, yet still afforded the needed clearance.

First flying on May 29, 1940 in XF4U-1 prototype form, it demonstrated a 404-mph speed by the end of the year, which was faster than that of any other U.S. fighter, sparking the Navy's 584-strong order for the type in June of 1941.

Production aircraft differed by introducing a three-foot further aft cockpit to provide additional fuel tankage. They also incorporated pilot armor, self-sealing tanks, and six .50-caliber wing machine guns.

Carrier operations of the type, approved by the Navy in April of 1944, were contingent upon several modifications,



Consolidated PBY-3 with fuselage cutaway below. (NNAM)

which included a raised pilot's seat, a semi-bubble canopy, a stall strip on the starboard wing, stiffened oleo struts, and a raised tail post to improve taxi visibility.

With a 14,670-pound gross weight, it had a 446-mph speed, 41,500-foot altitude, and 1,005-mile range. So much in demand was it, in fact, that it was additionally produced by Goodyear Aircraft and Brewster, respectively designated FG1 and F3A.

Achieving an eleven-to-one kill ratio in WWII and serving as a fighter-bomber during the Korean conflict, it enjoyed a 12,521-unit production run in 18 different versions.

Another significant WWII naval design was the General Motors TBM Avenger. Although this heavy aircraft, powered by a 1,900-hp Wright R-2600-20 piston engine and having a maximum takeoff weight just shy of 18,000 pounds, experienced an inauspicious introduction in the Battle of Midway when five of the six Grumman TBF-1 Avengers assigned to Torpedo Squadron (VT) 8 were shot down and the sixth sustained considerable damage, it would still become the Navy's standard torpedo-bomber throughout WWII, performing glider bombing in close air support, reconnaissance, and light transport duties.

Appearing as the XTBF-1 in 1940 after the Navy ordered an initial 286 units, it was intended to replace the obsolete Douglas TBD Devastator. It first flew on August 1 of the following year.

Because Grumman's resources were devoted to designing an F4F Wildcat replacement, much of its production was contracted to General Motors' newly-formed Eastern Aircraft

Division in New York, New Jersey and Maryland, resulting in a 2,290-aircraft run for Grumman-built TBFs and a 9,836 run for General Motors-built TBM-1s and -3s.

Heavily armed, the type, with a 276-mph speed at 16,500 feet and 2,060-fpm climb rate, was provisioned with two .50-inch forward-firing machine guns, one .50-inch dorsal one, and one .30-inch ventral one. It could also carry 2,000 pounds of bombs or torpedoes.

A major amphibious airplane operated by the Navy and on display is the Consolidated PBY Catalina. A design response to its October 1933 request for a patrol monoplane, it fulfilled the specifications with all-metal construction, an internally-braced parasol, high-mounted wing to eliminate the need for external, drag-creating struts and retractable stabilizing floats.

Designated the XP3Y-1, it was powered by two 825-hp Pratt & Whitney R-1830-58 engines, had a 104-foot wingspan, was crewed by between seven and 10, had a 2,990-mile range, could operate at 18,000-foot altitudes, was provisioned with three .30-inch machine guns and could carry up to 2,000 pounds of bombs. Because of its capacity, it was redesignated a patrol bomber.

First flying on March 15, 1935, it exhibited its aerodynamically clean lines and proved far superior to any aircraft in its class. Ultimately partaking of almost every major operation during the war and flown by the air arms of Canada, Britain, the Netherlands, the Soviet Union, New Zealand and

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Blue Angels Douglas A-4s Skyhawks in the central atrium. (NNAM)

Australia, the PBY was instrumental in detecting U-boats plying the Atlantic.

The PBY-3 Catalina on display is the only pure seaplane version in existence.

WWII-opponent aircraft take form as the Mitsubishi Heavy Industries A6M2 Zero and the Messerschmitt Me-262 Schwalbe (Swallow).

Exceeding the Japanese Imperial Navy's performance requirements, the Zero, entering service in July of 1940, was incredibly maneuverable, had a 2,600-fpm climb rate, could attain a 331-mph speed, and reach almost 33,000-foot altitudes.

Achieving these rates by means of thin, weight-reducing fuselage and wing skins, a 950-hp Nakajima NK1C Sakae 14-cylinder, air-cooled radial engine and a three-bladed propeller, the carrier-borne fighter, equipped with foldable wingtips, was the Imperial Japanese Navy's primary fighter, produced to the tune of 10,400 aircraft.

The Me-262 was the world's first operational jet fighter, powered by two Junkers Jumo 004 axial-flow turbojets that endowed it with a 3,900-fpm climb rate, a 559-mph speed (which was some 100 mph faster than that of the P-51 Mustang), and a 37,565-foot service ceiling.

Although it engaged in the first air-to-air combat on July 26, 1944 and the type downed 19 allied aircraft versus the six losses it itself suffered, protracted development, including replacement of the original, nose-installed piston engine, the

reconfiguration to a tricycle undercarriage arrangement and delays in engine manufacture, placed it in the skies too late to make any appreciable impact, despite its clearly superior performance. Nevertheless, it succeeded in destroying 542 allied airplanes in ratio to the 100 it itself sustained.

The museum's dual-seat Me-262 B-1a, the "White 35," was captured in Schleswig, Germany, in 1945 and provided technological understanding that was incorporated in Cold War pure-jet fighters.

Other era-transcending designs in the West Wing include the Douglas A-1H Skyraider, which, because of its 8,000-pound ordinance capacity (or more than that of a B-17 Flying Fortress), was considered the first close air support type of its time; the Lockheed TV-2 Shooting Star, which, powered by a single, 6,100 thrust-pound Allison J33-A-24 or -24A turbojet and introducing a three-foot fuselage stretch over the P-80 upon which it was based, featured a second cockpit for student pure-jet training during the early 1950s; and the McDonnell FH-1 Phantom, which was the first pure-jet aircraft to land on the *USS Franklin D. Roosevelt* and hence marked the dawn of naval aviation's jet age.

Mezzanine

Of the numerous exhibits on the museum's mezzanine, which itself overlooks both the South and West Wings and can even be accessed by airliner ground stairs, there can be none



Douglas Dolphin located in Hangar Bay One

that offer a greater contrast to each other than those devoted to lighter-than-air aviation and space exploration.

Evolved from the spherical balloon first successfully flown by the Montgolfier brothers in 1783 in the first case, airships were large, controllable balloons that attained lift by the buoyancy principle themselves, but incorporated engines for propulsion and rudders and elevators for, respectively, yaw (steering) and longitudinal (pitch) axis control. Suspended gondolas housed the crew and passengers. Rigid types featured internal frameworks, which were not required by the non-rigid ones, such as blimps.

Gondolas or control cars from the Navy's L-8 and WWII-era K-47 airships are on display. The latter, delivered on May 19, 1943 at Moffett Field, California, had a 425,000-cubic-foot internal volume.

In the second, or space, case, a replica of the Mercury Freedom 7 space capsule, the original of which was launched at 116.5 nautical miles and was air/space borne for 14.8 minutes, represents Naval Aviation's contributions to the Space Program, because Naval Aviator Alan B. Shepard became the first American to enter that realm on May 5, 1961.

Also on display is the original Skylab II Command Module, which orbited the Skylab space station during 28 days between May and June of 1973. Operated by a three-member, all-Navy crew, it set several records, including the longest manned spaceflight, the greatest distance traveled, and the greatest mass docked in space.

Visible from both the mezzanine and the main floor is the 75-foot-tall, 10,000-square-foot Blue Angels Atrium that connects the South and West Wings and features four Douglas A-4 Skyhawks in a diving diamond painted in the aerobatic team's dark blue livery.

Hangar Bay One

"The newest addition to the National Naval Aviation Museum, (the separate) Hangar Bay One, adds 55,000 square feet of exhibit space to a facility that is already one of the largest of its kind in the world," according to its website. "(With) its façade reminiscent of hangars of old, the new structure primarily displays aircraft from the museum collection that flew during the post-WWII era."

The collection is diverse.

The Sikorsky VH-3 Sea King, for example, was modified to provide short-range, six-minute flights between the White House's South Lawn and Andrews Air Force Base, among other missions. Powered by two 1,500-hp General Electric T58-GE-10 turboshaft engines with a 62-foot rotor diameter and capable of 166-mph maximum speeds, it served in the Executive Flight Detachment of Marine Helicopter Squadron (HMX) 1, transporting presidents Nixon and Ford during the 1970s, carrying the "Marine One" call sign.

Luxuriously appointed with couches, carpeting, radio telephones, a wet bar, and a lavatory, the type featured extensive soundproofing, armor, self-sealing fuel tanks, and energy-absorbing undercarriage struts. After an 18-year period with Helicopter Combat Support Squadron 2 between 1975 and 2003, it was transferred to the museum.

Another Hangar Bay One aircraft is the Douglas R4D-5L Skytrain, nicknamed "Que Sera, Sera" after the once-popular song. Based upon the commercial DC-3, the ski-equipped example partook of Operation Deep Freeze, becoming the first to land on Antarctica's South Pole on October 31, 1956 and enabling its seven crew members to become the first humans to set foot on it since Captain Robert F. Scott of the Royal Navy did so in 1912. Because of its 28,000-pound gross weight, however, only a subsequent jet-assisted take off (JATO) enabled it to triumph over the high altitude's atmospheric conditions,

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which minimized wing lift and oxygen-starved its two 1,200-hp Pratt and Whitney R-1830-92 engines.

The mammoth Martin SP-5B Marlin, with a 110.7-foot length, 118.2-foot wingspan, and two 3,450-hp R-3350-32WA engines, represents the last Navy operated flying boat.

Designed for antisubmarine patrol and surface search missions, it was one of 259 acquired as far back as 1962, monitoring shipping traffic of waters off of South Vietnam with the aid of its bulbous nose-housed APS-80 search radar. It also featured weapons bays in its long engine nacelles.

Because airfields had once been sparsely located and aircraft range was insufficient to connect them, flying boats were considered the only early solutions. But, as these conditions changed, their need was obviated and the Navy consequently decided to retire them. The museum's Marlin last flew on November 6, 1967, splashing down on San Diego Bay after a final pass over Naval Air Station North Island.

Several other aircraft are also on display.

The Lockheed P2V Neptune, for instance, a long-range maritime patrol aircraft developed during WWII and operated by Navy patrol squadrons during the Cold War and Vietnam conflict, set an endurance record in September of 1946 when it covered the 11,235-mile distance between Perth, Australia, and Columbus, Ohio, in 55 hours, 17 minutes. It was dubbed the "Truculent Turtle."

The LTV F-8 Crusader was the first aircraft operated by any military branch capable of exceeding 1,000 mph. Its variable-incidence wing, raised during takeoff and landing, facilitated low-speed operation and pilot visibility.

The McDonnell F-4N Phantom II established more than a dozen world speed, altitude, and time-to-climb records.

And the foldable wing, dual-engine Grumman A-6E Intruder was the world's first all-weather, carrier-borne attack aircraft, capable of carrying both conventional and nuclear weapons.

Perhaps the most widely recognized Navy aircraft, however, of *Top Gun* fame, was the Grumman F-14 Tomcat, a carrier-based advanced interceptor and air superiority fighter.

The product of a Navy design competition to fulfill the need its F-111 failed to, it was powered by two 27,800 thrust-pound General Electric F110-GE-400 afterburning turbofans, featured a variable-sweep wing that automatically shifted from 28 to 60 degrees for optimum performance at any speed, sported twin vertical tails, could track 24 hostile targets at 195-mile ranges, simultaneously attack six with its AIM-54 Phoenix missiles, could attain 1,544-mph supersonic speeds, and operated at altitudes as high as 55,000 feet.

The museum's F-14D, Bureau Number 161159, was accepted in December of 1980 in its initial F-14A configuration, operating its first combat mission over Afghanistan as part of Operation Enduring Freedom and based on aircraft carrier *Carl Vinson* (CVN-70). After flying 224 combat sorties over Iraq, it landed for the last time on the *Theodore Roosevelt* (CVN-71) on February 8, 2006, and was subsequently delivered to Naval Air Station Pensacola from Flight Squadron (VF) 213. It was the last F-14 of any version to log a combat mission.

Blue Angels

Formed at the request of Admiral Chester W. Nimitz, Chief of Naval Operations, as a flight demonstration team to showcase naval aviation, the now-famed Blue Angels initially operated Grumman F6F Hellcats from Naval Air Station Jacksonville, performing its first show on June 15, 1946. Both aircraft types and bases changed through the years, however.

Two months after its first demonstration, on August 25, it transitioned to the F8F Bearcat and flew its first jet, the F9F-2 Panther at the end of the decade.

After suspension in 1950 because of the Korean War, during which time the team was assigned to the *USS Princeton* (CV-37) and served as the nucleus of Flight Squadron (VF) 191, it was reorganized and based at Naval Air Station Corpus Christi, operating the high-speed F9F-5 version.

Its current Sherman Field-Naval Air Station Pensacola home was claimed in 1955, where it transitioned to ever more advanced designs, including the swept-wing F9F-8 Cougar, the F11F Tiger, the twin-engine McDonnell-Douglas F-4J Phantom II, and the Douglas A-4F Skyhawk II. On its 40th anniversary, which it celebrated on November 8, 1986, it introduced the McDonnell-Douglas F/A-18 Hornet.

Practice flights can be viewed at the Museum Flight Line north of the museum itself. ➔

About the Author

Robert G. Waldvogel has earned degrees, certificates, and licenses in aviation, teaching, writing, foreign languages, travel and tourism, computers, transportation, and Social Work from LIU Post, Farmingdale State College, Hofstra University, Nassau Community College, Adelphi University, New York Institute of Technology, Stony Brook University, the Nassau Association for Continuing Community Education at Molloy College, the Institute of Certified Travel Agents, the Air Safety Institute of the Aircraft Owners and Pilots Association, and some half-dozen major airlines. He has amassed three decades in the aviation industry with Capitol Air, Midway Airlines, Triangle Aviation Services, Royal Jordanian Airlines, Austrian Airlines, Sabena Belgian World Airways, Swissair, and Lufthansa-German Airlines in Ground Operations, Training, and Management.

He has created aviation curriculums for and taught at three international carriers, as well as at Farmingdale State College, the Long Island Educational Opportunity Center, and Hofstra University. He also created and taught the *Fundamentals of Writing Program* at several Long Island public libraries.

An aviation writer for Cole Palen's Old Rhinebeck Aerodrome, he has written some 50 books, training manuals, textbooks, and courses.

Fluent in three languages, he has traveled globally and extensively, and maintains professional affiliations with the Nassau Association for Continuing Community Education, the Aircraft Owners and Pilots Association, the Rhinebeck Aerodrome Museum, the National Air and Space Society, the Hofstra University Writers Community, the World Airline Historical Society, and, of course, the American Aviation Historical Society.