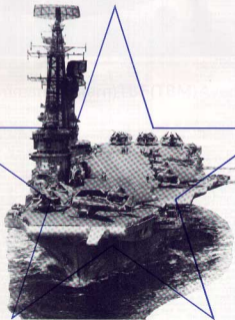


## GRUMMAN (EASTERN) TBF (TBM) AVENGER





A TBF-1C (note push over wing-mounted eng. which differentiated this version from the earlier TBF-1) about to be launched from the deck of the U.S.S. Franklin (CV-113) in March 1944. (Photos: National Archives)

# Grumman (Eastern) TBF (TBM) Avenger

René J. Francillon, Ph.D.

"AVENGER" was to become its battle name and average Pearl Harbour it certainly did.

Developed with some urgency in the dark days of 1940 when war clouds over Europe led to a rapid expansion of the air elements of the United States Navy, the fat-bellied Grumman torpedo-bomber went on from an inauspicious beginning during the Battle of Midway to become the most important carrier-based bomber embarked aboard American and British carriers. Ultimately, its telling blows with torpedoes, bombs, depth charges and rockets did much to bring about the Japanese surrender.

With the return to peace the Avenger, which was the last type of specialised torpedo-bomber to serve aboard the aircraft carriers of the U.S. Navy, appeared to be due for an early retirement. Yet its great adaptability, combined with its availability in large numbers, led to a new youth for the dependable Avenger which crowned a brilliant war record with a long and useful second life as the main type of anti-submarine strike aircraft operated during the early years of the Cold War by the Free World nations to check the menacing threat of the Soviet submarine fleet.

Finally retired from the military life, with the cooption of a few aircraft of the Uruguayan Naval Aviation Service—*Servicio Aeronáutico de la Marina*—still languishing on the shores of the River Plate estuary, the old war horse now fights its civilian strife in a very different battle. As the principal aircraft used by commercial operators in the United States to control dangerous forest fires, the Avenger appears in the 1970s to have many years of life to fulfil. Quite a

record indeed for an aircraft which, outwardly at least, had nothing to offer when it entered service but a big, strong and reliable airframe capable of absorbing heavy battle damages.

## DEVELOPMENT HISTORY

When, in 1940, the U.S. Navy began an ambitious programme to expand considerably the size of its carrier fleet, it could depend on having an adequate supply of fighter and dive-bomber aircraft to equip these new carriers. In the VP-class (lighters), the Navy was beginning to take delivery of its first monoplane, the Grumman F4F-3 Wildcat, while a successor to this aeroplane, the Yough XF4U-1 Corsair which was to be capable of speed in excess of 400 m.p.h., was just entering flight trials. In the VS-class (scout bombers), the Douglas SBD-2 Dauntless was entering service and the prototype for a more advanced aircraft, the Curtiss XSBC-1 Helldiver, had already been ordered on May 15, 1939. All these aircraft were expected to have performance equal or superior to those of foreign naval aircraft and were a good match for the new carriers aboard which they were intended to operate.

In the torpedo-bomber category (VT-class), the U.S. Navy was not faring as well and could only depend on the obsolescent Douglas TBD-1 Devastator of which 129 had been delivered commencing in October 1937. From the pilot's standpoint the Devastator was a pleasant aeroplane to fly but its performance was, in the light of the early events of



Two TBM-1C Avengers specially-equipped for electronic countermeasures operations in flight off Columbia, Capitan, on December 1, 1945. (Photo: National Archives)



TBM-1C from Gracie Squadron Five (VT-5) in flight near Guam in February 1945. (Photo: National Archives)

the Battle off Cape Engano, the TBF and TRM Avengers contributed to the sinking of the carriers *Chitose*, *Chiyoda*, *Zuikō* and *Zestuba*. Meanwhile, the Avengers based aboard the escort carriers of TG-77.4 Escort Carrier Group, which were providing air support for the invasion forces in Leyte Gulf, had to switch their combat role from air support sorties to attacks against the battleships and cruisers of Vice-Admiral Kurita which had surprised the invasion forces in the Battle of Saray (October 23, 1944). Even though they were handicapped by the insufficient number of torpedoes and ammunition bombs carried aboard their escort carriers (the limited ammunition storage facilities aboard the carriers of TG-77.4 were primarily stocked with bombs and rockets for use against land targets), these Avengers gallantly helped to save the landing fleet.

Combat operations around the Philippines brought about a number of tactical changes in the composition of the air groups embarked aboard the carriers of the U.S. Navy. The first of these changes was the appearance during the fall of 1944 of specialized Night Air Groups which comprised a number of night-fighting Hellcats (F6F-3N and F6F-3N) and of Avengers (TBM-1D and TBM-3D) fitted with specialized radar equipment to assist the Hellcats in detecting Japanese night-bombers. The other major change resulted from the need to provide increased fighter defense to contain the Kamikaze suicide-attacks first initiated by the Japanese on October 25, 1944. Consequently,

starting in the spring of 1945, the American carriers began substituting some of their Avengers and Helldivers for additional numbers of Hellcats and Corsairs assigned to fighter-bomber (VBF) squadrons.

In support of the landing at Iwo Jima on February 19, 1945, Task Force 58 and its Avengers began their first strikes against the heart of Japan on February 19 and then went on to assist in the softening of Japanese positions on Iwo Jima. At that time already the typical aircraft complement of an Essex-class attack carrier had been changed from 41 Hellcats, 42 Helldivers and 18 Avengers (CV-19 *Hancock* on October 20, 1944) to 72 Hellcats, 12 Helldivers and 10 Avengers (base carrier on February 25, 1945). With similar aircraft complement, the carriers of Task Force 58 helped fight the *Kamikaze* onslaught off Okinawa (April 1945) and on April 7 the Avengers based aboard these carriers contributed ten torpedo hits to the sinking of the 68,000-ton battleship *Yamato* (a sister ship to *Musashi*), the world's largest battleship. By June 1945, the Fast Carrier Force had been renumbered TF-38 and under the command of Admiral Halsey, this Task Force made a series of successful air strikes against Japan between July 10 and August 15, the day of the Japanese surrender.

While operations in the Pacific dominated the history of the U.S. Navy's Avengers during World War II, TBFs and TBMs were also operated by that Service in the Atlantic and the Mediterranean. In these theaters the first major action in which Avengers

TBM-1C aboard the U.S.S. *Franklin D. Roosevelt* (CV-42) in February 1945. Note catapult along arrowhead on the main gun. (Photo: National Archives)



TBM-1C from FMFV-217 dropping two 500-lb. bombs on Japanese positions on Okinawa. (Photo: U.S. Marine Corps)





The TBM-1E which performed the killer role in the TBM-1E/TBM-3E anti-submarine hunter-killer team. This particular aircraft is seen flying off Boca Linton, Florida, sometime in 1939. (Photo: National Archives)



The TBM-1E, improved version of the ubiquitous Corsair, was here shown at the U.S.S. Coral Sea (CV-4-47) in October 1947. Note the insignia of the "Loggia Fleet Air Wing, Atlantic Command" beneath the starboard tail. (Photo: National Archives)

Eastern TBM-1E with large natural rubber and auxiliary vertical tail surfaces on the stabilizers.

(Photo: via Kurt Miksa)





*(Main five views of '47'):* The tail mark VMTB-134, a U.S. Marines' Squadron part in the Peleliu landing operation in 1944. Depicted is an Eastern TBM-1C (BuAer. No. 46427).

*(Side view, bottom right):* A Grumman BuAer. No. 47850 modified for target-towing and serving with the RNZAF Target-T Otokoas in May 1945.

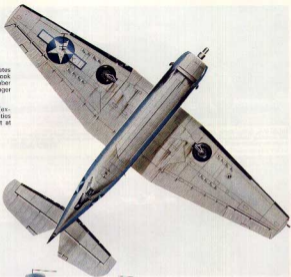
T. Brittain/T. Hester © Profile Publications



The tail marking indicates  
Squadron which took  
operation in September  
in TBM-1CP Avenger

Grumman TBF-1C (ex-  
cept target-towing duties  
of Target-Tug Flight at

*Publications Ltd.*





*F2A-1CP (BuNo. No. 49437) from FM7F-128 which, on September 15, 1944, made an emergency landing on the atoll of Pele-ka. Had this landing taken place three days earlier the crew would rather have been killed or taken prisoner as this airfield was captured by the Marines on September 13.*  
 (Photo: U.S. Marine Corps)



*F2A-3 (BuNo. No. 88768) from FM7F-213 aboard the U.S.S. Block Island (CVE-106) during the shutdown order of this escort carrier, the first carrier assigned to the U.S. 31st.*  
 (Photo: U.S. Marine Corps)

*Also belonging to FM7F-212, one of the most active Marine units over Okinawa, this F2A-3E fires a rocket salvo at a Japanese stronghold in southern Okinawa.*  
 (Photo: U.S. Marine Corps)



took part in Operation Torch, code name for the Allied landings in North Africa on November 8, 1942. For this operation 27 TBF-1s from VGS-26, VGS-27 and VGS-29 were (respectively) embarked aboard the escort carriers *Sangamon*, *Sawsoner* and *Savon*. Lacking sufficient training (some pilots had only flown Avengers for three hours prior to joining these carriers) these Avenger squadrons suffered heavy operational losses but, nevertheless, contributed to silencing several shore batteries of the French Vichy forces. However, the most important role played by the Avengers in the war against the European Axis powers was that of anti-submarine strike aircraft for which they operated from the decks of escort carriers. An idea of the effectiveness of the Avenger in this role can be obtained from the fact that during the eight months between May 1943 and February 1944, these aircraft were credited with the sinking of no fewer than 28 German U-boats.

### U.S. Marine Corps

The first Marine squadron to be equipped with Grumman TBF-1 Avengers was VM5B-131 (later properly redesignated VMTB-131), which arrived at Henderson Field in time to take part in the Battle of Guadalcanal, the major offensive launched by the Japanese on November 11, 1942. Almost immediately, VM5B-131 gained distinction on November 13, when four of its aircraft added a torpedo hit to the Japanese battleship *Mitai*. This had already received a torpedo launched by an Avenger of VT-10 (one of *Enterprise's* squadrons which was temporarily land-based at Henderson Field) as well as numerous hits scored by American surface vessels. The crippled *Mitai* finally sank five miles N.W.W. of Savo Island.

Even though for their combat debut the Marine Corps' Avengers used torpedoes against Japanese surface vessels, this proved to be an exceptional event and the TBFs and TBMs of the U.S.M.C. were primarily operated against land targets with bombs and rockets or on anti-submarine patrols with depth charges and rockets. Major actions in which land-based Marines' Avenger squadrons were deployed in the Pacific included the amphibious operation on November 2, 1943, leading to the establishment of a beachhead at Tarakan, Besigville (VMTB-143, VMTB-232 and VMTB-233) and the attacks made by aircraft of the same three squadrons in early 1944 against the five airfields and harbour installations which the Japanese had around their main base at Rabaul. For the operations in the Marianas in July 1944, the Marine Corps provided two Avenger squadrons, VMTB-131 which provided air support to ground forces on Guam and VMTB-242 which performed the same rôle on Tinian. Shortly thereafter, VMTB-134 took part in the Peleliu landing operation. During the battle for Okinawa, the last major amphibious operation of the war, VMTB-131 and VMTB-232 provided Avengers both for air support of ground forces and for anti-submarine patrols around Okinawa.

No story of the "Flying Leathernecks" Avengers would be complete without mentioning the agreement reached in August 1944 between the U.S.M.C. and the U.S.N., which provided for the organization of a



TBF-1 from VM5B-131, the first Marine Corps unit to be equipped with Avengers, photographed on Guadalcanal in November 1942. (Photo: U.S. Marine Corps)

number of escort carriers embarking exclusively Marine squadrons. The first of these Marine carriers was the U.S.S. *Block Island* aboard which the Avengers of VMTB-233 embarked in March 1945 to provide close-support missions on Okinawa and to make a number of air strikes in the Ryukyus. Next came the U.S.S. *Gilbert Islands* with VMTB-143 (Okinawa campaign and Balikpapan landings), the U.S.S. *Pelle Gulf* with VMTB-234 (strikes on Pagan and Rota) and the U.S.S. *Cape Gloucester* with VMTB-132 (operations in the East China Sea). Four more Marine escort carriers were to be added for Operation Olympic, the planned invasion of Japan in late 1945, but VJ-Day rendered this project unnecessary.

### Royal Navy: Fleet Air Arm

Initially named Tarpon by the Royal Navy but renamed Avenger in January 1944 to conform with the designation already adopted for the aircraft by American forces, the Grumman-designed torpedo-bomber became one of the most important types of carrier-borne aircraft operated by the Fleet Air Arm during the last 32 months of World War II.

Compared with the Fairey Barracuda—the only other type of monoplane torpedo-bomber operated by the Royal Navy—the Avenger was faster in level flight and climb, possessed a much longer range, was capable of surviving more battle damage and carried both heavier offensive and defensive armament. Above all, its adoption enabled the Fleet Air Arm to rely on U.S. Navy stocks of spare parts during joint operations in the Pacific. Consequently, even though the Royal Navy took delivery of two-and-a-half times as many Barracudas than Avengers, 15 first-line squadrons of the F.A.A. were eventually equipped with the American aircraft against only 12 Barracuda squadrons. Both types were delivered to operational

An early Tarpon I of the Fleet Air Arm. Note ventral machine-gun and observation blister on fuselage side. (Photo: Crown Copyright)





## Colour illustrations

- 6 Royal Canadian Navy Eastern TBM-3E (ex-BuAer. No. 80233).
- 7 Unusual modification to Eastern TBM-3E of RCN (ex-BuAer. No. 53078). This rework was carried out by Fairey Aviation of Canada.
- 8 A Grumman Avenger was modified to test the Frazer Nash F.N. 95 remotely-controlled barbette designed for the Fairey Spearfish.
- 9 An Eastern TBM-3U Avenger (BuAer. No. 85594) of USN Utility Squadron Five (VU-5)
- 10 One of the last two Avengers of the Royal New Zealand Air Force, still flying in 1960; a Grumman TBF-1 (serial NZ2504).

units within ten days of each other (No. 833 Squadron relinquishing its obsolescent biplane Fairey Albacore for Avengers on January 1, 1943, and No. 827 Squadron converting from even older Fairey Swordfish to Barracuda on January 10) but the Avengers were retired in 1957 whereas the last Barracuda in first-line service were superseded by Avenger A.S. Mark 4s in 1953.

Between 1943 and 1945 the Royal Navy was allocated under Lend-Lease a total of 958 Torpedos and Avengers including 401 TBF-1Bs (Torpedo or Avenger Mk. Ia), 334 TBM-1Cs (Avenger Mk. IIa) and 222 TBM-3s and TBM-3Es (Avenger Mk. IIIa) while 70 TBM-4s (Avenger Mk. IVa) were not delivered.

As was the case with other types of American-built carrier-borne aircraft delivered to the Fleet Air Arm, Blackburn Aircraft Ltd. was responsible for the modification of most of the Avengers to meet the specific requirements of the Fleet Air Arm. Among the many changes introduced into the Avengers by Blackburn, the most significant were the installation of British gun sights, oxygen system and wireless equipment; the addition of R.A.T.O.G. (rocket-assisted take-off gear); the installation in the rear ventral position of an F.24 camera and the removal of the stinger (i.e. in this position; the modification of the cockpit to relocate the navigator immediately behind the pilot; and the modification of the aerial mast which had to be hinged to clear the roof of the shallow hangars beneath the flight deck of the British carriers. Other modifications made to the Avengers of the Royal Navy included the fitting beneath the wings of some Avenger IIa and IIIa of rails for large rocket projectiles and one aircraft also served to test in flight the British Frazer Nash F.N.95 remotely-controlled barbette intended for the Fairey Spearfish.

Whereas U.S. Navy Avengers took part in many major air-sea battles during which they sank several capital ships, the F.A.A. aircraft of this type never had an opportunity to participate in any action of such magnitude. Yet, particularly during attacks against the vital oil refineries in Sumatra, the British Avenger



*Torpedo J (Grumman TBF-1B) with wings folded.*

crew proved that they missed none of the skill and valour of their U.S.N. companions. The first Fleet Air Arm unit equipped with Avengers to go into action was No. 833 Squadron which, based aboard the U.S.N. *Saratoga*, and later aboard H.M.S. *Victorious*, took part in operations in the Middle Solomons in June and July 1943 and bombed enemy shore positions in support of the landings on New Georgia. After this brief foray in the waters of the Pacific, the F.A.A. Avengers were primarily active in the Atlantic and the North Sea where No. 846 Squadron's Avengers took part in the Battle of the Atlantic during the first half of 1944.

For anti-submarine operations the Avenger, in spite of the added comfort offered by its enclosed canopy and of its superior performance, was not favoured by its British crews who, for operating from the small patching deck of escort carriers, preferred the venerable Fairey Swordfish. Consequently, No. 846 Squadron operated in the Atlantic for a very brief period only and was then shifted to north Russian convoys in the Arctic where its aircraft shared, on April 1, 1944, in the destruction of the German submarine U-235 and repeated this feat two days later when they shared, with Swordfishes, in the sinking of U-289. The only other Avenger squadron providing A.S.W. coverage for Arctic convoys was No. 833 Squadron, but this unit, although playing an important deterrent rôle by forcing the U-boats to stay away from Allied convoys, did not sink a single enemy submarine. Between April 1944 and May 1945 and operating from the escort carriers H.M.S. *Fencer*, *Prender*, *Quon*, *Tracker* and *Transporter*, these two squadrons—together with Nos. 852 and 856—also provided Avengers for a number of successful attacks in Nor-

*A freshly completed Avenger II (TBM-1) being taken to the airwing for acceptance trials.*  
(Photo: General Motors Corporation)







YB912, one of 509 Avenger A.S. Mk. IV delivered to the Fleet Air Arm in 1943. This particular aircraft is equivalent to the TBM-1E of the U.S.N. with dorsal turret removed and tailboom forward (the rearward wing).

(Photo: via Arthur Peacey, Air-Britain)

wegian waters against shore batteries and coastal shipping. Avengers from No. 846 Squadron sank at Kilsboen on May 4, 1945, the submarine *U-777* and its depot ship. Finally, before leaving the European theatre of operations, mention must be made of the anti-submarine patrols, mine-laying sorties and shipping sweeps in the English Channel which were made by shore-based Avenger squadrons of the Royal Navy.

On May 17, 1944, F.A.A. Avengers went back to fight the Japanese when 24 Avengers from Nos. 832 and 847 Squadrons took off from H.M.S. *Warrick* to strike the aviation fuel store and dockyard at Soerabaya, Java. For the next six months, however, the Avengers were again transferred to shore stations and escort carriers—and two Avengers from Nos. 832 (H.M.S. *Ripon*) and 851 (H.M.S. *Sheeh*) Squadrons shared with surface vessels the destruction of *U-198* on August 12, 1944—while the fleet carriers of the Eastern Fleet retained the Fairey Barracuda as their main type of strike aircraft. This situation was changed in late 1944 when co-operation between the U.S. Navy and the Royal Navy was being accelerated to co-ordinate the final attacks against Japan and the Avenger became the principal strike aircraft of the Fleet Air Arm. With the Eastern Fleet Avengers from Nos. 820, 848, 854 and 857 Squadrons respectively embarked aboard *Indefatigable*, *Victorious*, *Illustrious* and *Indomitable* took part in a successful strike against the oil refinery at Pangkajene Brandon on January 4, 1945. From then on the Eastern Fleet was deprived of fleet carriers as these vessels were transferred to the British Pacific Fleet but Avengers from Nos. 845 and 851 Squadrons aboard *Empress*, *Empress* and *Sheeh* took part between February and June 1945 in a series of strikes against targets in the Andaman Islands, Burma and Sumatra.

Avenger T.S. Mk. III (serial J2631), a TBM-1E of the Fleet Air Arm, fitted with heavy rocket projectiles.

(Photo: Crown Copyright)



Avenger A.S. Mk. IV (serial TB446) photographed at Royal Naval Air Station Culterton on July 12, 1945. This aircraft resembles the U.S. Navy TBM-1E but has British A.S.P. rather than dorsal turret forward section of the fuselage.

(Photo: via Arthur Peacey, Air-Britain)

Shortly after its inception, the British Pacific Fleet left Trincomalee, Ceylon, for its new base at Sydney. The transfer of the carriers *Illustrious*, *Indefatigable*, *Indomitable* and *Victorious*, between which embarked the 84 Avengers of Nos. 820, 849, 854 and 857 Squadrons, was combined with two very effective strikes on January 24 and 29, 1945, against the vital oil refineries at Saigo Geyong and Padang, Sumatra. Both refineries were almost totally destroyed and the success of these strikes contributed greatly to precipitating the fall of the Japanese Empire by accentuating an already critical shortage of aviation fuel.

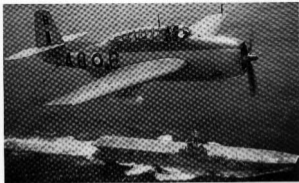
In March 1945 the British Pacific Fleet became for tactical purposes Task Force 37 under the command of Admiral Spruance's U.S. Fifth Fleet and the British carriers and their Avengers began a hard campaign against the Japanese. During the next two months the following Avenger-equipped squadrons, Nos. 820, 828, 848, 849, 854 and 857, struck repeatedly at Japanese airfields in Sakashima Gunto and Formosa to attempt keeping down the *Kamikaze* attacks against the Allied fleet operating around Okinawa. Finally, in July 1945, the British Pacific Fleet was renumbered Task Force 37 and took part in strikes against airfields, naval bases and shipping in and around the Japanese home islands. During this period an Avenger from No. 848 Squadron became, on July 24, 1945, the first British aircraft to bomb Japan.

With the end of the war the Avenger squadrons of the Fleet Air Arm were rapidly disbanded (the last being No. 828 on June 3, 1946) and large numbers of aircraft were thrown overboard as the U.S. Navy had no use for the Avengers delivered to the F.A.A. under Lend-lease and the British Government found no justification for paying to retain aircraft no longer needed. A few years later, the threat of Soviet submarines was to prove this to have been over-hasty action.

Escort TBM-1E from the Royal Canadian Navy. Note typical engine installation and recovery of the U.S. Model No. 40421.

(Photo: Royal Canadian Navy)



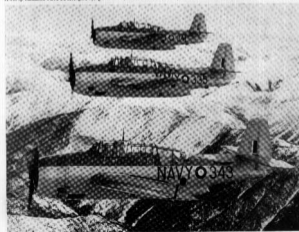


*TBM-3V from the R.C.N. flying over H.M.C.R. Magdalenen. Note lowered arrestor hook.*

*(Photo: National Defence, Canada)*

*A trio of Canadian TBM-3V Avengers flying over the Pyramid Mountains in July 1954.*

*(Photo: National Defence, Canada)*





Grumman TBF-1 (N22504 ex-builder No. 148151) from the R.N.Z.A.F. General and Utility Flight, Auckland, late 1940s.  
(Photo: Kenneth Meehan)

The last two R.N.Z.A.F. Avengers (TBF-1, serial N22504 and TBF-1C, serial N22527) in flight, just prior to retirement in 1993.  
(Photo: R.N.Z.A.F. Official)



TBM-1E No. 74, N7810C, operated by the Home Valley Flight Service as an "aerial tanker". Capable of carrying 5000-lb. of five standard chemicals in an enlarged central bay, this aircraft was photographed on November 7, 1949 at Ryan Field, Fresno, California.  
(Photo: Ross J. Francilop)

An Eastern TBM-1E (No. 1-8) of the Royal Netherlands Naval Air Service operating in the late 1950s. During 1953-4 the R.N.N.A.S. took delivery of 191 TBM-1E and TBM-1F Avengers. Two squadrons operated from the R.N.N.A.S. aircraft carrier Karel Doorman.  
(Photo: R.N.N.A.S. via Jan W. A. van Dongen, Netherlands)





Rear view of a TBAF-10 (BuAer. No. 46287). The aircraft carrier deck markings project beneath the wings, but a large radome on the leading edge of the starboard wing and additional radar details above and below both wings.

(Photos: National Archives)

World War II, wholly inefficient and the U.S. Navy had an urgent requirement for a new series of torpedo-bombers. Accordingly, on April 8, 1940, the Bureau of Aeronautics (BuAer.) placed with the Grumman Aircraft Engineering Corporation a contract for the design and construction of two prototypes of a three-seat, carrier-based torpedo-bomber. In its instruction to the contractor, the Navy stressed the need to design an aircraft which would be easy to build and maintain and which could take considerable punishment under normal operating conditions as well as under combat conditions.

Time being the most critical factor in the design of this new torpedo-bomber for the U.S. Navy, the Grumman engineering team led by William T. Schwadler elected to rely extensively on its experience with the development of the F4F-3 and so keep the aircraft's structure and systems as simple as possible. As work progressed, the XTBF-1 began to look as a large, fat-bellied aeroplane bearing a strong family resemblance to the Wildcat. Like the single-seat Grumman monoplane fighter, the torpedo-bomber had mid-mounted wings folding alongside the fuselage sides. Beneath the center section of the wings was installed an internal bomb-bay with hydraulically operated doors which could house either a 22-in. torpedo or four 300-lb. bombs whilst above the wings the crew of three (pilot, navigator/gunner, and radio-operator/gunner) sat in tandem beneath a large glazed greenhouse. Defensive armament consisted in a forward-firing 0-30-in. machine-gun mounted on the starboard side of the upper engine cowling and fired

by the pilot, a flexible rear-firing 0-30-in. Browning machine-gun in a ventral sump which was manned by the navigator and in a 0-30-in. m.g. in a dorsal turret at the end of the large canopy. With respect to this dorsal turret it is interesting to note that Grumman initially contemplated using a turret designed by Boulton Paul but that this turret of British design was rejected by the Grumman engineers for fear that it would be too prone to being put out of action following comparatively minor battle damages. Consequently, Grumman set out to design their own turret which was characterized by the mounting of the single 0-30-in. m.g. offset to port and this turret proved extremely reliable in service. The engine selected to power the XTBF-1 was the 1,700 h.p. Wright R-2600-8 18-cylinder, double-row, air-cooled radial driving a three-blade Curtiss Electric propeller. The aircraft was also fitted with a fully retractable landing gear and a retractable dock arrestor hook.

Twenty-six months after having received the initial contract for two XTBF-1s, Grumman had completed the first prototype (Bureau of Aeronautics number 2339) and this aircraft made its maiden flight on August 1, 1941, with Bob Hall at the controls. For the next three-and-a-half months the first XTBF-1 was utilized exclusively for manufacturer's trials which gave entire satisfaction with the exception of pointing out the need to improve directional stability. However, on November 28, 1941, this aircraft was lost when the two members of the test crew were forced to bale out following a fire in the bomb-bay. Fortunately for the contractor and the U.S. Navy little delay resulted from the loss of the first prototype as within three weeks of the crash of BuAer No. 2339 the second XTBF-1 (BuAer. No. 2340) took to the air and three days later, on December 23, 1941, Grumman received an initial production contract for 286 TBF-1s. These production aircraft as well as the second XTBF-1 differed externally from the first prototype in having a large dorsal fin extending from a point slightly behind the dorsal turret to a point on the vertical fin level with the horizontal tail surface.

With the first production TBF-1 (BuAer. No. 00373) coming off its line on January 3, 1942, and

The first of two XTBF-1s (BuAer. No. 24441) built by Grumman. (Photos: National Archives)



## Royal New Zealand Air Force

Starting in the summer of 1943, the R.N.Z.A.F. received six TBF-1s (NZ2301 to NZ2306) and 42 TBM-1Cs (NZ2307 to NZ2348). These aircraft were initially assigned to No. 30 Dive-Bomber Squadron, formed in September 1943, and to No. 31 Dive-Bomber Squadron, formed in December 1943. Both squadrons completed a tour of operations in the Solomon Islands, but then, because of changes of R.N.Z.A.F. policy, Nos. 30 and 31 Squadrons were disbanded in 1944.

In September 1945 nine of the surviving Avengers were transferred to the Royal Navy and a month later 16 were returned to the U.S. Navy. Avengers continued in service with the R.N.Z.A.F. for many years as target-tugs and as vehicles for aerial top-dressing trials, the last two aircraft finally being retired in 1960.

## PEACETIME DOLDRUMS AND COLD WAR ALERT

Following VJ-Day the number of *Avenger* squadrons operated by the U.S. Navy and the U.S. Marine Corps decreased rapidly not only because fewer aircraft were needed in peacetime (many carriers being "mothballed") but also because the Navy, as a result of the success achieved by the fighter-bombers in the last year of the war, was now favouring single-seat attack aircraft (Douglas A1D Skyraider and Martin AM Mauler) over multi-seat torpedo-bombers and dive-bombers. However, the *Avenger* had not yet reached the end of its military career as its large internal volume made it ideally adaptable to carrying an ever increasing amount of electronic equipment. It was then that the TBM-3W anti-submarine search aircraft with large ventral radome, TBM-3S anti-submarine strike aircraft and TBM-3Q radar counter-measures aircraft were developed from existing TBM-3 and TBM-3E airframes and were adopted by the U.S. Navy to fulfil these specialized rôles while other TBM-3s were developed to serve as night-strike aircraft (TBM-3N), utility aircraft (TBM-3U) and transport aircraft (TBM-3H). Thus modified, the

*Avengers* remained in first-line service with the U.S. Navy until June 1954 by which time they were replaced in all of their many rôles by versions of the equally ubiquitous Douglas Skyraiders.

When in the early 1950s the Cold War tension increased and the threat of the large Soviet submarine fleet became a major worry for the Western Powers, the *Avenger* was called upon to serve in the A.S.W. rôle with the naval air arms of the following nations:

**Canada:** One hundred and fifteen TBM-3Es, TBM-3S and TBM-3Ws were operated in the 1950s by Nos. 880 and 881 Squadrons of the Royal Canadian Navy from shore bases and aboard H.M.C.S. *Albatross*.  
**France:** An unknown quantity of TBM-3Es and TBM-3S-2W-2s (with oversize ventral radome) was handed over to the Armada in the early 1950s. Flotillas or units equipped with Avengers included 28 (at Lann-Bihoué), 35 (Cuzen), 105 (St. Raphael), 135 (Lartigue), 4F (Kerouba), 6F (Lartigue) and 9F (Aspretto). Apart from shore-based operations, the TBMs also served aboard the carriers *Arromanches*, *La Fayette* and *Rain-Bellou*. In addition to routine operations, some of these Avengers, heavily doped with multiple white stripes on wings and rear fuselage, provided anti-surface and -submarine patrol elements during the abortive Anglo-French Suez operation in 1956.

**Japan:** In a twist of fate, Avengers, aircraft which did so much to defeat the Imperial Japanese Navy, were among the first types delivered to the fledgling *Kaigo Jintai* (Maritime Self Defense Force) in 1954-5. Ten TBM-3Ws and ten TBM-3S were operated from Omura base at Saeki.

**Netherlands:** Fifty TBM-3S and TBM-3Ws were delivered in 1953-4 to the Royal Netherlands Naval Air Service and served with two squadrons including one based aboard the carrier *Karel Doorman*.

**United Kingdom:** One hundred TBM-3Es and TBM-3S were delivered to the Fleet Air Arm as Avenger A.S. Mk. 4s. Squadron allocations are given in Table V.

**Uruguay:** In the 1950s about a dozen TBM-1Cs were delivered to the *Servicio Aeronáutico de la Marina*. Some are still believed to be operated by that Service.

Grumman TBM-1 (NZ2301, ex-BuAer, No. 24317) from No. 31 Squadron at R.N.Z.A.F. Station (Gisborne in September 1943).

(Photo: R.N.Z.A.F. Official)



TABLE I—SPECIFICATION

	TBM-1	TBM-1C	TBM-3	TBM-3B
Span, ft. in.	54-2	54-2	54-2	54-2
Length, ft. in.	45-0	45-0	45-0	45-1 1/2
Height, ft. in.	18-5	18-5	18-5	18-5
Wing area, sq. ft.	495	495	495	495
Empty weight, lb.	10,000	10,000	10,543	10,540
Loaded weight, lb.	13,007	13,452	14,791	14,785
Maximum weight, lb.	16,000	17,304	18,290	17,895
Wing loading, lb./sq. ft. (at normal loaded weight)	27-0	27-0	29-2	29-9
Power loading, lb./hp. (at normal ll. weight and 1/2 rev./min.)	9-5	9-55	9-55	9-5
Engine type	R-2600-B	R-2600-B	H-2500-20	H-2500-20
Take-off weight, lb.	1,700	1,900	1,800	1,800
Maximum speed, mph./ft. mph./second	271/12,000	267/12,000	287/14,000	278/14,000
Cruising speed, m.p.h.	261	262	261	261
Climbing, ft./min.	145	153	161	143
Service ceiling, ft.	5,400/1	10,000/1 1/2	1,120/1	2,000/1
Range with tanks, miles	23,420	25,400	33,400	30,100
Range as point, miles	1,215	1,136	1,750	1,620
Forward-firing armament	3,500 lb. x 1	2,500 lb. x 2	2,500	1,000
Forward fuel	0-30 in. x 1	0-30 in. x 2	0-30 in. x 2	0-30 in. x 2
Vertical fuel	0-30 in. x 1	0-30 in. x 1	0-30 in. x 1	0-30 in. x 1
Offensive load, lb.	1,800	2,000	2,000	2,000

TABLE II—U.S. NAVY Bombs NUMBERS ASSIGNED TO AVENGERS

Garrison TBM	No. built
TBM-1: 2539 to 2640	2
TBM-1: 33213 to 33260	38
08173 to 011730	40
08173 to 00481	615
23307 to 24580	264
24142 to 24341	100
24328 to 27637	200
TBM-1C: 24202 to 24380	99
24342 to 24820	173
27638 to 28723	488
TBM-3: 33261, . . .	1
TBM-3C: 24141, . . .	1
24341, . . .	1
	<b>2,293</b>

Built by Grumman Aircraft Engineering Corporation at Bethpage, L.I.

Eastern TBM	No. built (= manufactured)
TBM: 24321 to 24370	50
TBM-1C: 16792 to 17991	160
28071 to 29174	104
29175 to 29235	61
32502 to 32600	178
32710 to 32720	20
34102 to 34535	4
45445 to 45644	300
48648 to 49444	799
72117 to 72480	363
TBM-3: 25175 . . .	1
26421 . . .	1
28769 . . .	1
49449 . . .	1
TBM-3: 22307 to 22600	300
22601 to 22940	340
22941 to 23200	259
23201 to 23260	60
27102 to 27160	59
27161 to 27200	40
27201 to 27270	70
TBM-4: 27323 to 27672	350

Built by the Eastern Aircraft Division of the General Motors Corporation at Trenton, N.J.

## Notes to Table II

The designations given in this table are those which were assigned by the Bureau of Aeronautics at the time when the aircraft were ordered. However, many aircraft were completed in a different configuration or were later modified, enabling them to fulfill different roles. How do some examples:

- No. 08035 was ordered as a TBM-1 but delivered as a TBM-1-L.
- No. 08037 was ordered as a TBM-1 but delivered as a TBM-1-P.
- No. 17268 was ordered as a TBM-1C but delivered as a TBM-1-CP.
- No. 17269 was ordered as a TBM-1C but delivered as a TBM-1-D.
- No. 28478 was ordered as a TBM-3 but modified as a TBM-3B.
- No. 28242 was ordered as a TBM-3 but modified as a TBM-3P.

## Production Summary

A total of 2,338 Avengers, including 2,293 Grumman-built aircraft and 7,545 Eastern-built aircraft, were built as follows:

2 TBM-1	550 TBM-1
1,828 TBM-1	2,032 TBM-1C
394 TBM-1C	4 TBM-3
11 TBM-2	4,607 TBM-3/TBM-3B
2 TBM-3	3 TBM-4

TABLE III—BRITISH SERIAL NUMBERS ASSIGNED TO TARDONS AND AVENGERS

	Total
Tarpon Mk. I (Average No. 1: 16792 to 17040)	260
(TBM-1B)	2173
	201
Avenger Mk. 1C	334
(TBM-1C)	
Average No. 1B	112
(TBM-3 and TBM-3C)	110
Average No. 1C	70 (3)
(TBM-4)	
Average A.S. No. 4	37
(TBM-3C)	50
	13
	<b>1,000</b>

TABLE IV—SUMMARY OF OPERATIONS OF THE U.S. MARINE CORPS, 1942-45

	Major centers of operations while equipped with Avengers
VMFV-131 (VMFB-131)	Guantanamo, Guay, Oriente
VMFV-132	U.S. Cape Gloucester (CVL-108)
VMFV-134	Boengmeitien, Rabaul, Pohnpei, Palau
VMFV-141	Reconnaissance training unit at Ft. Teno, California
VMFV-143	Central Salomon, Bougainville, U.S. Gilbert Islands (CVL-101)
VMFV-144	In training at end of WW 2
VMFV-145	In training at end of WW 2
VMFV-146	In training at end of WW 2
VMFV-147	In training at end of WW 2
VMFV-148	In training at end of WW 2
VMFV-149	In training at end of WW 2
VMFV-150	In training at end of WW 2
VMFV-151	In training at end of WW 2
VMFV-152	In training at end of WW 2
VMFV-153	In training at end of WW 2
VMFV-154	In training at end of WW 2
VMFV-155	In training at end of WW 2
VMFV-156	In training at end of WW 2
VMFV-157	In training at end of WW 2
VMFV-158	In training at end of WW 2
VMFV-159	In training at end of WW 2
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VMFV-162	In training at end of WW 2
VMFV-163	In training at end of WW 2
VMFV-164	In training at end of WW 2
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VMFV-296	In training at end of WW 2
VMFV-297	In training at end of WW 2
VMFV-298	In training at end of WW 2
VMFV-299	In training at end of WW 2
VMFV-300	In training at end of WW 2





Close-up of ship deck with parts materials in partly-filled condition. Avenger is an Eastern TBM-1A2 (No. 545) formerly of the Dutch Navy and subsequently used for engineering instruction at the Aviators' Flighter School in The Hague.

(Photo: Jack W. A. van Drongen, Rotterdam)



An Avenger of French Abnavaile, an Eastern TBM-1A2 (no. BuAer. No. 51483), formerly attached to Fleetw 28 in Louisiana and, when photographed in 1965, partially "mothballed", having ended its front-line service.

(Photo: Archives Bernard Rogier, France)



Training of French Abnavaile crews took place on the carrier Bellefleur (formerly U.S.S. Bellefleur CVE-31) and this photograph of November 1955 shows that U.S. Navy-marked TBM-1A2 Avengers served as an interim measure.

(Photo: via Bernard Rogier, France)



(Above and right): Two in operation views of a French Abnavaile Eastern TBM-1A2 (no. BuAer. No. 51483) of Fleetw 28 based at La Spezia. Because of the huge tropical rainforests (no amphibious warfare, additional side area was obtained by modifying the tail section) it presents a triplane configuration. Note the unusually tall electronic device on the fuselage.

(Photo: Archives Bernard Rogier, France)



TBM-1 bearing the commercial registration N204C and used by the U.S. Department of the Interior to help fight forest fires in Alaska. Five accident victims were carried in slung-in wing seats.

(Photo: David W. Meyers)

(Right): Avenger's impressions of three ancient Avengers. The top side view is of a U.S. Navy TBM-1E converted for ship-to-ship utility duties with arm seats, four (no cockpit) seats and cargo space. The activity typically CDD for Carrier-onboard delivery prompted the pseudonyms of "Codfish Line" and "C.O.D. Turkey". The middle side view is of a Japanese TBM-1E of the Maritime Self Defense Force operating from the Utsunomiya base at Saeki. The bottom side view is of a French TBM-1A2 of F Abnavaile Fleetw 28 based at La Spezia.



TABLE V-I—AVENGER SQUADRONS OF THE ROYAL NAVY, 1943-47

Squadrons	Avengers operated From	To	Main shore bases	Aircraft carriers (Area of operations)
No. 814	May 1945	1950	Cadiz	None (United Kingdom)
No. 815	May 1945	1950	Cadiz	Osborne (Home Fleet)
No. 820	Oct. 1944	Nov. 1945	Swansea; Belfast; Trincomalee; Sierra Leone; Iceland; Cadiz; Gibraltar	Osborne (Home Fleet)
No. 824	May 1945	Nov. 1945	None	None
No. 828	Feb. 1945	June 1945	Royal; Boston; Navos	Imphal (Far East)
No. 827	1952		Cadiz	None (U.K.)
No. 832	Jan. 1945	Feb. 1945	Norfolk (V.L.); Torquay; Hatteras; Madras; Trincomalee	U.S.S. Saratoga (Y-5, England; Osborn; Osborn; Sagan (Far East; Pacific)
No. 845	Feb. 1945	Oct. 1945	Norfolk (V.L.); Hatteras; Madras; Trincomalee	Clemson (English Channel; Azores; Osborn; Osborn; Sagan (Far East; India)
No. 846	Apr. 1945	Oct. 1945	Raleigh; Gosport; Gibraltar; Madras; Hatteras; Scarborough; Limerick; Ayr; Deal	Osborne; Sagan; Sagan (Far East; India)
No. 848	June 1945	Oct. 1945	Swansea; Cadiz; Eglinton; Hatteras; Torrey Island; Detlaff; Sierra Leone; Squantum; Eglinton; Penzance; St. Paul; Trincomalee; Sierra Leone; Mayflower	Temperley; Formidable (Home Fleet; Mediterranean); Far West; Madras; Royal Gibraltar (Home Fleet; Far Indian; Pacific)
No. 850	Sept. 1945	Dec. 1944	Squanton; Vancouver; Penzance; Limerick; Maydown	None (Attached R.A.F. Coastal Command, U.K.)
No. 851	Oct. 1945	Oct. 1945	Squanton; India; Darton; Scarborough; Trincomalee	Shear, Sagan (East Indies)
No. 852	Nov. 1945	Oct. 1945	Squanton; Madras; Eglinton	Wahle; Temperley; Peacor (Home Fleet)
No. 853	Feb. 1944	May 1945	Squanton; Mayflower; Hatteras; Torrey Island; Trincomalee; Sydney; Sierra Leone	Abdus; Peacor; Osborn (Home Fleet); Scarborough; Madras; Osborn (Home Fleet); East Indies; Pacific)
No. 854	Jan. 1944	Dec. 1945	Swansea; Cadiz; Eglinton; Hatteras; Torrey Island; Trincomalee; Sydney; Sierra Leone	None (Attached R.A.F. Coastal Command, U.K.)
No. 855	Feb. 1944	Oct. 1944	Squanton; Hatteras; Hatteras; Sirhan Hatteras; Doding	Peacor (U.S. and Home Fleet)
No. 856	Mar. 1944	June 1945	Squanton; Madras; Hatteras; Mayflower; Eglinton; Hatteras	None (U.S. and Home Fleet)
No. 857	Apr. 1944	Nov. 1945	Squanton; Sydney; Trincomalee; Sierra Leone	Royal; Imphal (East Indies)
No. 1020	1955	1957	Abdus	Royal Naval Volunteer Reserve Squadron (U.K.)
No. 1041	1955	1957	Osborn	Royal Naval Volunteer Reserve Squadron (U.K.)
No. 1044	1955	1957	Osborn	Royal Naval Volunteer Reserve Squadron (U.K.)

TABLE V-II—AVENGER-EQUIPPED UNITS OF THE ROYAL NAVY, 1943-48\*

Squadrons	Avengers operated From	To	Main shore bases	Aircraft carriers (Area of operations)
No. 708	Apr. 1945	July 1945	Torrey Island	And-Edinburgh; Warfar; Deutsches U-boat
No. 711	Sept. 1945	Dec. 1945	Cull	Tactical Trials Unit
No. 723	Oct. 1945	July 1944	Squanton	Operational Training Unit
No. 743	1945	Apr. 1945	Yarmouth, Nova Scotia	Telegraph (Air Gunner (T.A.G.))
No. 744	Apr. 1945	Feb. 1944	Yarmouth, Nova Scotia	Training Unit
No. 745	Mar. 1945	Apr. 1945	Yarmouth, Nova Scotia	T.A.G. Training Unit
No. 784	Oct. 1944	May 1945	Yarmouth, Nova Scotia	T.A.G. Training Unit
No. 785	1944	Feb. 1944	Cull	Target Towing Unit

\* As recently as 1952 some Avengers were attached to No. 857 Squadron (Cadiz), specialized development unit.

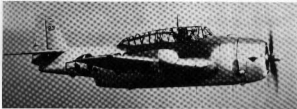


Typical Avengers operated at Self Lake City, Utah, by Aerial Application Unit, under an U.S. Ferrying Service's command. (Photo: Harry B. Adams)

Series Editor: CHARLES W. CAIN

ACKNOWLEDGEMENTS

The author extends his grateful appreciation to the many who have generously assisted in the preparation of this Profile, not least the U.S. Navy and Marine Corps, the National Archives (General Services Administration), the Smithsonian Institution, A.A.R.S. and Air-Britain. Also to Mr. Kurt Altko, Kenneth Johnson, David W. Almond and Harry B. Adams, and the Air-Britain research specialists James J. Holley, James W. Coas and Arthur Francis Jr. Special thanks, too, to Serge P. Kluska and Bernard Reppert of France.



*A TBM-3D in low-altitude pull-up and white camouflage. Note location of radome on starboard wing which characterized all "D" variants of the Avenger. On this aircraft the tail turret has been removed.*

*(Photo: National Air and Space Museum Smithsonian Institution)*



*The second XTBM-3 prototype (Bureau of Aeronautics number 2545), which made its first flight on December 20, 1942. This aircraft differed mainly from the first prototype in having a large dorsal fin, a feature retained for all production aircraft.*

*(Unofficial photograph; via Kurt Miska)*

*Beautiful view of a factory-fresh TBM-3D (BuAer. No. 28786). In addition to carrying extensive electronics equipment and rocket projectiles, this aircraft carries a powerful searchlight beneath its port wing.*

*(Photo: National Archives)*





During operations in American waters a Grumman TBF-1 (note mark-10 gun installation in front of cockpit) is photographed moments after releasing its 24-in. torpedo. (Photo: U.S. Navy)



being handed over to the Navy on January 30, Grumman performed a remarkable industrial feat by launching the TBF-1 production at an amazing pace: by the end of May 1942 85 TBF-1s had been delivered and during the following month a further 60 aircraft were accepted by the Navy. Eventually, including prototypes and experimental aircraft, the Grumman Aircraft Engineering Corporation built a total of 2,293 Avengers. Most of these Grumman-built aircraft were TBF-1s, the original production model, or TBF-1Cs, a version characterized by a revised forward-firing armament. Two experimental versions, the XTBF-2 and XTBF-3, primarily differing in the type of power plants used were also built and a multitude of variants based on the TBF-1 and the TBF-1C were realized and are identified below:

**XTBF-1:** Two prototypes powered by 1,700 h.p. Wright R-2600-8. Armament comprising one 0-50-in. m.g. in the engine cowling, one 0-50-in. m.g. in dorsal turret and one 0-30-in. m.g. in ventral position. The second prototype had a large dorsal fin added to improve directional stability.



Defending with U.S. naval aircraft, the Japanese fighter did, Perry Officer believe Japan made during the invasion of Guadalcanal the mistake of confusing the Avenger with the Wildcat while attacking from below a flight of eight Avengers. Concentrated fire from these Avengers' stagger guns left him blind from one eye and almost ended his life. (Air Force Museum photograph)

Gear, flaps and landing down, a TBF-1 Avenger dives to land aboard the training carrier U.S.S. Wolverine (IX-64), a converted Great Lakes oil-wheel steamer. (Photo: U.S. Navy)

**TBF-1:** First major production model of which 1,325 were ordered; however, many were modified as TBF-1D, TBF-1E, TBF-1F, etc. Basically identical to second XTBF-1.

**TBF-1B:** Designation applying to TBF-1s delivered under lend-lease to the Royal Navy.

**TBF-1C:** Second and last major production model built by Grumman. The TBF-1C differed mainly from the TBF-1 in having the engine-mounted m.g. replaced by one 0-50-in. m.g. in each wing and in featuring additional petrol tank capacity in the form of an auxiliary ferry tank installed in the ventral bomb-bay and raising maximum fuel capacity from 395 to 736 U.S. gallons.

**TBF-1CP:** Photo-reconnaissance version of TBF-1C.

**TBF-1D:** Designation applying to a small number of TBF-1s or TBF-1Cs fitted with centimetric radar installed in a radome on the starboard wing's leading-edge.

**TBF-1E:** Designation given to a small number of TBF-1s fitted with special electronics equipment.

**TBF-1J:** Small number of TBF-1s fitted with special equipment for operations under acoustic conditions.

**TBF-1L:** Variant of the TBF-1 fitted with a retractable searchlight in the bomb-bay to illuminate targets during night attacks by other aircraft.

**TBF-1P:** Photo-reconnaissance version of the TBF-1.

**XTBF-1:** Designation applying to the 21st production TBF-1 (BuAer. No. 00391) which was experimentally fitted with a Wright XR-2600-10 engine. First flight on May 1, 1942. Not proceeded with.

**XTBF-2:** Two prototypes (BuAer. Nos. 24141 and 24341) powered by a 1,900 h.p. R-2600-20 radial. This version was not placed into production by Grumman but served as prototype for the Eastern-built TBM-3s.

To supplement production of the Avenger by Grumman and to free Grumman's facilities for the production of carrier-based fighters, the Department of the Navy obtained that the Eastern Aircraft Division of the General Motors Corporation place this torpedo-bomber aircraft in production in their Tonawanda plant, New Jersey. To cover this work a first contract was awarded to Eastern on March 23, 1942, and eventually, after Grumman suspended production of the Avenger in December 1943, the Eastern Aircraft Division of GMC became the sole manufacturer of Avengers. This company built a total of 7,346 Avengers in the following variants:

**TBM-1, TBM-1C, TBM-1CP, TBM-1E, TBM-1J, TBM-1L and TBM-1P:** 2,882 Eastern-built Avengers

equivalent to the TBF-1 through TBF-1P variants built by Grumman, Wright R-2600-8 engine.

**TBM-3:** Four prototypes (BuAer. Nos. 25173, 25521, 25700 and 43643) powered by R-2600-20 and similar to the two XTBF-2s.

**TBM-3:** Main production version fitted with armament similar to that installed on the TBF-1Cs and TBM-1Cs and powered by R-2600-20 radials.

**TBM-3D:** Modification of the TBM-3 for night duty. Constrictive radar in radome on leading-edge of starboard wing.

**TBM-3E:** Final major production version of the Eastern-built Avenger which was characterized by a lighter but stronger airframe. Overall length was increased by almost a foot and a constrictive radar was fitted in a radome beneath the starboard wing.

**TBM-3H:** Designation applying to a few TBM-3s fitted with special search radar.

**TBM-3J:** Modified TBM-3s with special equipment for operations under arctic conditions.

**TBM-3L:** TBM-3s fitted with a retractable searchlight in the bomb-bay.

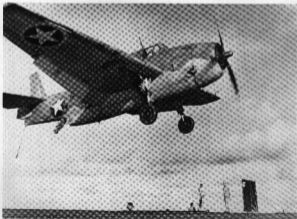
**TBM-3N:** Post-war modification of a small number of TBM-3s for night attack duty.

**TBM-3P:** Photo-reconnaissance version of the TBM-3.

**TBM-3Q:** Post-war modification of a small number of TBM-3s which were fitted with electronic counter-measure gear in a large ventral radome.

**TBM-3R:** TBM-3s modified after the war as seven-seat carrier-on-board delivery transport aircraft.

*During Operation Torch, the Allied landings in North Africa, a TBF-1 leads aboard a U.S. aircraft carrier. Note yellow outline around national markings, a special recognition feature adopted both by American and British forces for this operation. (Photo: U.S. Navy)*





A rocket-armed TBM-3C from Torpedo Squadron 3 (VT-3) which appeared from the U.S.S. Hornet (LP-12) during the Marianas campaign. (Photo: U.S. Navy)



A TBM-3 with forward-firing machine-guns in the engine cowling and early type of rocket propeller installation with landing gear located on the deck. (Photo: National Air and Space Museum)

**TBM-3S and TBM-3S-2:** Designation applying respectively to a number of TBM-3s and TBM-3Es which were modified post-war to serve as anti-submarine strike aircraft.

**TBM-3U:** Post-war modification of the TBM-3 to fulfil sundry utility duties including target-towing.

**TBM-3W and TBM-3W-2:** Designation applying respectively to a number of TBM-3s and TBM-3Es which were modified after the war to serve as anti-submarine search-aircraft. An APS-20 radar was carried in a large ventral radome and these variants operated in pair with TBM-3S/TBM-3S-2 as ASW hunter-killers.

**TBM-4:** These prototypes (BuAer. Nos. 97673 to 97675) realized late in the war. Basically these aircraft were similar to the TBM-3Ds but they featured reinforced wing centre-section panels and improved wing folding mechanism. Quantity production as the TBM-4 and Avenger IV was cancelled following VJ-Day.

## WAR AGAINST THE AXIS

During World War II the Grumman/Fockner Avengers were operated by the U.S. Navy, the U.S. Marine Corps, the Royal Navy's Fleet Air Arm and the Royal New Zealand Air Force. A summary of Avenger operations with these four Services between June 1942 and August 1943 follows:

### U.S. Navy

For the carrier-based torpedo-bomber squadron of the U.S. Navy the Battle of Midway (June 4, 1942) was a disastrous one and of the 42 Douglas TBD-1 Devastators from VT-3, VT-6 and VT-8 launched from the U.S.S. *Forklifts*, *Enterprise* and *Hornet*, 38 were lost without even scoring a single hit. Not more fortunate were the six Midway-based Grumman TBF-1 Avengers from VT-8 which attacked the Japanese fleet at 07.10 hours on June 4. In this action, the Avenger's combat debut, five aircraft were shot down and the only survivor reached Midway badly shot-up. No torpedo hit had been scored; not quite a promising beginning for the Navy's newest torpedo-bomber but, fortunately, the Avenger went on to obtain a brilliant war record.

By the time the American forces were ready to mount a first offensive in the Pacific the Grumman Avengers had completely supplanted the venerable Douglas TBDs and, for supporting the amphibious assault against Guadalcanal on August 7, 1942, Task

Force 51 embarked 41 Avengers from VT-3, VT-7 and VT-8 aboard *Enterprise*, *Wasp* and *Saratoga*. During the initial phase of the landing, the TBF-1s bombed Japanese positions on Guadalcanal and Tulagi and helped destroy the Japanese seaplane base on Gavutu Island. While no opposition was encountered during the early hours of August 7, a group of eight Avengers was attacked later on in the day by a Mitsubishi A6M2 Zeisei flown by the Japanese ace, Petty Officer Saburo Sakai. Not familiar with U.S. naval aircraft, Sakai believed that he was engaging a formation of single-engine P-4F Wildcats and attempted an attack from behind and below. A curtain of crossfire from the flexible ventral 0.30-in. mg. of the eight Avengers greeted this audacious pilot and he was seriously wounded.

With luck finally on their side the Avengers went on to participate with considerable success in all the major air-sea battles of the Pacific from the struggle around Guadalcanal to the final air action by the U.S. Third Fleet in Japanese waters. A synopsis of the Avenger's role in these major actions follows:

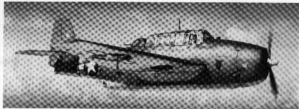
**Battle of the Eastern Solomons (August 24-25, 1942):** 45 TBF-1s from VT-3 (*Enterprise*), VT-7 (*Wasp*) and VT-8 (*Saratoga*) helped to sink the carrier *Sybil*.

**Battle of the Santa Cruz Islands (October 26-27, 1942):** Even though 29 TBF-1s from VT-6 (*Hornet*) and VT-10 (*Enterprise*) were available at the start of this battle, no Avenger was able to score a hit on any of the four Japanese carriers challenging the American Task Force.

**Operations in the Gilbert Islands (November 10-December 10, 1943):** During the landings on Makin and Tarawa, a total of 199 Avengers was embarked aboard five attack carriers, five light carriers and eight escort carriers and these aircraft played a major part in providing air support for the Marines.

**Conquest of the Marshall Islands (January 29-February 23, 1944):** In support of the landings at Majuro, Kwajalein and Eniwetok, the U.S. Navy deployed six attack carriers, six light carriers and eight escort carriers aboard which was embarked a total of 247 Avengers.

**Battle of the Philippine Sea (June 19-24, 1944):** During the "Great Marianas Turkey Shoot" 194 Avengers, embarked aboard seven attack carriers and eight light carriers, first bombed airfields on Guam to neutralize Japanese land-based aircraft prior to attacking the Japanese carriers on June 20. On that day, beginning at 16.21 hours, 54 Avengers joined 162 P-4F Hellcats, SIOC Helldivers and TBD Daunt-



*TBM-1C from the U.S.S. Monaghan (CVE-26) being sent the broken bow of Guam, July 1944. (Photo: National Archives)*

*Formation of U.S.N. Avengers winging their way towards Japanese targets in the Central Pacific. (Photo: U.S. Navy)*



*Many deck crew aboard an escort carrier of the U.S. Navy make their assignments in the Atlantic. In the foreground is a TBM-1 and in the background are Wildcats. On both cases of aircraft note the characteristic wing-folding system of the intermediate carrier. (Photo: U.S. Navy)*





A pair of TBM-3E (BuAer. No. 24588 in the foreground) from Naval Air Station San Diego, California, in the late 1940s. (Photo: National Air and Space Museum)

losses in an attack on the fleet commanded by Adm. Ozawa and contributed to the sinking of the carrier *Miyō* and to the damaging of the carriers *Chiyōda* and *Zuikaku*. Probably better results would have been achieved if it were not for the fact that too many Avengers were armed with 500-lb. G.P. general-purpose bombs instead of torpedoes.

Besides participating in the attack against the Japanese surface fleet, Avengers of Task Force 58 provided anti-submarine patrols and, during one such sortie, a TBM-1C from VT-37 (*Princeton*) flown by Ensign Warren C. Burgess, U.S.N., was involved in an unusual air battle. Details from this action are quoted here from the *Princeton Aircraft Action Report*:

"While on an ASW (anti-submarine warfare, Editor) patrol at noon on 23 June, Ensign Burgess spotted a Japanese twin-engine Betty [*Mitsubishi G4M*®] bomber which was flying only 10 feet above the ocean. After overtaking the enemy aircraft, Burgess made two passes at the Betty firing his two wing guns but the pass jammed prematurely. Burgess decided it was time to change his tactics and splash the Betty without the aid of gunfire. He put his plane about two feet above her and sat there in an attempt to force her into the water. He succeeded in forcing the Betty to hit the water with her belly, but she immediately bounced back up to ten feet,

\*See Profile No. 210.

TBM-1E in flight over the U.S.S. *Sangamon* (C-13-28) during anti-submarine operations in the Atlantic in May 1945. (Photo: U.S. Navy)



## Colour illustrations

- 1 An early Grumman TBF-1 Avenger, with markings of VT-4 Squadron.
- 2 An Eastern TBM-3 fire-fighter of the mid-1950s.
- 3 Another civilianised TBM-3 (ex-BuAer. No. 91110) at Porterville in the 1960s.
- 4 Eastern TBM-352 (No. 030) of the Royal Netherlands Naval Air Service.
- 5 For comparison, an Eastern TBM-3W2 of the RNNAS (No. 16-117). The national flag is partly visible above the outrigger fin.

her initial attack, with no damaging results. Abandoning this procedure, Burgess retired to the Betty's starboard side and during retirement the TBM-1C's wingler (ventral rear m.g. Editor) was able to fire about 30 rounds into the after part side of the Japanese fuselage.

"Burgess next decided to adopt the Russian technique of drawing-up the enemy plane with his propeller. This was also unsuccessful, although his prop. came within inches of the Betty's starboard wing. Feeling somewhat frustrated, Burgess flew wing-on to the Betty with about two feet between wing-tips. He looked over and waved at the Japanese pilot, who only reached (grinned—sic, Editor) back at him. At this juncture the turret gunner of the torpedo plane in desperation opened his hatch and heaped all six rounds of his .38-calibre revolver into the Betty, with unimpaired results on the enemy but with great elation to the gunner.

"Firing of this, Ensign Burgess crossed over top of the enemy plane and retired to about a quarter-of-a-mile away on the Betty's port side. He managed to get his starboard wing gun charged, and made a pass at the Betty's port side. This time his tracers went into the starboard engine and it burst into flames. The flames spread to the starboard wing, Betty lost control, her port wing dipped into the water, and she executed a neat cartwheel. Ensign Burgess saw one survivor in the water, who was picked up almost immediately by a friendly destroyer."

The next major battle fought by the carrier-based Avengers resulted from the preparation of and actual execution of the landing in Leyte. Some 236 Avengers were embarked aboard the nine attack carriers and eight light carriers of TF-38 Fast Carrier Force. These aircraft took part in air strikes on Okinawa and Formosa between October 10-16, 1944, and on airfields in the Philippines between October 18-19. However, in spite of the loss of the light carrier *Princeton*, which was sunk by a land-based Japanese naval dive-bomber, TF-38 and its Avengers were to gain more fame on October 24 when they helped sink the heavy battleship *Yamato*, scoring 19 torpedo hits. Then, between October 25-26, during



