

TBF Avenger



Type [Torpedo bomber](#)

Manufacturer [Grumman](#)
[General Motors](#)

Designed by [Leroy Grumman](#)

Maiden flight [7 August, 1941](#)

Introduced 1942

Retired 1960s

Status Retired

Primary users [United States Navy](#)
[Fleet Air Arm](#)
[Royal Canadian Navy](#)
[Royal New Zealand Air Force](#)

Number built 9,837

The [Grumman TBF Avenger](#) (designated **TBM** for aircraft manufactured by [General Motors](#)) was a [torpedo bomber](#), developed initially for the [United States Navy](#) and [Marine Corps](#) and used by a large number of air forces around the world. It entered service in 1942, and first saw action during the [Battle of Midway](#).

The [Douglas Devastator](#), the main torpedo bomber of the U.S. Navy (from [1935](#) to about 1942) had become obsolete by [1939](#). In order to replace it, Grumman (the "Iron Works") was contracted to create a new replacement. Designed by [Leroy Grumman](#), its first prototype was called the **XTBF-1**. Although one of the first two prototypes crashed near [Brentwood](#), [New York](#), rapid production continued.

Design and development



TBF-1 Avenger early in 1942, the VT-8 crew from [USS Hornet \(CV-8\)](#) is boarding. The four-man crew was later reduced to three by eliminating the horizontal bombardier behind the pilot.



TBF Avenger in mid-1942

Grumman's first [torpedo bomber](#) was the heaviest single-engine plane of WWII, and it was the first to feature a new wing-folding mechanism (designed by Grumman) intended to maximize storage space on an aircraft carrier; the [F6F Hellcat](#) (also manufactured by Grumman) would employ the same mechanism. The [engine](#) used was the [Wright R-2600-20](#) (which produced 1,900 [horsepower](#)). There were three crew members—pilot, turret gunner, and radioman/bombardier/ventral gunner. A .50-caliber machine gun was mounted in each wing, and one more .50 caliber gun was mounted right next to the turret gunner's head in a rear-facing electrically powered turret. There was a single .30 caliber hand-fired machine gun mounted ventrally (under the tail), which was used to defend against enemy fighters attacking from below and to the rear. This gun was fired by the radioman/bombardier while standing up and bending over in the belly of the tail section, though he usually sat on a folding bench facing forward to operate the radio and to sight in bombing runs. There was only one set of controls on the aircraft, and no access to the pilot's position from the rest of the aircraft. The radio equipment was massive, especially by today's standards, and filled the whole glass canopy to the rear of the pilot. The radios were accessible for repair through a "tunnel" along the right hand side. Any Avengers that are still flying today usually have an additional rear-mounted seat in place of the radios, which increases crew to four.

During the [Battle of Midway](#), all of the three [aircraft carriers'](#) torpedo groups (from the [USS Hornet](#), [USS Enterprise](#), and [USS Yorktown](#)) had taken horrendous casualties; one group had a single survivor ([Ensign George Gay](#)). This was partly due to the slow speed of the Devastator (less than 200 mph (320 km/h) during glide-bombing) and its weak defensive armament. Ironically, the first shipment of TBFs had arrived only a few hours after the three carriers quickly departed from [Pearl Harbor](#) (although a few eventually participated launched from Midway Island).

The Avenger had a large bomb bay, allowing for one Bliss-Leavitt [Mark 13 torpedo](#), a single 2000 lb (900 kg) bomb, or up to four 500 lb (230 kg) [bombs](#). Torpedoes were generally abandoned after Midway and were not carried again regularly until after June of 1944, when improvements mandated their use again. By that time, it was rare for American aircraft to encounter enemy shipping at sea and the Avenger was primarily employed as a ground support weapon. The plane had overall ruggedness and stability, and pilots say it flew like a truck, for better or worse. With its good radio facilities, docile handling, and long range, the Grumman Avenger also made an ideal command aircraft for Air Group Commanders (CAGs). With a 30,000 foot (10,000 m) ceiling and a fully-loaded range of 1,000 miles (1,600 km), it was better than any previous American torpedo plane, and better than its chief

opponent, the then obsolete [Japanese Nakajima B5N](#) "Kate". Later Avenger models carried radar equipment for the [ASW](#) and [AEW](#) roles. Although improvements in new types of aviation [radar](#) were soon forthcoming from the engineers at MIT and the electronic industry, the available radars in 1943 were very bulky, because they contained [vacuum tube](#) technology. Because of this, radar was at first carried only on the roomy TBF Avengers, but not on the smaller and faster fighters.

Operational history



TBF Avenger ready for catapult launch.



Grumman TBF Avenger aboard the USS [Yorktown \(CV-10\)](#), circa late 1943.



A [famous](#) Avenger pilot was former American President [George H. W. Bush](#), flying a TBM Avenger off the light aircraft carrier [USS San Jacinto \(CVL-30\)](#) in 1944.

On the afternoon of [December 7, 1941](#), Grumman held a ceremony to open a new manufacturing plant and display the new TBF to the public. Ironically, on that day, the [Imperial Japanese Navy](#) attacked Pearl Harbor, as Grumman soon found out. After the ceremony was over, the plant was quickly sealed off to ward against possible enemy action. By early June 1942, though, a shipment of more than 100 planes was sent to the Navy (although, as mentioned before, most were too late to participate in the fateful Battle of Midway).

However, six TBF-1s were present on [Midway Island](#), as part of VT-8 (Torpedo Squadron 8), while the rest of the [squadron](#) flew Devastators from the Hornet. Unfortunately, most of the pilots had very

little previous experience, and only one TBF survived (with heavy damage and casualties). As author [Gordon Prange](#) mentions in [Miracle at Midway](#), the outdated Devastators (and lack of new planes) contributed somewhat to the lack of a complete victory (and the loss of the *Yorktown*); bravery was no equal to superior planes.

On [August 24, 1942](#), the next major naval battle occurred at the [Eastern Solomons](#). With only two carriers (the [USS Saratoga](#) and the *Enterprise*), the 24 TBFs present were able to sink the Japanese aircraft carrier [Ryūjō](#) and claim one dive bomber, at the cost of seven planes. During the early war period, a non-aircraft related problem had emerged: the faulty torpedoes used by the U.S. Navy had failed to explode (even on direct hits) on many occasions; Prange mentions a likely problem in the magnetic detonation device (at Midway, one [submarine \(USS Nautilus \(SS-168\)\)](#) actually hit the [Sōryū](#) with a faulty torpedo, although after it was already incapacitated).

The first major "prize" for the TBFs (which had been assigned the name "Avenger" in October 1941, before the Japanese attack on Pearl Harbor) was at the [Naval Battle of Guadalcanal](#) in November 1942, when Marine Corps and Navy Avengers helped sink the [battleship Hiei](#).

After hundreds of the original TBFs were built (designated the **TBF-1**), the **TBF-1C** began production. The allotment of space for specialized internal and wing-mounted fuel tanks doubled the Avenger's range. By [1943](#), Grumman began to slowly phase out production of the Avenger to produce F6F Hellcat fighters, and the Eastern Aircraft Division of General Motors took over (causing the designation to be changed to the **TBM**). Starting in mid-[1944](#), the **TBM-3** began production (with a more powerful powerplant and wing hardpoints for drop tanks and [rockets](#)). The dash-3 was the most numerous of the Avengers (with about 4,600 produced). However, most of the Avengers were dash-1s until near the end of the war (in [1945](#)).

Besides the traditional surface role (torpedoing surface ships), Avengers claimed about thirty [submarine](#) kills, including the cargo submarine [I-52](#), whose remains were found in [1998](#). They were one of the most effective sub-killers in the [Pacific theatre](#), as well as in the Atlantic, when escort carriers were finally available to escort Allied convoys. There, the Avengers contributed in warding off German [U-Boats](#) while providing air cover for the convoys.

After the "[Marianas Turkey Shoot](#)", in which more than 250 Japanese aircraft were downed, [Admiral Marc Mitscher](#) ordered a 220-aircraft mission to find the Japanese task force. At the extreme end of their range (300 nautical miles out), the group of Hellcats, TBF/TBMs, and [dive bombers](#) took many casualties. However, Avengers from [USS Belleau Wood](#) (CVL-24) torpedoed the light carrier [Hiyō](#) as their only major prize. Mitscher's gamble did not pay off as well as he had hoped.

In June 1943, future-[President George H.W. Bush](#) became the youngest naval aviator at the time. While flying a TBM with VT-51 (from the [USS San Jacinto](#)), his plane was shot down on [September 2, 1944](#) over the Pacific island of [Chichi Jima](#)^[1]. Both of his crewmates died; however, because he released his payload and hit the target before being forced to bail out, he received the [Distinguished Flying Cross](#).

Another famous Avenger aviator is [Paul Newman](#), who flew as a rear gunner. He had hoped to be accepted for pilot training, but did not qualify because of being [color blind](#). Newman was onboard the carrier *Hollandia* (CVE-97) roughly five hundred miles from Japan when the [Enola Gay](#) dropped the first atomic bomb on Hiroshima.^[2]

TBF/TBMs sank the two Japanese "super battleships": the [Musashi](#) and the [Yamato](#) (which was Admiral [Isoroku Yamamoto](#)'s [flagship](#) for most of the war). The Avengers played a very major role in

the American victory during World War II, although torpedoes had become largely outdated (replaced by the faster and more effective dive bombers) by then.

The Avenger was also used by the [Royal Navy's Fleet Air Arm](#) where it was initially known as the "[Tarpon](#)" however this name was later discontinued and the Avenger name used instead. The first 402 aircraft were known as Avenger Mk 1, 334 TBM-1s from Grumman were the Avenger Mk II and 334 TBM-3 the Mark III. Post war the antisubmarine version was the "Avenger AS Mk IV" in RN service.

The only other operator in [World War II](#) was the [Royal New Zealand Air Force](#) which used the type primarily as a bomber, operating from South Pacific Island bases. Some of these were transferred to the [British Pacific Fleet](#).

In 1945 Avengers were involved in pioneering trials of [aerial topdressing](#) in [New Zealand](#) that led to the establishment of an industry which markedly increased food production and efficiency in farming worldwide. Pilots of the [Royal New Zealand Air Force's 42 Squadron](#) spread fertilizer from Avengers beside runways at Ohakea air base.

The post-war disappearance of a flight of American Avengers, known as [Flight 19](#), began the [Bermuda Triangle](#) legend.

One of the primary postwar users of the plane was the [Royal Canadian Navy](#), which obtained 125 former US Navy TBM Avengers from [1950](#) to [1952](#) to replace their venerable [Fairey Fireflies](#). By the time the Avengers were delivered, the RCN was shifting its primary focus to [anti-submarine warfare](#) (ASW), and the plane was rapidly becoming obsolete as an attack platform. Consequently, 98 of the RCN Avengers were fitted with an extensive number of novel ASW modifications, including [radar](#), [electronic countermeasures](#) (ECM) equipment, and [sonobuoys](#), and the upper ball turret was replaced with a sloping glass canopy that was better suited for observation duties. The modified Avengers were designated **AS 3**. A number of these aircraft were later fitted with a large [magnetic anomaly detector](#) (MAD) boom on the rear left side of the fuselage and were redesignated **AS 3M**. However, RCN leaders soon realized the Avenger's shortcomings as an ASW aircraft, and in [1954](#) they elected to replace the AS 3's with [S-2 Trackers](#), which offered longer range, greater load-carrying capacity for electronics and armament, and a second engine- a great safety benefit when flying long-range ASW patrols over frigid [North Atlantic](#) waters. As delivery of the new license-built CS2F Trackers began in [1957](#), the Avengers were shifted to training duties, and were officially retired in July [1960](#).^[3]

Many Avengers survived the remainder of the 20th century as firebombers in [New Brunswick](#).

There are also Avengers in Private collections around the world [\[1\]](#)

Variants

TBF

United States Navy designation for Grumman built aircraft.

XTBF-1

Two prototypes each powered by a 1700hp R-2600-8 engine, second aircraft introduced the large dorsal fin.

TBF-1

Initial production model based on the second prototype, 2291 built (some as TBF-1Cs)

TBF-1C
TBF-1 with provision for two 0.5in wing guns and fuel capacity increased to 726 gallons.

TBF-1B
Paper designation for the Avenger I for the Royal Navy.

TBF-1D
Conversions of the TBF-1 with centimetric radar in radome on starboard wing leading edge.

TBF-1CD
Conversion of TBF-1Cs with centimetric radar in radome on starboard wing leading edge.

TBF-1E
TBF-1 conversions with additional electronic equipment.

TBF-1J
TBF-1 equipped for bad weather operations

TBF-1L
TBF-1 equipped with retractable searchlight in bomb bay.

TBF-1P
TBF-1 conversion for photo-reconnaissance

TBF-1CP
TBF-1C conversion for photo-reconnaissance

XTBF-2
One TBF-1 re-engined with a 1900hp XR-2600-10 engine.

XTBF-3
Two TBF-1 aircraft with 1900hp R-2600-20 engines.

TBF-3
Planned production version of the XTBF-3, cancelled

TBM

United States Navy designation for General Motors built aircraft

TBM-1
as TBF-1, 550 built.

TBM-1C
as TBF-1C, 2336 built.

TBM-1D
Conversions of the TBM-1 with centimetric radar in radome on starboard wing leading edge.

TBM-1E
TBM-1 conversions with additional electronic equipment.

TBM-1J
TBM-1 equipped for bad weather operations

TBM-1L
TBM-1 equipped with retractable searchlight in bomb bay.

TBM-1P
TBM-1 conversion for photo-reconnaissance

TBM-1CP
TBM-1C conversion for photo-reconnaissance

TBM-2
One TBM-1 re-engined with a 1900hp XR-2600-10 engine.

XTBM-3
Four TBM-1C aircraft with 1900hp R-2600-20 engines.

TBM-3

Production version with provision for drop tanks and underwing rockets, 4657 built.

TBM-3D
TBM-3 conversion with centimetric radar in radome on starboard wing leading edge.

TBM-3E
TBM-3 conversion with radar radome beneath starboard wing and strengthened airframe.

TBM-3H
TBM-3 conversion with surface search radar.

TBM-3J
TBM-3 conversion for bad weather operations.

TBM-3L
TBM-3 fitted with retractable searchlight in bomb bay.

TBM-3M
TBM-3 conversion as a missile launcher.

TBM-3N
Post-war TBM-3 conversion for night attack

TBM-3P
TBM-3 conversion for photo-reconnaissance

TBM-3Q
TBM-3 conversion for electronic countermeasures with large ventral radome.

TBM-3R
TBM-3 conversions as 7-passenger ship-to-shore transport.

TBM-3S
Anti-submarine strike version converted from TBM-3

TBM-3U
General utility and target towing conversion of TBM-3

TBM-3W
Anti-Submarine search conversion of TBM-3 with APS-20 radar in ventral radome.

XTBM-4
Three prototypes based on TBM-3E with modified wing incorporating a reinforced centre section and a different folding mechanism

TBM-4
Production version of XTBM-4, 2141 on order were cancelled.

Avenger

Royal Navy designation for the TBF/TBM

Tarpon

Original Royal Navy name, changed to Avenger

Avenger I

RN designation of the TBF-1, 400 delivered.

Avenger II

RN designation of the TBM-1/TBM-1C, 334 delivered.

Avenger III

RN designation of the TBM-3, 222 delivered

Avenger IV

RN designation of the TBM-3S, 70 cancelled

Avenger AS4

RN designation of the TBM-3S, 100 delivered postwar

Operators

[Brazil](#)

- [Brazilian Navy](#) operated Avengers in 1950's.

[Canada](#)

- [Royal Canadian Navy](#) operated Avengers until 1960, when replaced by the [S-2 Tracker](#).

[France](#)

- [Aéronavale](#) operated Avengers in 1950's.

[Japan](#)

- [Japan Air Self-Defense Force](#) operated Avengers in 1950's.

[Netherlands](#)

- [Royal Netherlands Navy](#) operated Avengers in 1950's.

[New Zealand](#)

- [Royal New Zealand Air Force](#)
 - [No. 30 Squadron RNZAF](#)
 - [No. 31 Squadron RNZAF](#)
 - [No. 41 Squadron RNZAF](#)
 - [No. 42 Squadron RNZAF](#)
 - Central Fighter Establishment

[United Kingdom](#)

- [Fleet Air Arm](#)

[United States](#)

- [United States Navy](#)
- [United States Marine Corps](#)

[Uruguay](#)

- [Uruguayan Navy](#) operated Avengers in 1950's.

Famous incidents

Flight 19



US Navy TBF Grumman Avenger flight, similar to Flight 19. This photo had been used by various Triangle authors to illustrate Flight 19 itself. (US Navy)

[Flight 19](#) disappeared on December 5, 1945 while on a training mission over the Atlantic. According to the popular [Bermuda Triangle](#) stories, the flight leader reported a number of odd visual effects while lost; i.e. mentions of "white water", the ocean "not looking as it should", and his compass spinning out of control, before simply disappearing. Furthermore, Berlitz in his book claimed that because the [TBM Avenger](#) bombers were built to float for long periods, they should have been found the next day considering what were reported as calm seas and a clear sky. However, not only were the planes never found, a Navy search and rescue seaplane that went after them was also lost and never found. Adding to the intrigue is that the Navy's report of the accident was ascribed to "causes or reasons unknown".^[4]

While the basic facts of the Triangle version of the story are essentially accurate, some important details are missing. The popular image of a squadron of seasoned combat aviators disappearing on a sunny afternoon did not happen. By the time the last radio transmission was received from Flight 19, stormy weather had moved in. Only the Flight Leader, Lt. [Charles Carroll Taylor](#), had combat experience and any significant flying time, but at the same time he had less than six months of flight experience in the south Florida area, less than the trainees serving under him, and a history of getting lost in flight, having done so three times previously in the [Pacific theater](#) during [World War II](#) and being forced to ditch his planes twice into the water. Lt. Taylor also has since been depicted as a cool, calm and confident leader. Instead, radio transmissions from Flight 19 revealed Taylor to be disoriented, lacking confidence in his decisions, and completely lost.

Exaggerated claims also often stated that all the planes were having compass problems, however later naval reports and written recordings of the conversations between Lt. Taylor and the other pilots of Flight 19 do not indicate this. As for the Navy's report, it is stated that blame for the loss of the aircraft and men rest upon the flight leader's confusion. However the wording was changed from blaming Taylor to "cause unknown" in a second official report in deference to the wishes of his family. It was this incident as stated in the second, altered report, plus the later losses of the airliners *Star Tiger* and *Star Ariel*, which began the legend of the Bermuda Triangle.^[4]

Specifications (TBF Avenger)



Grumman TBM-3E Avenger - Tom Buck, N683G

General characteristics

- **Crew:** 3
- **Length:** 40 ft 11.5 in (12.48 m)
- **Wingspan:** 54 ft 2 in (16.51 m)
- **Height:** 15 ft 5 in (4.70 m)
- **Wing area:** 490.02 ft² (45.52 m²)
- **Empty weight:** 10,545 lb (4,783 kg)
- **Loaded weight:** 17,893 lb (8,115 kg)
- **Powerplant:** 1× [Wright R-2600-20 radial engine](#), 1,900 hp (1,420 kW)

Performance

- **Maximum speed:** 276 mph (444 km/h)
- **Range:** 1,000 miles (1,610 km)
- **Service ceiling:** 30,100 ft (9,170 m)
- **Rate of climb:** 2,060 ft/min (10.5 m/s)
- **Wing loading:** 36.5 ft·lb/ft² (178 kg/m²)
- **Power/mass:** 0.0094 hp/lb (0.17 kW/kg)

Armament

- 1x 0.30 cal (7.62 mm) nose-mounted [machine gun](#)
- 2x 0.50 cal (12.7 mm) wing-mounted [machine guns](#)
- 1x 0.50 cal (12.7 mm) dorsal-mounted machine gun
- 1x 0.30 cal (7.62 mm) ventral-mounted machine gun
- Up to 2,000 lb (900 kg) of bombs
- 1x 2,000 lb (900 kg) [Mark 13 torpedo](#)

[\[edit\]](#) References

1. [^] Hove, Duane (2003). *American Warriors: Five Presidents in the Pacific Theater of World War II*, ISBN1-57249-260-0
 2. [^] [Biographies in Naval History](#)
 3. [^] [Shearwater Aviation Museum- Aircraft History- Grumman Avenger](#)
 4. [^] ^a ^b http://www.bermuda-triangle.org/html/the_disappearance_of_flight_19.html
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- [Walkaround](#)
- [Raising Grumman](#)
- [History.navy.mil "Flight 19"](#)
- [American Air Power Museum](#)

[\[edit\]](#) Related content

Comparable aircraft

- [Fairey Barracuda](#)
- [Fairey Firefly](#)
- [Nakajima B5N](#)
- [Nakajima B6N](#)
- [TBD Devastator](#)
- [TB2D Skypirate](#)
- [TBY Sea Wolf](#)

Designation sequence