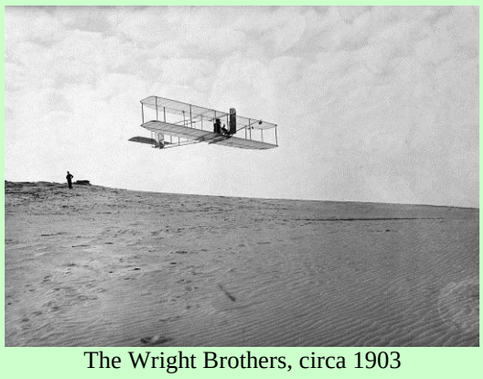
US NAVY FLEET AIRCRAFT

Updated 11/09/2012



The Wright Brothers, circa 1903

There is evidence that the first powered flight actually occurred at Fairfield, Connecticut on 14 August 1901. Gustave Whitehead (born Gustave A. Weisskopf in 1874), a German immigrant, was the pilot and inventor. Between 1897 and 1901, Gustave made several short flights in a series of improved aircraft. His 1901 flight in #21 traveled about a half mile before reversing course and safely returning to its starting point. A 1902 flight in #22, a seaplane, took off from Long Island Sound and travelled 7-miles before returned to its starting point. Although witnessed, without photographs his accomplishments were disputed. Thus, the Wright brother's claim may only be the first photographed flight.

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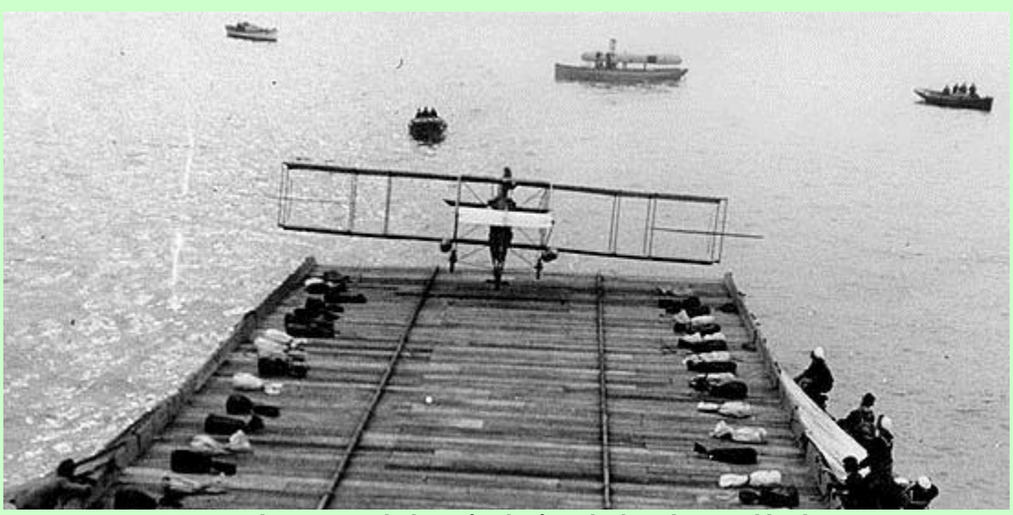
THE BEGINNING OF NAVAL AVIATION



Eugene Ely nears touch-down for the first shipboard arrested landing.

On 18 January 1911, Eugene Ely (1886 -1911) successfully landed a flying machine aboard *USS Pennsylvania* while anchored in San Francisco Bay. The temporary flight deck consisted of a wooden platform (30' x 120') constructed on the stern of the armored cruiser. The deck was pitched upward 2° and sandbags attached to the arresting wires provided the deceleration necessary to stop the 40 mph flying machine.

After landing, Mr. Ely said, "It was easy enough. I think the trick could be successfully turned nine times out of ten." Fortunately, some early naval aviators thought nine out of ten was not good enough, and through their efforts, carrier landings actually became easier, and safer, as time passed.

Mr. Ely flew a Curtis Model D, pusher biplane (38'-3" wingspan). Similar to the Wright Flyer, it differed mainly by using ailerons instead of wing-warping for roll control. However, Mr. Ely could not swim. Besides a football helmet, he wore bicycle inner-tubes for floatation. His flying machine had an arresting hook and floatation tanks.

After landing, the deck crew turned the flying machine around and, 57 minutes later, Mr. Ely launched without difficulty and flew back to shore. On 14 November 1910, Mr. Ely had launched from a smaller platform aboard *USS Birmingham* at Hampton Roads, but bad weather plagued this earlier flight. He nearly crashed into the water, but struggled into the air and managed to land on a nearby beach.

This first carrier pilot died when his flying machine crashed on 19 October 1911 while participating in a flying exhibition at Macon, Georgia. He pulled out of a dive too late. In 1933, Congress posthumously awarded Eugene Ely, the DFC for his contributions to aviation.

A nameless British pilot scored the second shipboard arrested landing aboard *HMS Argus*, a converted passenger liner, commissioned 16 September 1918. *USS Langley* became the second carrier, commissioned as CV-1 on 20 March 1922. Thus, the U.S. Navy started out nine months ahead of the Japanese when they commissioned their first carrier *IJN Hosho* on 27 December 1922. However, a number of factors hampered carrier development, including the economic crisis of the Great Depression during the 1930s.

CDR Kenneth Whiting became the first commanding officer of *Langley*, and also made the first catapult launch on 18 November 1922. Lt. Virgil Griffin made the first deck launch from *Langley* on 17 October 1922, while LCdr Godfrey Chevalier made the first arrested landing aboard *Langley* on 26 October 1922.

Many of these early carrier pilots died and dozens of fragile planes wrecked to develop carrier aviation and military aviation in general over the next twenty years. Countless airfields carry the names of these fliers to honor their contribution to naval aviation. Many others lived to see American carriers spearhead the greatest naval force the world has ever seen.

It soon became clear that carrier aircraft are different. Now, these reasons seem obvious, including folding wings and a capability for catapult launches and arrested recoveries. Salt-water corrosion is a major issue and, until recently, noxious stack gas (sulfur) from fossil-fueled boilers, further aggravated corrosion. Of course, carrying lots of weapons and flying safely near stalling speed are also important.

During WW-II, the Panama Canal width limited carrier size and the Japanese Zero dictated aircraft design and performance parameters. Atolls with strange names became fleet anchorages for ships that were there for the duration, unless damaged or sunk, and admirals took turns in command. Later, the shore-hugging Korean War and miserable weather added new dimensions to both pilot training and aircraft design. Of course, the early jet aircraft required emphasis on range and speed, but there never seemed enough of either.

In the years following the Korean War, the angled-deck carrier made fundamental changes in carrier aviation. Most significantly, the level power-on paddles approach of the straight-deck carrier was replaced by the descending glide-slope mirror approach, with the option of trying it again after a missed arrestment (bolter). This change required subtle changes in design, but also major changes in pilot training that included regular night flying and instrument training.

At the same time, aircraft engine designs were improving, with more thrust and better reliability. The after-burner became a standard feature on fighter aircraft. Big-deck carriers gradually replaced the ubiquitous Essex-Class carrier and the nuclear-powered *USS ENTERPISE* joined the fleet in 1961 (retired in 2012). On the minus side, some folks in high places thought the lowly machine gun was no long needed in carrier aircraft.

The Vietnam War caught everyone by surprise, but the all jet USAF had a very limited conventional warfare capability – again. First, they put bomb racks on some Navy T-28Bs and then rebuilt T-28As into T-28Ds. All the SPADs the Navy could spare soon took on USAF colors. The USAF then bought the F-4 Phantom, complete with folding wings and tail-hook, and ended that war also flying the A-7D. Except for their different color scheme, someone might have thought only the Navy and Marines were flying in Vietnam.

One major change came in 1966, with the turbo-fan engine in the A-7 Corsair II, providing a significant improvement in range by reducing specific fuel consumption, even in the landing pattern. In 1967, sipping only about 6-lbs of fuel per minute, the piston-engine A-1s were the last to land. In 1969, burning only 50-lbs per minute, the A-7s were still the last to land.

In the years since Vietnam, the cost of aircraft (and everything else) escalated as both services sought aircraft with super-sonic performance and a thing called STEALTH. Meanwhile the Soviet Union collapsed and our only remaining enemy is . . .

FIST OF THE FLEET AIRCRAFT

TBM-3, circa 1945. Previous Avengers were nearly identical except for the engine (1700 HP).
Color scheme and tail markings (small X) indicate this “Turkey” is from *USS SAN JACINTO*.

TBF/TBM TECHNICAL DATA

Wing span 54’-2”	Length 40’-0”	Wing area 490 sqft
Empty weight 10,080 lbs		Max gross weight 15,905 lbs
Max speed 271 kts at 12,000 feet		Max range speed 145 knots
Initial rate of climb 1,430 ft/min		Service ceiling 22,400 feet
Range 1,215 miles		325-gallons of fuel
Bomb load 1,600 lbs in bomb bay		(3) 50 caliber machine guns
Power plant Wright R-2600-8/20		1700 hp (-1)/1900 hp (-3)
Some TBF/TBM-1Cs had ASB radar		TBM-3s had APS-4 radar
2,296 TBFs built by Grumman		7,546 TBMs built by Eastern

The Avenger or Turkey (big bird) was not without its faults. The generous cockpit was built for a “large” pilot, but average size pilots found ways to cope with the excess space. A hydraulic autopilot was installed that sometimes worked properly, but was seldom used. The unboosted flight controls required two-hands for most maneuvers, but made it easy to fly on instruments. Almost every maneuver required continuous elevator trim adjustment. The aircraft had few prohibited maneuvers, but anything more than a wing-over was physically impractical.

A two-speed blower permitted the TBM-3E to easily cruise at 220 knots (TAS) at 20,000 feet in high blower. However, Grumman divided the plane’s internal fuel into three tanks, giving the pilot ample opportunity to run a tank dry. The throttle had a single “talk” button. Unfortunately, the pilot had to separately select intercom or radio, resulting in ordinary crew talk frequently broadcast to the entire world.

> The Avenger held the all-time Navy record for unintentional wheels up landings. The cockpit layout had the wheel and flap levers side-by-side, forward of the throttle quadrant. This flaw became apparent very early because production aircraft had two levers for the wheels. Raising a short lever unlocked the wheel lever. Unfortunately, pilots soon learned the right combination of fingers and wrist position to raise the gear with one movement. The TBM-3E added a spring lock that almost required two-hands to raise the gear, but it was still possible to do it with one hand.

It was critical to fully raise the flaps before folding the wings. The wing-fold cycle would neatly crunch the flaps if not fully raised. The same rule applied to the F6F Hellcat, which had the same wing-fold system.

The original TBF-1 had a single cowl-mounted .30-caliber machine gun, firing through the propeller. All later versions were equipped with a .50-caliber gun in each wing, firing outside the propeller arc. The TBM-3 was similar to the TBF/TBM-1C except for a 1900 HP engine. The TBM-3E was nearly 2,000-lbs lighter, but deleted the stinger gun.

Bombs, up to 2,000-lbs, or a torpedo were carried in the bomb bay. The Avenger could perform glide bombing, but steep dives were out of the question. The aircraft was not stressed for high-G pullouts (3 to 4 Gs depending on weight). Radar equipped Avengers achieved success at night using low-altitude horizontal bombing (skip bombing) of ships. The TBF/TBM-1Cs, and later versions, were also equipped with external bomb racks and four rocket rails on each wing.

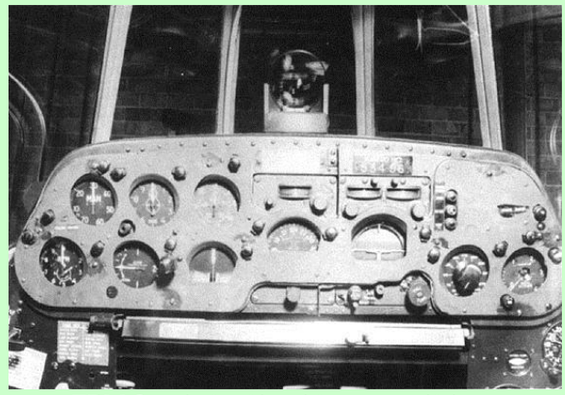
The turret gunner (always a little guy) occupied the cramped ball-turret during combat. The turret had a single 50-caliber machine gun. The aircraft was originally designed for a crew of four, but the co-pilot seat was deleted, leaving the greenhouse tunnel filled with black-boxes, but allowing the crew to talk directly with the pilot during flight. (See PEOPLE and EVENTS for another view in *A TBM Air Crewman*.)

The radio operator manned the 30-caliber stinger gun (near the tail wheel), but otherwise operated the ART-13 transmitter and ARB receiver for HF/MHF communications. By 1943, many aircraft were equipped with ASB radar (range only A-scope), requiring extra training for the radio operator.

By 1945, some TBM-3s and all TBM-3Es were equipped with APS-4 radar in a white bomb-like pod under the right wing. This new radar provided bearing and distance from B-scopes mounted aft and in the cockpit. Typically, islands were detected out to nearly 100 miles, but much less for submarines. This radar was used for night intercepts of Japanese bombers and radar bombing of ships with some success.

VT-17 flew the TBF/TBM-1C during their first deployment aboard *BUNKER HILL* in late 1943. During the squadron’s second deployment aboard the new *HORNET* in the spring of 1945, the squadron flew TBM-3/3Es.

TBF-1 cockpit with UV instrument lighting


TBM-3 cockpit with red instrument lights

Until 1944, most aircraft had black-light fluorescent cockpit lighting. The instruments digits were coated with radium that fluoresced under UV light. During this period it was discovered that black light (UV) destroyed night vision and cockpit lighting on new aircraft was changed to shielded red instrument lights. This latter system is still in use today.

This restored SB2C-5 currently flies with the Ghost Squadron of the Commemorative Air Force.
Tail markings (diamond) are those of VB-5 embarked in *USS FRANKLIN* prior to 19 March 1945.

SB2C-4E/5 TECHNICAL DATA

Wing span 49'-9"	Length 36'-8"	Wing area 422 sqft
Empty weight 10,547 lbs		Max gross wt 16,616 lbs
Max speed 295 kts at 16,700 feet		Max Range speed 145 knots
Initial rate of climb 1,800 ft/min		Service ceiling 29,100 feet
Range 1,165 miles		320/355-gallons of fuel
Bomb load 1,600 lbs in bomb bay		(2) 20mm cannon
Power plant Wright R-2600-8/20		1700 hp (-1)/1900 hp (-3)
Some SB2C-1/-1Cs had ASB radar		-3E, -4E, & -5s had APS-4
5,516 SB2Cs built by Curtis		1,034 built by others

The Curtis SB2C Helldiver was intended to replace the Douglas SBD Dauntless. However, production Helldiver's empty weight increased by 3,000-lbs, resulting in a top speed only 35 knots faster than the Dauntless. The early Helldiver (-1) was short-coupled, with stability and buffet problems in the dive. The -3 airframe was lengthened 15-inches and the wing-span shortened by 3.5-inches to remedy the stability problems. The dive flaps (like the SBD) were modified in the -3 version to solve the buffet problem. The aircraft continued to have hydraulic and electrical problems.

The SB2C-2 was a one-of-a-kind floatplane that never entered production. It was designed at a time when we were down to only two carriers and the war in the South Pacific was still looking up-hill.

The SB2C fell short of the Navy's expectations. The main advantage of the Helldiver over the Dauntless was its folding wings. The SB2C became known as the "BEAST" for a variety of reasons and retired from fleet service long before the TBM, F6F, and F4U. The last operational Helldiver squadron was VA-54 in June 1949, although the BEAST served a few more years in Reserve units.

The SB2C-1 had four 0.50-caliber machine guns installed in the wings and the same 1700-HP R-2600-8 engine as the TBF-1. The SB2C-1C and subsequent versions replaced the four 0.50-caliber guns with two 20mm cannon. The 20mm provided greater destructive power, but were less reliable. The early version had a single 0.30-caliber machine gun in the rear cockpit, but was soon replaced by twin 0.30-caliber guns. The SB2C-3 used the upgraded 1900-HP R-2600-20 engine and included four zero-length rocket launchers under each wing. The SB2C and TBF/TBM had the same electronics and communications equipment. The SB2C-5 also had a bomb director (toss bombing).

During 1944, the number of fighters aboard carriers increased while the number of Helldivers decreased as Kamikaze attacks became more prevalent and Japanese shipping became scarce. While vertical dive-bombing was desirable against warships and heavily defended shore targets, glide bombing was a more realistic tactic in support of ground troops. The Marines began using the Corsair for air-to-ground attacks in 1943 and the Navy F6F squadrons followed suit in 1944. Even the plucky F4F (FM) wasn't retired; it flew close-air support missions from CVEs, while Island hoping with the Marines. By late 1945, the number of dual-role fighters increased to cope with the Kamikaze threat – some designated Fighter-Bomber (VFB) squadrons.

Several Marine squadrons operated SB2Cs near the end of the war, but promptly reverted to Corsairs after VJ-day. The US Army Air Force (USAAF) ordered the A-25 (SB2C-1 sans wing fold and tail hook), but eventually gave them to the Marines after refusal by the RAAF. Nearly all these aircraft were used stateside for training.

The squadron flew SB2C-4Es and -5s in 1946 and 1947, before receiving AD-1 Skyraiders on September 21, 1947. Records reflect only a *VALLEY FORGE* shakedown cruise while flying the Helldiver. The SB2C-5 was essentially identical to the SB2C-4E except for the addition of 35-gallons of fuel (about 45 minutes at best range power). Basically, the SB2C was an aircraft that only Curtis loved, but the company had good connections in Congress. Thus, Helldivers were still being produced long after they were being beached.

This VA-65 AD-6, circa 1958, operated with CVW-2 (NE) from *USS MIDWAY*.
The practice bomb (Mk-8) dispenser and two smoke lights indicate practice bombing at sea.
Unlike the AD-4B, the AD-6 had a tear-drop ADF antenna on the upper fuselage.

AD-4 TECHNICAL DATA

Wing span 50'-0"	Length 38'-10"	Wing area 400 sqft
Empty weight 11,707lbs (early BuNo)		Max gross weight 24,000 lbs
Max speed 315 kts at 18,300 feet		Max range speed 145 knots
Initial rate of climb 2,570 ft/min		Service ceiling 36,500 feet
Range 1,100 miles (clean)		380-gallons of internal fuel
Bomb load 8,000 lbs externally		(4) 20mm cannon
Power plant Wright R-3350-26W (2,700 hp)		AD-1 = R-3350-24W (2,500 HP
AD-1, AD-2, and AD-3 had APS-4 radar		AD-4 had APS-19 radar
3,180 AD/A-1 aircraft built by Douglas		

The Douglas AD Skyraider replaced the TBM and SB2C aboard aircraft carriers. It was a torpedo bomber, dive-bomber, and better than average fighter in a pinch. Production began in early 1947, with squadron delivers in the spring. AD-1 production continued until mid-1948.

> The SKYRAIDER was originally known as the ABLE DOG (old alphanumeric code). Later it became known as the SPAD (after the WW-I biplane) out of respect for its age and capabilities in the jet age.

The **AD-1** (ex-BT2D) had a 2500 HP engine and canopy designed for cloth helmets. It was an easy transition from the SNJ and it had a bomb director (toss bombing). In service, the AD-1 suffered structural problems after repeated carrier landings. Strengthening didn't completely solve the problem and the AD-1s soon became shore-based trainers.

Instead of using SBD and SB2C split-flap dive brakes, Douglas installed three fuselage dive brakes on the Skyraider. It was difficult to exceed 250-knots in a near vertical dive with the three brakes open. Unfortunately, if the 3,000-psi hydraulic system failed, the brakes closed and the aircraft promptly increased speed and could easily enter compressibility – the pilot had to closely monitor airspeed in the dive.

The **AD-2** corrected most of the AD-1 structural defects and had a 2700-HP engine, along with a revised cockpit and larger canopy. The "duce" was the fastest and lightest of all the Skyraiders, and a delight to fly. However, the outer wings could only carry rockets.

One standard variant of the AD was the **Queen** (AD-1Q, AD-2Q, AD-3Q, and AD-4Q). These birds had a single rear seat between the dive brakes with electronic countermeasure (ECM) equipment installed. The ECM operator had a windowed door on the starboard side and a window on the port side. Some of these aircraft were also equipped with a hydraulic tow reel on the center bomb rack to provide gunnery practice for ships in the task force. The rear-seat crewman could reach the tow cable through a deck hatch.

The **AD-3** version was a development of the AD-2, with the oleo stroke lengthened for softer landings. Production ended in mid-1949. Some AD-3s used in Korea had twelve Aero-14 wing racks, which could carry a 500-lb bomb or 5" rocket.

The **AD-3W** 'Guppy' had the APS-20 radar installed in a large radome between the main landing gear. This installation was an improvement over the TBM-3W, the Navy's first carrier-based AEW aircraft. Twin fins were installed on the horizontal stabilizer to improve stability and permanent slots were installed on the wings. This variant carried two radar operators with the dive-brakes deleted. Two windowed doors were installed and a turtle-back behind the cockpit provided more room for the radar. The fuel system was modified to provide fuselage space for all the electronics. Instead of a single fuel tank, the -3W had a 180-gallon tank in the fuselage and 90-gallon tanks in the wing stubs. This version also had 72-gallons tanks in the outer wing panels and no outer wing stations or guns. Two aircraft were modified for anti-submarine work (hunters), but never went into production.
The **AD-3N** had the same two back seats and no dive brakes as the guppy, but it used the APS-19 radar on the port bomb rack in lieu of the APS-4 radar used on other –3 aircraft. This variant carried the ECM equipment of the Queen, and included equipment for radar bombing. Two aircraft were modified as anti-submarine work (killers), but never went into production.

The **AD-4**, production started just before the Korean War and had the largest production run, with 1,630 aircraft including variants. This version had the more dependable R-3350-26WA engine. Probably the most noticeable improvements included two additional 20-mm cannon and bolt-on armor plate around the cockpit and engine (some 619-lbs worth), after aircraft #210. These aircraft was fitted with a P-1 autopilot and APS-19 radar.

> The first 210 AD-4s had only two 20mm canon. These planes received two additional cannon during overhaul. Later production versions were nearly 1500-lbs heavier with external armor and four cannons.

The **AD-4L** had pneumatic deicer boots installed on the wings and tail for cold weather operations, but was otherwise identical to the AD-4. The propeller had electric deicers.

The **AD-4B** was a historically important variant of the AD-4. Identical in most respects to the AD-4, this variant had a beefed-up Aero-3A ejector rack on the center station, wiring for nuclear weapons, and a fuselage recess for the bomb's tailfins. A run-in timer was later installed in the cockpit between the rudder pedals. It gave the Navy a carrier-based nuclear delivery capability with the early Mk-7 and Mk-8 weapons, first from MIDWAY-class carriers and then from 27A modified Essex-Class carriers.

The **AD-4Q** and **AD-4W** variants had only minor differences from their AD-3Q and AD-3W predecessors. However, the features of the experimental AD-3Ws were incorporated in the AD-4W.

The **AD-4N** had some major improvements over the AD-3N. The AD-4N came equipped with the large APS-31 radome in-lieu of the starboard bomb rack. This radar cost more than the airframe. This powerful radar and other equipment gave the aircraft a multi-mission capability. Using the radar, the aircraft could detect a submarine periscope or trucks on a road. The radar bombing computer, and appropriate slant-range tables, allowed the aircraft to horizontal bomb a radar target in any weather. This version carried a sonobuoy receiver and could carry a searchlight/sonobuoy dispenser on the port wing, the AD-4N could search for submarines, or drop up to eighteen parachute flares. And, of course, the aircraft carried ECM equipment that could detect and analyze radar signals. One interesting feature was a receiver to download the radar image from the AD-4W. The AD-4N also had a lower fuselage periscope so the rear seat crew could see forward during flight. The periscope controlled the searchlight, when installed. Some of the early AD-4Ns were converted to **AD-4NL**s for cold weather service.

AD-4NAs were converted from AD-4Ns after the AD-5Ns began arriving in 1954. There were still no dive brakes, but the two rear seats were retained. All the rear compartment electronics was removed, leaving the empty racks (and less weight). It was a nice plane for cross-country flights.

The **AD-5** (A-1E) became known as the FAT SPAD because of its enlarged fuselage width. The front cockpit had two seats, but only one set of flight controls. The fuselage was also lengthened and the side dive brakes eliminated. The AD-5 and all subsequent versions had a retractable tail-hook. The plain AD-5 was a multi-purpose aircraft that included bombing, troop carrier, ambulance, or VIP transport. Generally, performance figures for the AD-5 left something to be desired. The Marines used them as bombers, but the Navy AD-5s became utility planes. **VA-65** was assigned one such aircraft in 1955.

The AD-5W (EA-1E) had the **AD-4W electronic** equipment squeezed into fuselage. The only major difference was an extra crewmember, but the two aft crewmembers had much improved view. The larger

rudder eliminated the need for extra-fins on the horizontal stabilizer. This version had a blue tinted canopy over the rear compartment (the blue room). This helped radar operators view the yellow tinted radarscopes in broad daylight. The Navy started training Non-Flying Officers (NFOs) for these aircraft instead of using enlisted personnel. The AD-5W was replaced by the WF-1/E-1 (Willie Fudd), but that is another story.

The **AD-5N** (A-1G) arrived in the fleet during the spring of 1954, with the same mission capabilities as the AD-4N. This variant also had a "blue room", but retained the weapons delivery capability of the AD-4N.

> Many A-1Gs and EA-1Es were converted to A-1E standard by the USAF for use in Vietnam. A few of these aircraft were fitted with flight controls in the right seat.

The **AD-5Q** (EA-1F) developed later from the AD-5N when 54 airframes were converted. This version had both active and passive ECM equipment and a lot of weird antennas that didn't exactly improve performance. These Electric SPADS also flew missions in Vietnam.

The **AD-6** (A-1H) was built and delivered concurrently with the AD-5 variants. Air Group attack squadrons began training for nuclear weapon missions in 1954. A few Navy and Marine squadrons flew AD-4Bs, but nuclear magazines (SCB-27A conversion) were required for a carrier-based nuclear mission. The angled-deck carrier (SCB-125 conversion) made it practical (?) for everybody to fly at night.
The **AD-7** (A-1J) was a beefed-up variant of the AD-6, to carry an aerial refueling store (D-704). Later, the AD-6s were upgraded to the AD-7 standard. Eventually, other aircraft took on the tanker mission and SPAD pilots rejoiced at doing what they did best. The last AD-7 rolled off the production line on February 18, 1957. A total of 3,180 SPADs were produced over a ten-year period.

Later improvements in the AD-5/6/7 included an engine torque-pressure gage, TACAN (ARN-21), and a UHF homer (ARA-25). The torque gage allowed improved fuel consumption on long-range flights. Typically, a 300-gallon external tank provided four-hours of fuel. With the torque-gage, it was easier to squeeze out a little more speed (or range), but ultimate range was still limited by oil consumption (normally 1 gallon/hr). TACAN appeared about 1955, replacing the old ARR-2 YE/ZB (Hayrake) equipment from WW-II, but the plotting board remained. There was wing wiring for the APS-19 radar; but the radar pods were never delivered. The Idiot-Loop LABS-timer was mounted in place of the radar scope. In November 1967, all VA-25 SPADs received the Yankee extraction seat.

The last SPAD combat mission was flown in A-1H (BuNo 135300), which is now on display in the National Museum of Naval Aviation in Pensacola. Most remaining SPADs were transferred to the USAF or VNAF and flew until the Vietnam War was over. A few SPADs (mostly AD-4 variants) still fly under civilian ownership.

The **Fist of the Fleet** flew several versions of the AD (A-1) between September 21, 1947 and April 10, 1968. The squadron flew AD-4s during the first deployment to Korea and a variety of ADs on the second deployment. The squadron was back in AD-4s during the third Korean War deployment. This change in aircraft resulted from the transition from the ARC-1 VHF transceiver to the ARC-27 UHF transceiver – the planes had to match the carrier's capability. The squadron also made three deployments to Vietnam in A-1H/Js. On the first Vietnam deployment, Clint Johnson and Charlie Hartman shot down a MiG-17, proving the SPAD was not yet obsolete (see Delta Pattern).

This VA-25 A-7E, circa 1970, operated from *USS Ranger* with CVW-2.
Mk-82 500-lb bombs are on triple ejector racks on outer stations.

A-7E TECHNICAL DATA

Wing span 38.73'	Length 46.13'	Wing area 375 sqft
Empty weight 18,546 lbs		Max gross weight 42,000 lbs
Max speed 645 kts (1.12 IMN)		Cruising speed 0.792 IMN
Range about 2,280 miles (clean)		1,500-gallons of internal fuel
A-7E Power plant TF41-A-2 (15,000 lbs ST)		A-7A = TF30-P-6 (11,350 lbs ST)
A-7C had TF-30-P-408 (12,200 lbs ST)		A-7B = TF30-P-8 (12,200 lbs ST)

In the early 1930s, Vought built a two-seat biplane, called the Corsair. However, the great bent-wing bird of WW-II is the best known Corsair, overshadowing all other Navy propeller aircraft of that era. There might have been faster fighters or better bombers, but the F4U had a distinctive grace and beauty of form and flew like it was connected directly to the pilot's brain. The F4U was still flying in Reserve Squadrons as Vought began development of the F8U Crusader, otherwise it might have been the Corsair II. The USMC developed an early love affair with the F4U that continued through the Korean War, but Marine squadrons never flew the Corsair II. The last Reserve F4Us were flown to the bone-yard in 1955.

The development of the A-7 began with the 1962 VAX Study. Cost and time constraints forced the Navy to consider only modifications of existing subsonic designs. Of the four proposals, Vought's was based on the F8U (F-8) and was declared the winner on 11 February 1964. The A-7A made its first flight on 27 September 1965.

Eight instructor-pilots from VA-174 and VA-122 flew the A-7A at the LTV plant in Dallas, Texas in August 1966. The first A-7A (BuNo 152665) arrived at NAS Lemoore on 10 November 1966. Most VA-122 instructors had already taken the jet transition course with VA-127 and began A-7 training immediately, with help from a half-dozen instructors from VA-125. VA-147 was commissioned and began training in January 1967, and then departed for Yankee Station aboard *RANGER* in November 1967. The first A-7A combat strikes were flown on 3 December 1967 – not quite 13-months after the A-7 arrived at NAS Lemoore.

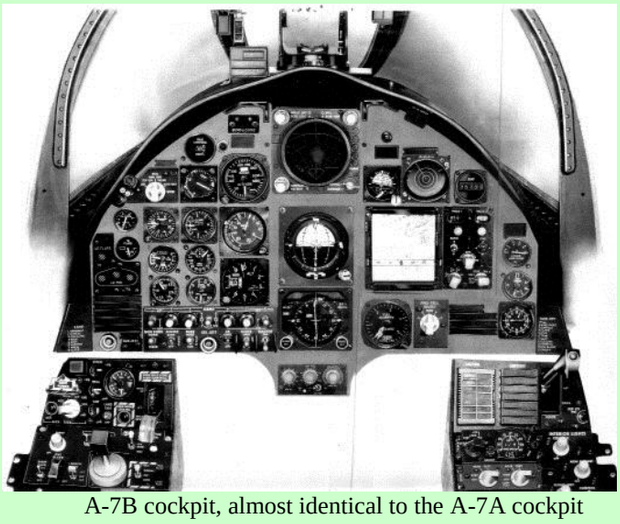
> Previously, VA-174 had been the East Coast Replacement Training Squadron for the F-8. VA-122 was still training SPAD pilots when the first A-7 arrived. Indeed, nearly all A-1 instructors had transitioned to the A-7 by the time VA-147 completed training in September, and were instructing in both aircraft.

The **A-7A** was a single-seat sub-sonic attack aircraft and 199 were built. Most ex-Skyhawk pilots considered the plane underpowered and less maneuverable than the A-4. At the same time, they lauded the aircraft's internal fuel load and low fuel-consumption. It was an easy aircraft to land aboard a carrier and had some features not installed in early A-4s. On the other hand, most ex-Skyraider pilots had only praise for the A-7 because it could fly higher and faster, but most importantly, it had air conditioning.

> The A-7A would barely go supersonic, briefly, in a very steep dive at full throttle. Pull-out required a lot of altitude without using the dive brake (possible excessive deceleration).

Actually, there were many things about the A-7A that were "improvements" over the later versions of the A-4. One feature was the roller-map, but that never seemed to work. Another feature was a HUGE dive-brake that could keep airspeed well below 300-knots in a vertical dive. The two 20mm cannon each had 300-rounds of ammunition at a time when the A-4s only carried 50-rounds. The multi-mode radar gave the pilot something to do on long boring flights. The air-to-ground ranging mode of the radar was part of the weapons system that could achieve remarkable results over manual bombing. An automatic power control system maintained proper airspeed during the landing approach. Although not new, this system was a delight for ex-SPAD pilots who were used to looking around at the scenery during a carrier approach.

The 196 **A-7Bs** had a few improvements over the A-7A, including slightly more engine power and variable flaps. Most changes in the A-7B were internal to correct maintenance problems, including stainless-steel hydraulic fittings.



A-7B cockpit, almost identical to the A-7A cockpit

The **Fist of the Fleet** returned to NAS Lemoore in April 1968 to retire the SPAD. Most officers and men were transferred before the squadron began A-7 training with VA-122. On November 1, 1968, the squadron had 13 factory-new A-7Bs parked on the ramp. The Skipper flew the first test flight (BuNo 154436) and then preparations began for a Fallon deployment from 12 November to 27 November. Three aircraft were borrowed from VA-122 to permit the squadron to fly in excess of 1,100-hours between leaving and returning to NAS Lemoore – a remarkable achievement in only 18 flying days. On 6 February 1969, VA-25 flew aboard

TICONDEROGA to begin its fourth deployment to Yankee Station, flying the first A-7B strikes into Laos on 28 February.

> *USS Enterprise* had departed a month earlier with two A-7B squadrons. However, she was damaged from a major flight deck fire while operating off Hawaii. Repairs in the Pearl Harbor shipyard delayed her arrival on Yankee Station until 27 March.

The biggest problem with operating the A-7B from an ESSEX-Class carrier was running the ship out of bombs. Even carrying only eight MK-82s required frequent weapons replenishments. However, this load avoided catapult problems during light winds. Generally, we cruised at normal rated power to the target and used the same power returning. Typically, we landed with about 4,000-lbs of fuel (50-lbs per minute in the landing pattern). These flights were usually deep into Laos by way of Danang, and sometimes we did a little strafing for the Marines near Danang.

The original **A-7C** was an underpowered A-7E, since the Allison engines were yet unavailable and 67 airframes were built. In 1975, 36 A-7Cs and 24 A-7Bs were stretched to become tandem-seat TA-7Cs. Later, 49 of these aircraft were upgraded with TF-41 engines. Six of these latter aircraft were converted to EA-7C for an electronic warfare mission. Similarly, the USAF stretched A-7Ds to make 30 A-7Ks, a tandem-cockpit version with full combat capability.

The USAF **A-7D** was nearly identical to the Navy A-7E, or vice-versa, and 459 were built. The main differences included fire-suppressing foam in the fuel tanks, an engine self-starter (no huffer required), and a USAF refueling receptacle. Only the nose-gear launch-bar and Navy refueling probe were deleted.

Upon returning from the 1969 *TICONDEROGA* cruise with A-7Bs, the squadron transitioned to the A-7E and made two more combat deployments to Vietnam.

The A-7E had many new features and 535 were built. Prominent among these were more engine power, a third hydraulic system, a M61 cannon with 1,000 rounds, a digital tactical computer, a Heads-Up Display (HUD), and anti-skid brakes. The tactical computer was perhaps the most complicated installed in a single-piloted aircraft. This system had an inertial measurement system with various ways to update the aircraft's position during flight. Probably the most useful improvement was the projected map display – vastly superior to the roller map display in the A-7A/B. Pilots now had little excuse for getting lost.

> On the downside, the A-7E was 3,500-lbs heavier than the A-7A and flew only from the big-deck carriers.

OK 3 wire, *USS RANGER* circa 1970

A VFA-25 Hornet circa 2007

FA-18C TECHNICAL DATA

Wing span 40.4’	Length 56’	Wing area 400 sqft
Empty weight 23,832 lbs		Fighter T/O weight 51,900 lbs
Ceiling about 50,000’		Fighter radius 400nm
Ferry range in excess of 2,000 nm		Attack T/O weight 49,224 lbs
Max speed 1,183 kts		Attack radius 575nm
		1600-gallons of internal fuel
Engines (2) GE F404-GE-400		32,000 lbs ST (wet) each

After Vietnam, the USAF wanted a new fighter and the YF-17, one of several competitors, was derived from the Northrop Cobra and flew for the first time in June 1974. In 1975, the USAF selected the General Dynamics designed F-16 instead.

Meanwhile, the Navy was looking for a plane to replace both the F-4 and A-7. In this competition, Northrop paired with McDonald/Douglas to create a carrier fighter based on the YF-17 design. The Navy selected this redesign in 1976 to become the F/A-18A Hornet. This new aircraft had its first flight in 1978 and deliveries began to VA-125 in November 1980.

> McDonald and Douglas Corporations merged before beginning development of the F/A-18. Since then, the Boeing Company acquired McDonald/Douglas. Technically, the Super Hornet (F/A-18E/F) is a Boeing aircraft.

VA-25 pilots began transition to the Hornet in 1983, and then transitioned to the F/A-18C version in 1989.

Next up: The F/A-18E Super Hornet …

1942 FLEET AIRCRAFT

At the beginning of WW-II, many Navy and Marine squadrons were still completing the transition from biplanes to monoplanes. A few squadrons finally completed that transition after 7 December 1941. However, those first monoplanes were designed without recent combat experience and certainly without knowledge of the

aircraft the Japanese were building. Two squadrons, VB-8 and VS-8 aboard *HORNET*, flew SBC-4s biplanes until their arrival at San Diego in March 1942, where they switched to SBDs, but with little training time. Biplanes were used in some advanced training units until "used" combat aircraft were returned from the Pacific.

BREWSTER BUFFALO

Brewster designed the F2A-1 to replace the Grumman F3F biplane, competing with an early version of Grumman's F4F. The XF2A-1 first flew on 2 December 1937, but fell short of promised performance. After a series of extensive modifications it achieved 264 kts and other design criteria. The XF2A-1 handled well in 1938 tests and the Navy ordered 54, but only ten went to the Navy, the rest went to Finland. However, production was slow at the Queens, New York factory. The Navy began buying the improved F4F-3, while Brewster continued building Buffalos, selling many to the United Kingdom, the Finns and the Dutch.

Brewster had management problems during WW-II. Originally, the company was a minor parts manufacturer, but over-committed itself as a major aircraft manufacturer. In 1942, the company was sued for $10-million involving financial misdeeds. In May 1942, the Navy sized Brewster. The company began assembly of the F3A Corsair, but couldn't maintain their production commitments. The Navy cancelled Brewster's last contract and the company was dissolved on 5 April 1946.

F2A-3 Buffalo, circa August 1942, flown by LCDR Joseph C. Clifton

F2A TECHNICAL DATA

Wing span 35'-0"	Length 26'-4"	Wing area 209 sqft
Empty weight 4,732 (F2A-3)		Max gross weight 7,159 lbs
Max speed 279 kts at 16,500 feet		Cruising speed 224 knots
Initial rate of climb 2,290 ft/min		Service ceiling 33,300 feet
Range 1,000 miles (-1) or 1,680 miles (-3)		318-gallons of fuel (-3)
Bomb load (2) 100 lb bombs on wings		(4) 50 caliber machine guns
Power plant Wright R-1820-34		950 hp (F2A-1)
Power plant Wright R-1820-40		1200 hp (F2A-2/3)
108 F2A-3 version built		590 Buffalos (all versions) built

The Buffalo had weak landing gear and no amount of engineering could fix the problem, especially in the heavier F2A-3 version. The early versions had a minimum of pilot armor, but without an armored glass windscreen, and less fuel.

F2A-1 was the first production version, first flown in February 1939. This version was nearly identical to the XF2A-1, but with a telescopic gun-sight and an improved canopy. Nine aircraft were delivered to VF-3 in December 1939. All of these were phased-out of service by October 1940.

F2A-2 had a 1200-hp engine that increased its top speed to 300 knots. It was equipped with two 50-caliber machine guns in the wings and two firing through the propeller. This version entered Navy service in late 1940, but it was clearly obsolete.

There were five versions built for export. Each had minor variations, but the same basic flaws.
F2A-3 was the must numerous, but had poor performance compared to the -2. It had more fuel in self-sealing tanks, more pilot armor, and more ammunition and entered Navy service in August 1941, but was already being replaced by the F4F-3 by the end of the year. The remaining Buffalos were transferred to the Marines to train fighter squadrons.

VMF-221 at Midway Island had 21 F2A-3s and 7 F4F Wildcats. Most of these were launched on the morning of 4 June 1942 to face 107 Japanese aircraft. Only 7 Buffalos and 3 Wildcats returned. The Buffalo was removed from front-line service, but served in training squadrons.

It would be hard to find another fighter so unworthy of the name.

GRUMMAN WILDCAT

The XF4F-1 began life in 1935 as a biplane, intended to replace the F3F (also a biplane), but never got off the drawing board. In 1936, the Navy expressed the need for a monoplane. With few changes to the fuselage, Grumman converted the design to a mid-wing monoplane.

The XF4F-2 made its first flight on 2 September 1937. However, performance was not much better than the Brewster Buffalo and there were persistent engine problems.

Grumman installed a Pratt and Whitney R-1830-76, which had a two-stage two-speed supercharger that drastically improved the aircraft's performance at altitude and 100-octane gasoline solved engine overheating problems.

In October 1938, Grumman received a contract for the XF4F-3. There were many changes and testing was nearly complete in December when the aircraft crashed. However, Grumman received a contract for 54 F4F-3 aircraft in August 1939.

The Wildcat had no hydraulic system and a very basic 12-volt DC electrical system, but with a Curtis electric propeller that was later replaced with a Hamilton Standard propeller. A vacuum system raised and lowered the flaps, but the landing gear used a hand-crank and bicycle chain that required 27-revolutions with the right hand. Electronics was a single-frequency HF transmitter, a tunable receiver, and a YE/ZB navigation receiver, with IFF added in 1942. The early aircraft also employed a telescopic sight.

The narrow landing gear of the Wildcat made it ripe for ground-loops. Pilots loved flying this stubby little fighter, despite its poor performance against the Japanese Zero. Eight of the nineteen naval aviators who received the Medal of Honor did so flying the F4F Wildcat.

FM-2 Wilder Wildcat cockpit

VF-41 F4F-4, circa 1942, with rocket rails on the wings

F4F/FM TECHNICAL DATA

Wing span 38'-0"	Length 28'-10"	Wing area 260 sqft
Empty weight 5,732 lbs		Max gross weight 8,700 lbs
Max speed 276 kts at 12,000 feet		Cruising speed 140 knots
Initial rate of climb 1,920 ft/min		Service ceiling 34,800 feet
Range 770 miles (-4) or 900 miles (FM-2)		144-gallons of fuel
Bomb load (2) 100 lb bombs on wings		(4/6) 50 caliber machine guns
Power plant P&W R-1830-76/86		1200 hp (F4F-3/4 & FM-1)
Power plant Wright R-1820-56		1350 hp (FM-2)
1,971 Wildcats built by Grumman		5,280 Wildcats built by Eastern

F4F-3 was the first production version, flown in February 1939. These were stiff-wing aircraft with four 50-caliber machine guns and 1800 rounds of ammunition (450 rnds per gun). There was also a F4F-3A version with a single-stage two-speed supercharger. These two versions were originally employed aboard carriers, but shifted ashore when the F4F-4 became available. Production of these versions started in July 1940 and 350 were delivered to the U.S. Navy by May 1941.

F4F-4 was a folded-wing version that had six 50 caliber machine guns and 1440 rounds of ammunition (240 rnds per gun). The folding-wing system was manual (a couple guys pushing on the wing-tips), but reduced parking width to 14'-6" with a minimum of extra weight. Production of this version started in November 1941 and 1,169 were delivered by May 1943. The F6F Hellcat began replacing the Wildcat in carrier combat operations after August 1943.

Built by Eastern Aviation (General Motors), the **FM-1** was identical to the F4F-4 except with four 50 caliber machine guns and 1720 rounds of ammunition (430 rnds per gun). Production of this version started in September 1942 and 1,220 were delivered to the U.S. Navy and Royal Navy by December 1943.

FM-2, called the Wilder Wildcat, was a much improved version with a 1350 hp engine and a taller tail to compensate for the added engine torque. Three rocket rails were mounted under each wing. Production of this version started in September 1943 and 4,060 were delivered to the U.S. Navy and Royal Navy by May 1945. Some 422 Japanese aircraft were downed by pilots flying the FM-2 during the last 20-months of the war.

F4F-7 was a stiff-wing version without armor or armament. This photo version incredibly carried 555-gallons of fuel internally with a camera installation in the aft fuselage. This plane could stay airborne for 24-hours or fly non-stop across the United States. Only 21 of these aircraft were delivered in 1942.

There were a number of other versions, some for prototype development, and 1,082 were delivered to the Royal Navy, who called it the Martlet. A total of 7,251 of the stubby fighters were built and about 30 are on display in various museums, mostly the FM-2 version.

VMF-211 flew the F3F-2 biplane until October 1941. VF-2 (*LEXINGTON*) and VMF-221 still flew the F2A-1 Buffalo in December 1941, the latter squadron destined for Midway Island. The Marines had mostly F4F-3s at Guadalcanal until the F4U Corsair began arriving in October 1942.

After the Battle of Coral Sea, fighter squadrons were increased from 18 to 27 aircraft using folding-wing Wildcats. After the Battle of Midway, the fighter squadrons were increased again to 36 aircraft. By the end of 1942, IFF was in common usage, but communications was still a problem. After the F6F Hellcat entered service (mid-1943), the F4F continued to serve aboard escort carriers (CVE) providing close-air support during amphibious landings and anti-submarine patrols in both the Atlantic and Pacific theaters. Japanese aircraft continued to fall prey to the stubby little fighter until the last days of the war.

VOUGHT VINDICATOR

In 1934, the Navy prepared specification for a scout-bomber and invited bids. Six companies responded, but three proposed biplanes. Northrop (a subsidiary of Douglas) proposed the XBT-1 monoplane (see SBD below). Brewster proposed the XSBA-1 monoplane and 30 were built by the Naval Aircraft Factory as SBN-1s. Chance Vought proposed a monoplane with folding wings.

The XSB2U-1 was ordered. However, the Navy was concerned about the higher landing speed of a monoplane and also ordered a biplane version – the XSB3U-1. This latter aircraft was essentially a Vought SBU-2 with retractable landing gear. Vought's monoplane version was first flown on 4 January 1936

Vought delivered both aircraft to the Navy in July 1936. Testing proved the monoplane concept and the biplane never went into production.

This SB2U-3, circa 1941, was assigned to VMS-1 (later VMSB-131).

SB2U-3 TECHNICAL DATA

Wing span 42'-0"	Length 34'-0"	Wing area 305 sqft
Empty weight 5,634 lbs		Max gross wt 9,421 lbs
Max speed 211 kts		Cruising speed 121 knots
Initial rate of climb 1,070 ft/min		Service ceiling 23,600 feet
Range 1,120 miles		420-gallons of fuel
Bomb load 1,000 lbs externally		(4) wing 50 caliber and (1) flexible 50 caliber
Power plant Pratt & Whitney R-1535-96	825 hp	
2,965 SBDs built for USN		

The SB2U had a reversible propeller that could be used in-lieu of a dive brake for steep dives. This was the first aircraft equipped with the Vought designed retractable landing gear, with a 90° twist during retraction so the wheel fit flush within the wing.

The **SB2U-1** was powered by the P&W R-1535-96 engine with 825 hp. Vought received a contract for 54 aircraft, with the first flight on 21 May 1937. Deliveries to operational units began in December 1937.

The **SB2U-2** was slightly heavier. Vought received a contract for 58 aircraft, with the first flight on 11 August 1938. Deliveries to operational units began in December 1938.

The **SB2U-3** was developed for the Marine Corps, with three additional fuel tanks and other changes that added 921-lbs to the empty weight. Of course the extra 300-gallons of fuel also added 1,800-lb to the aircraft's takeoff weight. Vought received a contract for 57 aircraft, with the first flight on 10 January 1941. Deliveries to operational units began in March 1941.

Prior to the Japanese attack on Pearl Harbor, *LEXINGTON* loaded 18 SB2U-3 from VMSB-231 and headed for Midway Island. When the ship received word of the attack, she reversed course and launched the Vindicators back to their base at MCAS Ewa. On 17 December VMSB-231 formed up on a PBY and flew the 1,137 miles to Midway Island. In March 1942, the squadron was redesignated VMSB-241. On 26 May 1942 nineteen 19 SBD-2 were ferried to the Island.

USS RANGER operated in the Atlantic theater during the first year of the war. VS-41 and VS-42 began operating SB2Us in December 1940. VS-41 transitioned to SBDs in March 1942 and VS-42 converted to SBDs in the summer of 1942. The last Vindicator left *RANGER* in September 1942.

CVG-9 was commissioned on 1 March 1942. VB-9 and VS-9 operated SB2Us until ESSEX was commissioned on 31 December 1942. The two squadrons then transitioned to SBDs in January and February 1943.

On the morning of 4 June 1942, all flyable aircraft were launched from Midway Island when the Japanese inbound strike aircraft were detected on radar. Major Lofton Henderson, the squadron CO, led the SBDs and Major Benjamin Norris, the squadron XO, led the SB2Us.

The SBDs arrived first and set-up to attack ***Hiryu***, but Major Henderson and five others were shot down before diving on their target. Captain Richard Fleming took over the lead and dropped on the Japanese carrier. Two more SBDs were shot down and the rest were damaged.

Major Norris, with his SB2U flight of inexperienced pilots, made a glide-bomb attack on the battleship ***Haruna***. Two aircraft failed to return for unknown reasons. Two other aircraft ran out of fuel and ditched near Midway Island.

At 1900 that evening, VMSB-241 launched to locate a burning Japanese carrier some 200 miles NW of Midway. Major Norris led six SB2Us, while Captain Marshall Zack led six SBDs. Darkness and bad weather prevented locating the carrier (or it had sunk). On the return flight, Major Norris apparently experienced vertigo and was seen making a steep right turn and disappeared.

At 0705 the next morning, the remaining VMSB-241 aircraft departed Midway to find two Japanese cruisers. Captain Tyler led the SBDs on the cruiser ***Mogami*** and Captain Fleming led the SB2Us on the cruiser ***Mikuma***. Captain Fleming's aircraft was hit as he rolled in and his aircraft was burning during the dive. These were the last combat sorties for the SB2U.

VMSB-241 was reorganized and remained on the island until March 1943. The squadron retained three SB2U-3s until September 1943. By 1943, most Vindicators wound up at NAS Jacksonville where they served in scout-bomber operational training squadrons.

No Vindicators (nicknamed the Wind Indicator) survived the war. However, one SB2U-2 was recovered from Lake Michigan, restored, and is now on display at the National Museum of Naval Aviation in Pensacola.

DOUGLAS DAUNTLESS

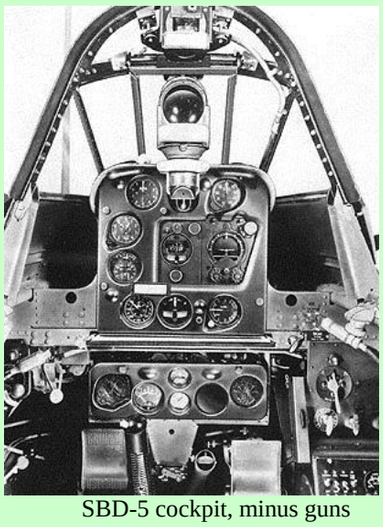
The SBD (Slow But Deadly) began life in 1934 as the Northrop designed XBT-1, intended to replace several biplanes then in service. The prototype had a 700 hp engine and flew for the first time in August 1935. The Navy ordered 54 BT-1s in 1936, which were assigned to VB-5 and VB-6. This aircraft proved unsatisfactory in service. This was Ed Heinemann's first design, but he eventually got it right.

Northrop began development of the XBT-2 with a 1000 hp engine and resolved some problems during testing that began in April 1938, but with only marginal improvement. Northrop then flew the aircraft to Langley for full-scale wind-tunnel tests. This resulted in a long list of recommendations that were implemented over the next six months.

Before the revised XBT-2 was completed, John Northrop resigned and the aircraft became property of the parent Douglas Company. Thus, the XBT-2 became the XSBD-1.

The SBD has a remarkable exterior resemblance to the 1938 SNJ (T-6) trainer that began its evolution in 1934. While the SBD was 3-ft. longer and has 28% more wing area, other dimensions differ by inches. The main differences were in weight, power, and performance. Indeed, some SNJs were fitted with a 30-caliber flexible gun mount for training SBD gunners.

This SBD-2, circa October 1941, was CEAG's aircraft.



SBD-5 cockpit, minus guns

SBD-5 TECHNICAL DATA

Wing span 41'-6"	Length 33'-0"	Wing area 325 sqft
Empty weight 6,533 lbs		Max gross wt 10,700 lbs
Max speed 219 kts		Cruising speed 121 knots
Initial rate of climb 1,280 ft/min		Service ceiling 24,300 feet
Range 1,115 miles		260-gallons of fuel
Bomb load 1,200 lbs externally		(2) 50 caliber/ twin 30 caliber
Power plant Wright R-1820		1200 hp
2,965 SBDs built for USN		675 A-24s built for Army

The SBD's spar-less multi-cellular wing design was strong, but precluded folding wings. The aircraft had split dive-flaps. The bottom flap hinged downward for diving or landing, while the top flap hinged upward for diving. The standard dive was from 15,000 feet to near vertical (70°) at 210 to 240 knots, with a release at 1500 to 2000 feet, then pulling out while closing the dive-flaps. The SBD also provided anti-submarine patrols and flew torpedo-defense mission against Japanese torpedo planes during the early months of the war.

Besides being a gunner, the rear-seat man was also the radio operator. Generally, this meant sending and receiving brief Morse-code messages during scouting missions and sometimes changing the transmitter frequency to contact other units. Some SBD-4s were fitted with ASB radar and the gunner also became the radar operator.

The Navy accepted the XSBD-1 in February 1939 and ordered 144 production versions in April. The Navy wanted more range and the first 57 were transferred to the Marines. The remaining 87 aircraft were modified to become the SBD-2 and assigned to *LEXINGTON* and *ENTERPRISE* squadrons.

The **SBD-1** was powered by the Wright R-1820-32 engine with 1000 hp, but had only 210-gallons of fuel which provided less-than 900 miles of range. The aircraft had no crew armor or self-sealing fuel tank bladders. Of the 57 aircraft delivered to the Marines, 17 were destroyed at Pearl Harbor and another 12 were damaged.

The **SBD-2** was identical to the SBD-1 except for 310-gallons of fuel which provided about 1200 miles of range and the aircraft had an auto-pilot. However, the aircraft was still without crew armor and self-sealing fuel tanks. The remaining 87 aircraft (of the original 144 plane contract) were delivered to the Navy in late 1940, outfitting the four *LEXINGTON* and *ENTERPRISE* squadrons. Of 18 SBDs launched from *ENTERPRISE* on the morning of 7 December 1941, seven were shot down or crashed, while claiming two of the 27 Japanese aircraft shot down that day.

The **SBD-3** was originally ordered by the French, but never delivered. This version featured self-sealing fuel tanks (260-gallons), an armored windscreen, and crew armor, which increased the aircraft's weight by 655 lbs. Still powered by the 1000 hp Wright R-1820-52 engine, the aircraft's performance suffered. The 174 French aircraft and 410 other SBD-3 aircraft were delivered to the Navy, beginning in late spring 1942, just in time for the Battle of Midway.

The **SBD-4** had a 24-volt electrical system to provide the extra electrical power needed for the expected ASB radar and improved communications systems. Gone were the variable pitch propeller and spinner, replaced by a Hamilton Standard constant-speed propeller. Most SBD-4s were delivered to Navy and Marine shore-based squadrons beginning in late1942 – the aircraft's stiff-wing became a serious handicap aboard carriers. Douglas delivered 780 SBD-4 aircraft to the Navy between October 1942 and April 1943, plus another 170 modified aircraft to the Army under the designation A-24A, used mostly for training.

The **SBD-5** was nearly identical to the SBD-4 except for the Wright R-1820-60 engine, producing 1200 hp, barely compensating for added weight from new equipment. The telescopic sight was finally replaced with a reflector sight. This version could carry a pair of 58-gallon external tanks which increased range to 1340 miles.

Douglas delivered 2,965 SBD-5s to Navy and Marine units between February 1943 and April 1944, plus another 615 aircraft to the Army as A-24Bs.

The **SBD-6** was nearly identical to the SBD-5 except for the Wright R-1820-66 engine, producing 1350 hp and the self-sealing fuel tanks were replaced with bladder tanks. Only 450 SBD-6 aircraft were delivered, beginning in March 1944, while the remaining orders were cancelled. Even if fitted with folding wings, the design was obsolete and no amount of power increase would change that fact. However, the Slow But Deadly did leave an indelible mark on world history.

Douglas built a total of 5,936 SBDs and several ended up in museums and a few to private ownership. The National Museum of Naval Aviation at Pensacola has 14 SBD aircraft; all salvaged from the depths of Lake Michigan after carrier qualification mishaps. These include the 17th production SBD-1, a SBD-2 that survived the Battle of Midway, one SBD-3 that flew from Henderson Field and two SBD-3s that participated in Operation Torch (Invasion of North Africa).

The Dauntless was replaced in carrier combat operations by the Curtis SB2C Helldiver beginning in November 1943. This transition was not exactly smooth, as the Beast had many teething problems.

DOUGLAS DEVESTATOR

The Navy issued a requirement for a replacement for the aging TG-2 (1926 biplane). Douglas was one of three companies that responded. One company responded with another biplane design while another responded with a float monoplane that was not suitable for carriers. Thus, Douglas won the competition by default.

The XTBD-1 was an all-metal monoplane with an 800 hp engine and hydraulically folded wings. The prototype was first flown in April 1935. The plane went through extensive testing with easily corrected flaws. The Navy issued a production contract for 114 aircraft in February 1936, with the first delivery in August 1937.

The TBD was designed as a horizontal bomber and torpedo delivery aircraft. The third crewmember in the center cockpit crawled under the pilot's seat and from a prone position could employ a version of the Norden bombsight (top secret during WW-2) to release bombs from altitude. The pilot was responsible for releasing the torpedo during a low-level attack.

VT-6 TBD, circa 1941, shows the retracted wheels and telescopic sight. The pilot and gunner are shown with open canopies. The third crewman in the center cockpit was the bombardier or observer, but didn't fly on torpedo missions.

TBD-1 TECHNICAL DATA

Wing span 50'-0"	Length 35'-6"	Wing area 422 sqft
Empty weight 6,182 lbs		Max gross weight 10,194 lbs
Max speed 195 knots at 9000 feet		Cruising speed 156 knots
Initial rate of climb 720 ft/min		Service ceiling 19,700 feet
Range 435 miles (torpedo)		180-gallons of fuel
Bomb load 2,000 lbs externally		(2) 30 caliber flexible gun
Power plant P&W R-1830-64 (900 hp)		(1) 30 caliber cowl gun
130 aircraft built by Douglas		

The gunner in the rear cockpit had radio equipment similar to the SBD and a single 30 caliber machine gun, also similar to the SBD. Before the Battle of Midway, the flexible mount was modified with twin 30 caliber guns. The pilot also had a single 30 caliber gun in the cowl that fired through the propeller.

TBD-1 was the only version built, although one aircraft was modified with floats (TBD-1A). The first deliveries were in the fall of 1937 to VT-2 in San Diego. Eventually, 130 aircraft were delivered, the last in October 1939.

After the Battle of Midway, the Navy had only 36 TBD aircraft remaining. The last combat mission was a three-plane search mission from *ENTERPRISE* on 6 June. They found the crippled cruisers *Mogami* and *Mikuma*, but fierce AAA kept them from making torpedo attacks.

Eventually, most of the remaining TBDs were used in operational training at NAS Miami until late 1943. Meanwhile, the Pacific Fleet Torpedo squadrons were hastily reorganized and began a two month transition to the TBF Avenger before flying combat missions near Guadalcanal in August.

Overall, the Devastators flew 178 combat sorties, averaging 2.2 sorties per aircraft. Of these sorties, 132 carried torpedoes, and of 95 torpedoes dropped only 10 hits were recorded. This poor success rate was probably related to a combination of factors, most notably the aircraft's slow speed, torpedo launch restrictions, and unreliability of the MK-13 torpedo. (See The Great Torpedo Scandal of WW-II in Delta Pattern.)

Although only photographs and grim memories of the TBD survived the war, two salvageable TBDs are known to exist and may someday take their rightful place at the National Museum of Naval Aviation at Pensacola.

EARLY NAVY JET AIRCRAFT

The two decades between 1940 and 1960 were the most prolific in both the numbers and types of military aircraft produced. Although only a few aircraft were produced in large numbers, there were dozens of backup projects in case the front-runner flopped – and some did.

The Navy's passion for radial piston-engines was developed to produce almost one horsepower per pound of engine weight, helped along by 115/145 octane fuel (purple). The largest was Pratt and Whitney's R-4360 28-cylinder engine, eventually rated at 3,500 HP, with a dry weight of 3,404-lbs.

$$HP = \frac{\text{thrust (lbs) x knots}}{325}$$

This formula gives the mathematical relationship between piston horsepower and jet thrust. At 325 knots, they are equal, but this does not consider propeller efficiency.

This period also encompassed the birth of jet aircraft, with the first generation of Navy jets being only slightly faster than the F4U-4.

Although early jet aircraft performance was disappointing, the future was certainly clear – jet engines could produce much more power with less weight and easily out-performed piston-engines at altitude. But those early jet engines were "fuel-hogs" and often unreliable. The early J-35 engines, for instance, often flamed out in the rain.

Furthermore, the same features that made an aircraft fly fast usually increased its landing speed. Thus, carrier jets required special design features to land aboard aircraft carriers. One of these features was light weight, yet carrier aircraft required greater structural strength to endure the stress of catapults and arrested landings.

Even the catapults and arresting gear aboard the carriers had to be improved to launch and recover aircraft that were getting larger and heavier.

Some of these problems were solved with the angled-deck carrier, steam catapults, kerosene-based jet fuel, and the afterburner.

While the SPAD had an approach speed below 90 knots, its design sink-rate was only 12 fps. Most of today's jets have a much higher approach speed and about double that design sink-rate.

Perhaps the biggest difference is inside the fuselage. Most of the interior of the SPAD and WW-II aircraft was empty space. Thus, bullets often went harmlessly in one side and out the other. There is very little empty space inside modern jet aircraft.

Furthermore, the piston-engine often continued running with a missing cylinder. The jet engine will literally vacuum bullets out of the sky and not run very well afterwards.

CHRONOLOGY

1943

In January 1943, the Navy began the long tedious process of developing carrier-based jet aircraft. Three pure-jet and one mixed-engine prototypes comprised this first-generation of jet aircraft. All but one of these eventually went into limited production and assigned to squadrons that included carrier operations. None saw combat service.

January General Electric began design of the I-16 (later J-31) jet engine. This single-stage centrifugal engine produced 1,650-lbs of thrust and weighed 850-lbs.

February Ryan Aircraft received a letter of intent requesting three hybrid XFR-1 (later Fireball) prototypes within ten months.

3 August McDonnell received a contract for three XFD-1 (later FH-1 Phantom) aircraft.

Ryan received a contract for 100 production FR-1 Fireballs.

1944

January McDonnell began work on the XFD-1 jet fighter.

May North American received a contract for 100 FJ-1 jet fighters. This was later cut to 30 aircraft.

25 June The first flight of the Ryan XFR-1 took place at Lindbergh Field in San Diego, but without the jet engine installed. The jet was installed in July and another successful flight made.

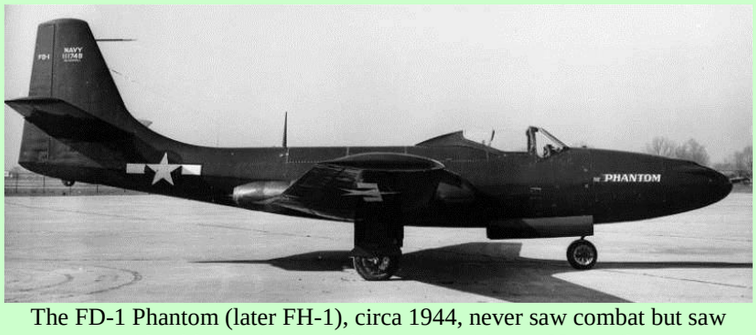
The Ryan Model 28 (FR-1) Fireball had almost identical measurements and wing area as the later North American T-28B trainer, but this single-seater also had a 1650 lb-thrust J-31 (I-16) jet engine in the tail.

5 September Chance Vought received a contract for 3 prototype jet aircraft (XF6U-1 Pirate).

1945

January VF-66 was formed and began training in the FR-1 Fireball.

26 January McDonnell conducted the first flight of the XFD-1 (later FH-1) on one engine. The second engine was yet unavailable. In March, the Navy ordered a single improved aircraft, the XF2D-1.



The FD-1 Phantom (later FH-1), circa 1944, never saw combat but saw considerable service providing jet transition to Navy pilots.

February The Navy awarded a contract to Grumman for three prototype XBT3F mixed-power aircraft. The first and second aircraft would have a Westinghouse 19XB-2B jet engine in the tail. The third aircraft would have a Westinghouse 24C-4B jet engine in the tail.

7 March McDonnell received a contract for 100 production FD-1 Phantoms, the Navy's first jet fighter. Later the aircraft designation was changed to FH-1.

May Three Ryan FR-1 Fireballs completed carrier qualification trials aboard the *USS RANGER*. The entire squadron completed qualifications later in the month.

1 June The Navy opened competition for a carrier aircraft that could make 600 mph at 40,000-feet. Vought's V-346 design was declared the winner. This aircraft later became the F7U Cutlass. Three prototypes were ordered in 1946.

18 October VF-66 was decommissioned, with the personnel and aircraft transferred to VF-41. On 15 November, this squadron was redesignated VF-1E and continued to fly the Fireball until July 1947. On 1 September 1948, this squadron was redesignated VF-1, but was disestablished on 20 November 1948. Only 66 Fireballs were built.

1946

April — Douglas received a contract for three XF3D-1 night fighters.

May — North American received a contract for 100 FJ-1s (Fury). This was later cut to 30 aircraft.

May 11 — Grumman received a contract for a jet night-fighter prototype designated the XF9F-1. Further studies determined this aircraft would not meet the Navy's specifications and the contract was cancelled.

June — North American was awarded a contract for the XAJ-1, a carrier-based nuclear bomber.

21 July — Takeoff (deck launch and catapult) and landings were conducted with the XFH-1 Phantom aboard the *USS Franklin D. Roosevel*t (CVB-42).

McDonnell XFH-1 makes a deck launch in under 400-feet.

10 September — The Navy amended Grumman's XF9F-1 night fighter contract for three XF9F-2 day-fighter prototypes,

11 September — North American conducted the first flight of the XFJ-1 Fury, powered by a J-35 with 4000 lbs of thrust.

2 October — Chance-Vought conducted the first flight of the XF6U-1 Pirate. The aircraft was powered by a single J-34-WE-22 engine producing only 3,000 lbs of thrust. It was seriously underpowered, but pioneered the use of laminated materials.

28 October — McDonnell conducted the first flight of the production version of the FH-1. This aircraft differed from the prototype only slightly, but was 19-inches longer and had an empty weight of 6,680-lbs. Two J-30-WE-20 engines each produced 1,600-lbs of thrust, and with 375-

gallons of internal fuel. Only 60 FH-1s were built, assigned to one Navy and two Marine squadrons. The aircraft was phased out in 1949, but continued to fly in Reserve squadrons until 1954.

November — Grumman began development of the first swing-wing fighter.

19 December — Grumman flew the hybrid XBT3F-1 for the first time, although without the turbojet engine in the tail.

XBT3F-1, circa 1945, but without the jet engine installed.

24 December — The Navy decided they no longer needed another torpedo-bomber, but asked for an ASW aircraft instead. To this end, Grumman completed the XBT3F contract by redesigning the aircraft without the jet engine and installing crew seats and ASW equipment in the aft section. One aircraft was configured as the XBT3F-2S (killer) and the other XBT3F-1W (hunter) with the APS-20 radar mounted between the landing gear (later AF-2S and AF-2W).

1947

January — The Navy issued a request for a short-range carrier-based interceptor. Douglas used the concepts of Dr. Alexander Lippisch, a German aerodynamic engineer who studied tailless aircraft and developed the Me-163 rocket-powered fighter to develop the Douglas D-571 project, which evolved into the XF4D-1 Skyray.

11 January — McDonnell conducted the first flight of the XF2H-1 Banshee, an enlarged and improved version of the FH-1 Phantom, which had two J34-WE-22 engines and 877-gallons of fuel.

McDonnell F2H-1, circa 1947, a look alike, but radically improved over the FH-1.

The ubiquitous Westinghouse J-34 powered several other aircraft of this period. This two-stage axial flow engine weighted 1,200-lbs and cost $68,000 at the time. The basic engine produced 3,000-lbs of thrust, with afterburning versions producing 4,370-lbs. It was installed in the F2H-1/2, F3D, F6U, and F7U-1.

May — McDonnell received an order for 56 F2H-1 Banshees.

3 September — Grumman made little progress on the swing-wing fighter. However, the Navy saw sufficient merit to issue a letters of intent, one in December and another in April 1948. The latter established the design of the XF10F-1.

September — Douglas won a contract for two prototype XA2D-1 turbo-prop aircraft. The Navy was impressed by the low specific fuel consumption of the turbo-prop engine and was looking for an engine test-bed as well as an aircraft with superior performance that could operate from the short CVE flight deck.

October North American began deliveries of 30 FJ-1 Fury aircraft, with the only squadron being VF-5A (later VF-51). The squadron won the 1948 Bendix Trophy, but fleet service was short-lived. In July 1949, the FJ-1s were transferred to the Navy Reserve and retired in 1950.

14 October Air Force Captain Chuck Yeager flew the Bell X-1 rocket plane at supersonic speeds, an event that changed future aircraft design goals. The sound-barrier was not really a barrier, but merely a design problem.

10 November Chance-Vought flew the third XF6U-1 Pirate, powered by a single J-34-WE-30 engine, producing 4,224 lbs of thrust in afterburner.

Chance Vought F6U-1 with afterburner never got to the production line.

24 November Grumman conducted the first flight of the XF9F-2 Panther.

Grumman F9F-2 Panther saw combat service during the Korean War.

The XF9F-1 was to be a four jet engine night-fighter that was cancelled early in the design stage. Funds were then transferred to the F9F-2 project.

1948

January The Navy published a requirement for a jet-powered, carrier-based bomber capable of carrying a 10,000-lb bomb load – the weight of first nuclear weapons. North American Aviation was interested and began development of the XAJ-1.

March Douglas made the first flight of the XF3D-1. This was the first aircraft designed as a night fighter and had a crew of two seated side-by-side.

3 July North American Aviation flew the XAJ-1 for the first time. This aircraft had twin turbo-charged R-2800 engines, each rated at 2300-HP, and a J-33 turbojet engine in the tail. This aircraft had numerous development problems and it was July 1949 before all were resolved.

AJ-2, circa 1953, had taller tail, longer fuselage, additional fuel, and more engine power.

August — McDonnell rolled out the first F2H-1 Banshee (nicknamed "Banjo"), replacing the FH-1 then in service. Although an improvement over the FH-1, it was considered an interim type. The Navy ordered the improved F2H-2, which was stretched 36-inches to provide more internal fuel and 200-gallon wing-tip tanks were installed for a total fuel capacity of 1454-gallons.

September — Douglas was awarded a contract for the XA3D-1.

29 September — First flight of the Vought XF7U-1 took place at NAS Patuxent River. Production orders were placed for the F7U-1 and further development of the F7U-2 and F7U-3. All three prototypes crashed, but the Navy ordered 14 productions versions.


Two J-34 engines weren't enough power for this early F7U-1

1949

1 March — Vought flew the first production version of the F6U-1 Pirate. Twenty aircraft were assigned to a fleet evaluation squadron, which labeled the aircraft "unacceptably unimpressive." The 30 production aircraft were then used by a Texas Reserve squadron and in development of arresting gear and jet barriers (barricades).

Vought production version of the F6U-1 Pirate.

Summer — McDonnell began production of 364 F2H-2 Banshees, including 27 F2H-2B, 14 F2H-2N, and 89 F2H-2P versions. The F2H-2B was capable of delivering the Mk-7 or Mk-8 nuclear weapons, which was also carried by the AD-4B during the early 1950s. The F2H-2N had an extended nose to house the APS-19 radar, the same radar used by the F4U-5N and AD-4 aircraft at the time. The unarmed F2H-2P had a "duckbill" nose-cone mounting six cameras.

1950

Early — Douglas flew the first production F3D-1 and delivered 28 aircraft. VC-3 and VMF-542 were the first operational squadrons.

26 May — Douglas flew the XA2D-1 for the first time. The aircraft was powered by the 5,100-HP T-40 turbo-prop engine driving counter-rotating propellers.

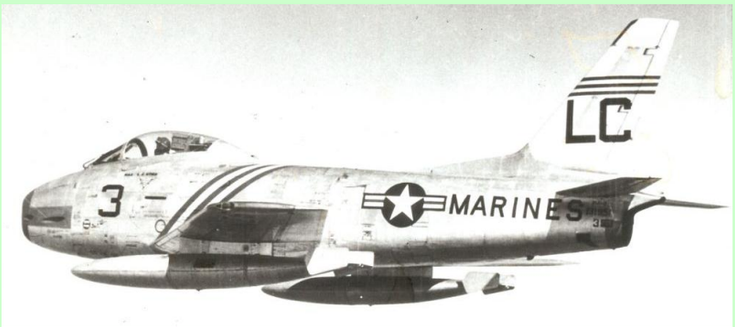
XA2D-1, circa 1950, with 150-gallon fuel tank on center station.

August — VF-172 was the first squadron to fly the F2H-2 Banshee during the Korean War, primarily on air-to-ground strike missions.

December — The first XA2D-1 was lost in a fatal accident.

Grumman and the Navy reached an agreement on the design specifications for the swing-wing XF10F-1.

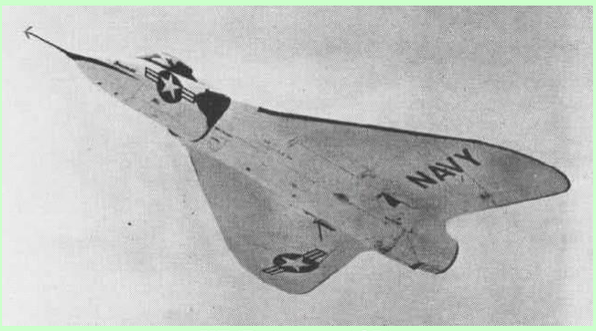
The Navy tested three modified North American F-86E aircraft, fitted with the J-47 engine (5,270 lbs thrust). However, the demands of the Korean War slowed delivery until 1953. By then, there were problems with the nose gear and tail-hook, so deliveries went to the Marines.



One of 200 FJ-2 aircraft assigned to the Marines

1951

21 January — Douglas test-pilot Larry Peyton made the “exciting” first flight of the XF4D-1 at Muroc AFB (later Edwards AFB). Russ Thaw took over the test program after some problems were corrected. The original test versions were underpowered with a J-35 (5,000 lbs thrust), but were later powered by the XJ-40 (7,000 lbs thrust). These engines were replaced by an afterburner version of the J-40 (11,600 lbs thrust) and the aircraft set two world speed records in October 1953.



XF4D-1, circa 1951

February — Douglas flew the first production F3D-2 and eventually delivered 237 aircraft. Although designed for J-46 engines, engine production delays forced the continued use of J-34 engines. This version had 1350-gallons of internal fuel and two wing stations. Instead of ejection seats, there was a bailout chute between the engines. The aircraft carried three radars: search radar, intercept radar, and tail-warning radar. This plane was flown by only a few Navy and Marine squadrons. Later designated the EF-10, this plane served the Marines in Vietnam until replaced by the EA-6A.

F3D-2 Skyknight, circa 1951, assigned to VC-3. Note open side speed brakes.

Although the SPAD was considered the oldest Navy aircraft that served during the Vietnam War, the F3D/EF-10 was actually older. Marines EF-10s were built in 1951, while the A-1s that served in Vietnam were built between 1954 and 1957.

During 1953, the BLUES flew two F7U-1s as a side act. After several incidents, these aircraft were dropped from the Program.

The BLUES, based at North Whiting Field, flew F8F Bearcats in 1949. Late in 1950, the BLUES flew their last piston-engine show and then disbanded. The pilots formed the nucleus of VF-191 and deployed to Korea aboard USS Princeton (CV-37). In 1952, they reformed at NAS Corpus Christi and began flying F9F Panthers, along with two F7U-1 Cutlasses – the gutless Cutlass didn't last the season.

20 December Vought flew the first XF7U-3, a larger version with more powerful engines. The F7U-2 had development problems and was never built.

1952

29 March McDonnell made the first flight of a production F2H-3, of which 250 were built. This version was stretched 8-feet and carried the APS-41 radar and 50% more fuel. The 150 F2H-4 versions were nearly identical, but had the APS-37 radar and were flown mostly by the Marines. Production ended in October 1953 and both aircraft were out of service by 1961.

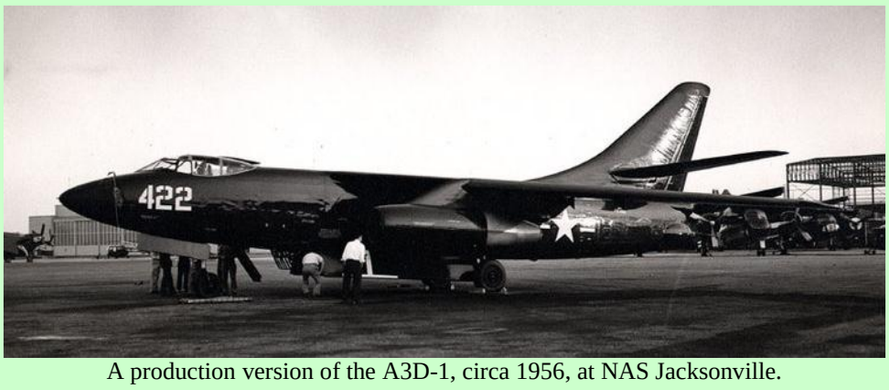
The F2H-4 Banshee, almost identical to the F2H-3 except for the radar.

19 May Grumman conducted the first test flight of the swing-wing XF10-1. Marred by mechanical problems, the 16 minute test flight was followed by a flight two days later that ended in a dead-stick landing. However, the swing-wing functioned properly.

XF10-1 taking off with under-powered J-40 engine, circa 1952

12 June Douglas received a contract for the XA4D-1.

28 October Douglas flew the XA3D-1 for the first time. The prototype aircraft flew with J-40 engines, later replaced by J-57 engines.



A production version of the A3D-1, circa 1956, at NAS Jacksonville.

1953

25 April The swing-wing XF10-1 trials ended after a 30-second flight. Earlier, the Navy cancelled the production contract and the prototypes were later used for barrier testing. One problem was the under-powered J-40 engine that also doomed other aircraft.

Douglas completed its production run of 1,051 AD-4 and 39 AD-4Q aircraft. In addition, Douglas produced 161 AD-4B and AD-4L. The AD-4B was designed to carry M-7 or Mk-8 nuclear weapons. AD-4L had deicer boots on the wings and tail surfaces. Douglas also completed 307 AD-4N and 68 AD-4W aircraft. These were improved versions of the AD-3N and AD-3W. The AD-4N carried the APS-31 radar pod on the right wing station.

1954

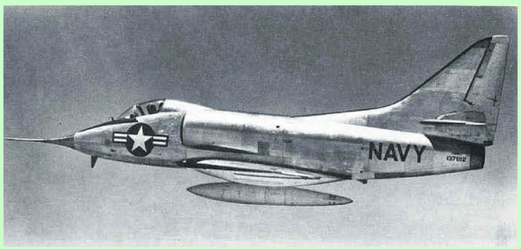
April VF-81 was the first F7U-3 Cutlass squadron. Vought built 288 aircraft with J-46 engines. VA-66 turned-in the last Cutlass in 1957. Orders for 202 F7U-3M and 250 A2U-1 were cancelled. Fortunately, Vought had the F-8U Crusader in development.


F7U-3 carrier suitability trials, *USS MIDWAY*, circa 1951. Notice the long nose-strut.

5 June Douglas flew the first of 420 F4D-1 (later F-6) production aircraft. These planes were fitted with the J-57 engine (10,200 lbs dry/16,000 lbs wet) and APQ-50 radar. The plane's carrier service was cut short, but served with VC-3 (VFAW-3) and the Marines until retired from squadron service in February 1964.

Production version of the F4D-1 (F-6A) Skyray preparing for catapult launch, circa 1957, with external fuel tanks and Sidewinder missiles on wing stations.

22 June — Douglas flew the first XA4D-1 at Edwards AFB.



XA4D-1 on early test flight, powered by J-65.

3 July — North American flew the XFJ-3 for the first time. Slightly larger and heavier than its predecessor, this version was fitted with the J-65 engine (7,200 lbs thrust). Deliveries of 538 aircraft began in 1954 and joined the fleet in 1955. An FJ-3 made the first landing aboard USS *FORRESTAL*.

North American production FJ-3, with two drop-tanks.

August — The Douglas test pilot was forced to bail out of the second XA2D-1. The Navy cancelled the A2D-1 Skyshark production order.

28 October — North American flew the XFJ-4 version of the Fury. This version had many improvements for carrier operations and had a distinctive “Razor-Back” dorsal spine. The FJ-4B could carry conventional weapons or a nuclear weapon.

1955

March — North American began delivery of 152 FJ-4 and 222 FJ-4B aircraft. The FJ-4s (F-1E) went to the Marines, while the Navy operated the FJ-4Bs (AF-1E).

FJ-4B assigned to Air Group Two, circa 1960

Besides the development of carrier jets, there were also dozens of purely experimental aircraft during this period. Some difficult to fly, some with little combat value, and some that never got off the drawing board. There were also a few promising propeller-driven aircraft that were dropped simply because the Navy wanted jet aircraft.

In the late 1950s, Douglas Aircraft Company had five carrier aircraft flying, including the SPAD. Two of these aircraft had flown in Korea and four flew in Vietnam. Most other companies were lucky to have one production model by 1960.

McDonnell Aircraft had a string of successful carrier aircraft, but ran into trouble with the F3H Demon. The company bounced back with the incredible F4H Phantom II that was also flown by the USAF. McDonnell/Douglas developed the F/A-18 Hornet, which, in 2010, was the only operational carrier fighter.

Grumman Iron works built a series of successful day-fighters – from the F9F-2 Panther to the F-11Tigercat, but had only the A-6 Intruder for the 1960s. The company brought out the F-14 Tomcat after the Vietnam War. One very expensive flop was the A-12 Avenger that was proposed as a Stealth replacement for the A-6 Intruder.

The Vought Company had a string of failures after their Great Bent-Wing Bird. The F8U Crusader joined the fleet in 1957, with time to work-out the bugs before the Vietnam War. Flying from small-decks, the Crusader earned its reputation as the last gun-fighter. Vought (then LTV) used what they learned from the Crusader to develop the A-7 Corsair II, which joined the Vietnam War in December 1967.

Generally, early jet aircraft were reasonably inexpensive compared to their recent descendants. Indeed, some recent aircraft are so expensive one might question the wisdom of sending them into harm's way.

Next up is Lockheed's F-35 Lightning II, with three different versions. The cost of just one if these aircraft could pay for an entire Korean War Air Group, with change leftover. Hopefully, it will be a winner.

The Association's history library includes flight manuals for many of the above aircraft, and questions are welcome.

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