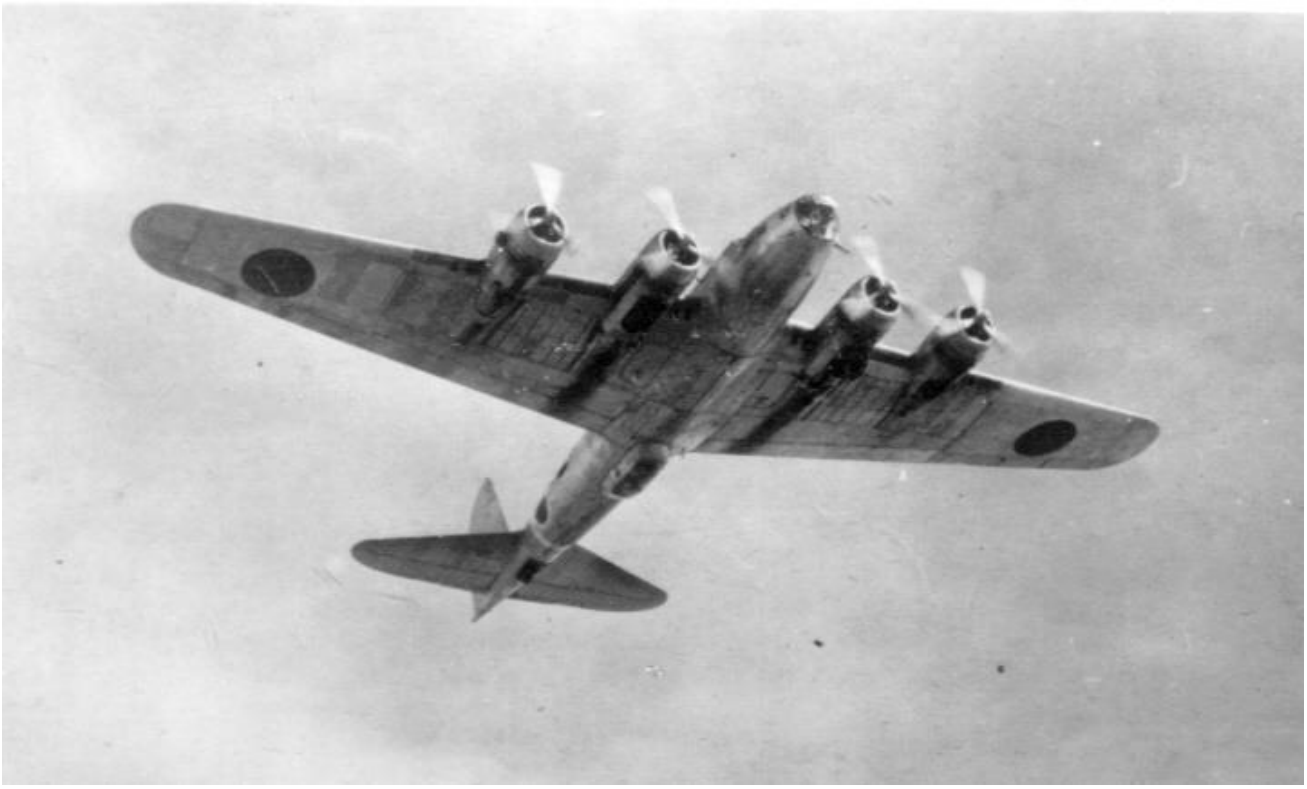
Boeing B-17 Flying Fortress

Boeing B-17 Flying Fortress - Cockpit

En 1990 sortait le film "Memphis Belle", racontant de manière romancée une histoire authentique : celle d'un équipage de B-17 lors de sa dernière mission, en 1943. "Memphis Belle", elle, a réellement existé : elle, puisqu'il s'agit d'une forteresse volante. Et ce sont de ces dernières que nous allons parler aujourd'hui. Le 8 août 1934, l'USAAC demanda un bombardier multimoteur destiné à remplacer ses B-10. Les spécifications demandées renvoyaient à une charge utile conséquente pouvant être emportée à 10000 pieds d'altitude, à la vitesse de 200 mph (320 km/h), avec une endurance de 10 h. L'appareil devait être stationné à Hawaï, au Panama et en Alaska. Ce qui n'était pas exigé, mais espéré, était une vitesse maximale de 250 mph (400 km/h) et une autonomie de 2000 miles (3200 km). Boeing y répondit avec son modèle 299, conçu par E. Gifford Emery et Edward Curtis Wells sur fonds propre. Il combinait des éléments repris sur le XB-15 et sur le Boeing 247. Il allait être mis en concurrence avec le Douglas B-18 et le Martin 146 (dérivé du B-10). Il emportait 2200 kg de bombes, était défendu par 5 mitrailleuses de 7,62 mm et était propulsé par 4 Pratt & Whitney R-1690 "Hornet" de 750 hp chacun. Il effectua son vol inaugural le 28 juillet 1935 entre les mains de Leslie Tower. Le nombre de mitrailleuses était conséquent pour l'époque et lui valut le surnom de "Flying Fortress" (forteresse volante) donné par Richard Williams, un journaliste du Seattle Times. Boeing s'empressa d'utiliser ce surnom pour mettre en valeur son prototype. Par ailleurs, il se montra vite supérieur à ses concurrents bimoteurs, y compris en terme de vitesse. Mais l'enthousiasme de l'USAAC (65 YB-17 avaient déjà été commandés) fut refroidi par l'accident du 30 octobre 1935. Bien qu'il s'agisse d'une erreur humaine, il eut pour conséquence de voir le B-18 préféré dans un premier temps. Mais ce ne fut que partie remise et 13 Y1B-17 furent commandés le 17 janvier 1936. Le 1 dénote une ligne budgétaire spéciale, accordée après la fin de l'année fiscale. Ils étaient propulsés par des Wright R-1820-39 Cyclone plus puissants. La désignation XB-17 fut accordée rétrospectivement au prototype. Le premier d'entre eux vola le 2 décembre 1936 et les 13 appareils furent livrés en 1937 pour des tests opérationnels. Un de ces tests consista à envoyer une patrouille de 3 B-17 menée par Curtis LeMay photographier le paquebot italien Rex à 1000 km des côtes. Il fut largement médiatisé par la suite.

Boeing B-17G Flying Fortress de collection à Duxford

Un 14e Y1B-17, destiné aux essais statiques, fut finalement équipé de turbocompresseurs et désignés Y1B-17A. Ils furent difficiles à mettre au point et l'appareil ne vola que le 29 avril 1938. Ces appareils de présérie entrèrent en service sous les désignations respectives de B-17 et B-17A en 1938. Ils furent suivis par les B-17B, C, et D, construits à une quarantaine d'exemplaires chacun. Les B-17C furent les premiers à accomplir une mission de guerre. 20 d'entre eux furent cédés à la RAF sous l'appellation Fortress I et bombardèrent Wilhelmshaven le 8 juillet 1941. Ce raid, ainsi qu'un autre sur Brest le 24, furent un échec total. De plus, 8 exemplaires furent perdus. Le B-17C montra qu'il était inapte au combat, et qu'il fallait améliorer la défense, augmenter la charge offensive et surtout améliorer la précision des bombardements. Ils servirent dès lors à la patrouille maritime au sein du Coastal Command et à la lutte anti sous-marine, ainsi que les 19 B-17F Fortress II et 45 B-17E Fortress III acquis par la RAF. Ils coulèrent 11 sous-marins, dont le premier le 27 octobre 1942. Quelques exemplaires furent aussi utilisés pour la guerre électronique, en se substituant aux contrôleurs au sol des chasseurs de nuit allemands. Le B-17E fut la première version construite en masse (512 exemplaires) et vola pour la première fois le 5 septembre 1941. Lors de l'attaque sur Pearl Harbor, moins de 200 exemplaires avaient été livrés et 155 étaient en service. Le raid japonais fut d'ailleurs confondu avec une formation de 12 B-17 qui avait été annoncée. Cette formation fut d'ailleurs impliquée dans l'attaque et deux appareils furent endommagés. D'autres furent détruits au sol aux Philippines. Les B-17 furent engagés dans les premières batailles du Pacifique, telles celle la mer de Corail ou celle de Midway, avec peu de succès. Bombarder des navires à haute altitude ne donnait une précision que de 1%. En revanche, l'altitude et leur armement défensif les protégeaient des chasseurs japonais. Le pic fut atteint dans le Pacifique avec 168 B-17, mais cet appareil se montra inadapté à ce théâtre et il fut remplacé en 1943. Des B-17 parachutèrent cependant des commandos australiens à Rabaul.



Boeing B-17D Flying Fortress capturé par les Japonais

Les B-17 furent les premiers avions de l'USAAF à arriver en Europe. La première mission de la 8e Air Force fut un raid de B-17 sur Rouen le 17 août 1942. 12 B-17E escortés de Spitfire attaquèrent des gares de triages avec succès, et seulement 2 appareils endommagés. De plus, le viseur Norden, alors secret, fit son apparition. La doctrine d'utilisation des bombardiers fut alors décidée à Casablanca : à l'USAAF les raids de jour visant l'industrie allemande (en particulier aéronautique), à la RAF les raids de nuit visant les villes (afin de détruire le moral de la population civile, selon les théories de Douhet). Mais le manque de chasseurs d'escorte, l'idée que des Forteresses Volantes en box pouvaient se défendre mutuellement, firent que les raids se soldaient, en 1943, par un massacre. C'est dans ce contexte, en mai 1943, que "Memphis Belle" fut l'une des premières, sinon la première, des Forteresses Volantes à finir son tour d'opération de 25 missions. Elle dispute cet honneur avec le B-17F 41-24577 "Hell's Angels" : cette dernière aurait fini son tour 6 jours avant Memphis Belle, le 13 mai 1943. Le raid du 14 octobre 1943 au-dessus de Schweinfurt reste connu comme le "jeudi noir". 291 B-17 avaient décollés, et affrontèrent 300 chasseurs allemands : 77 B-17 furent perdus définitivement (60 abattus, 5 accidentés et 12 irréparables), 122 furent endommagés, seuls 33 B-17 furent indemnes. Sur 2900 membres d'équipages, 650 furent perdus. Les raids de jour furent suspendus pour un temps, les pertes étant trop élevées. Il fallut attendre février 1944 et l'arrivée de chasseurs à long rayon d'action (P-47 et P-51) pour que les pertes soient réduites. Les pertes (notamment dues à la Flak) ne furent sérieusement réduites qu'en 1945. Le dernier raid des B-17 date du 25 avril 1945. Sur les 1,5 millions de tonnes de bombes largués par l'USAAF sur l'Allemagne nazie et ses territoires occupés, il en aura largué 640 000. L'acteur Clark Gable fut mitrailleur sur un B-17, de mai à septembre 1943.

Boeing B-17E Flying Fortress capturé par les Japonais

La Luftwaffe captura et utilisa une quarantaine de B-17, uniquement pour des missions de transport. Les rumeurs selon lesquelles ces B-17 furent employés pour des missions spéciales (parachutages d'agents, infiltration de formations de bombardiers) ne relèvent probablement que de la légende. 73 B-17 durent atterrir en URSS pour des raisons techniques, et 23 furent maintenus en état de vol. Ils ne furent jamais engagés au combat et furent rapidement remplacés par le Tu-4. Au moins 3 B-17, dont deux B-17D et un B-17E, furent capturés par les Japonais aux Philippines. Ils furent évalués afin de déterminer les meilleurs techniques d'attaque. Après la seconde guerre mondiale, l'USAF le retira rapidement des premières lignes, mais le conserva dans des rôles secondaires, comme la reconnaissance (sous la désignation F-9, F pour Fotorecon, puis RB-17) jusqu'en 1949, pour le transport de VIP ou les missions SAR. Ces derniers furent utilisés pendant la guerre de Corée et furent retirés du service vers 1955. 107 B-17 furent aussi modifiés en drones-cibles et furent utilisés jusqu'en 1959. L'US Navy en utilisa une version de veille aérienne, le PB-1W, dotée d'un radar AN/APS-20. L'US Coast Guards utilisa ses B-17 jusqu'en 1959. Quelques B-17 furent utilisés par la CIA afin de larguer des agents taïwanais en Chine communiste : ils furent peints aux couleurs de Taïwan et mis en oeuvre par des équipages taïwanais. Au moins 2 exemplaires furent utilisés de 1952 à 1958. Le B-17, construit en grand nombre, fut rapidement disponible comme surplus : il fut donc vendu au Brésil (13 B-17G de 1951 à 1969), au Canada (3 B-17E et 3 B-17F de 1943 à 1946), à la Colombie (?), au Danemark (1 B-17G de 1948 à 1953), à la république Dominicaine (2 B-17G de 1947 à 1954), à la France (1 B-17F, qui servit d'avion personnel au général Koenig), au Nicaragua (?), au Pérou (?), au Portugal (5 SB-17G de 1947 à 1960). Il fut principalement utilisé dans des rôles de transport et de SAR.

Boeing XB-17 Flying Fortress au sol

Israël acquit illégalement 4 B-17G passés en contrebande via l'Amérique latine et la Tchécoslovaquie : En 1948, Israël était sous embargo américain concernant les armes. Un fut abandonné à cause de pannes, puis fut confisqué par les États-Unis. Au cours de leur convoyage, les 3 autres reçurent l'ordre de bombarder le palais du roi Farouk en représailles d'une attaque sur Tel-Aviv. La mission entraîna peu de dégâts. S'il y eut par ailleurs peu de cibles pour un tel bombardier, l'aspect psychologique ne fut guère négligeable. Ils furent utilisés pendant la guerre de 1948 et pendant la crise de Suez. Ils furent retirés du service en 1958. Il connut également une carrière civile, comme avion de transport voire de passagers.

L'IGN utilisa 14 B-17 pour des missions cartographiques. Des exemplaires furent utilisés pour la lutte contre le feu. Il donna naissance aux dérivés XB-38 et YB-40, ainsi qu'au C-108 de transport. 12731 exemplaires furent construits de 1936 à 1945, dont 8000 furent perdus au combat ou par accident. 13 exemplaires sont toujours en état de vol, et des dizaines sont stockés ou exposés. Ce sont en majorité des B-17G qui furent parmi les derniers construits, par Douglas et Lockheed. En France, Pink Lady est en état de vol (elle subit une grande visite de 3 ans depuis 2010) et le Musée de l'Air et de l'Espace en possède un dans ses réserves. Il reste un B-17D (en cours de restauration, il s'agit du plus ancien B-17 connu), 4 B-17E et 3 B-17F (dont un en état de vol). Le B-17 fut, en Europe, le symbole de la toute-puissance américaine pendant la seconde guerre mondiale. Puissance militaire, certes, mais aussi et surtout puissance industrielle. L'image de formations géantes à l'assaut du ciel nazi, déversant des milliers de tonnes de bombes sur les principaux centres industriels et villes, a marqué durablement les esprits. Ajoutez à ça une grande robustesse et un armement défensif meurtrier et on peut comprendre pourquoi le B-17 est une légende. Le portrait est pourtant à relativiser quelque peu : ses débuts furent difficiles et il n'était pas fait pour le théâtre du Pacifique, trop vaste pour lui. Il a beau être robuste, les 2/3 des B-17 construits furent perdus pendant la guerre. Son armement défensif ne fut au point que sur la dernière version, le B-17G. Quand à la précision, elle était inexistante et la seule possibilité était le tapis de bombes, avec les résultats que l'on sait. Ses équipages ne partaient pas en raid en toute confiance, loin de là. A la fin de la guerre, il était ancien et quelque peu dépassé. Ce n'est qu'avec l'arrivée des chasseurs à long rayon qu'il fut définitivement l'arme de la victoire.

Source : https://aviationsmilitaires.net/v3/kb/aircraft/show/2603/boeing-b-17-flying-fortress

Version anglaise Wikipédia

The **Boeing B-17 Flying Fortress** is a four-engined heavy bomber developed in the 1930s for the United States Army Air Corps (USAAC). Fast and high-flying for a bomber of its era, the B-17 was used primarily in the European Theater of Operations and dropped more bombs than any other aircraft during World War II. It is the third-most produced bomber of all time, behind the four-engined Consolidated B-24 Liberator and the multirole, twin-engined Junkers Ju 88. It was also employed as a transport, antisubmarine aircraft, drone controller, and search-and-rescue aircraft. In a USAAC competition, Boeing's prototype Model 299/XB-17 outperformed two other entries but crashed, losing the initial 200-bomber contract to the Douglas B-18 Bolo. Still, the Air Corps ordered 13 more B-17s for further evaluation, then introduced it into service in 1938. The B-17 evolved through numerous design advances[4][5] but from its inception, the USAAC (later, the USAAF) promoted the aircraft as a strategic weapon. It was a relatively fast, high-flying, long-range bomber with heavy defensive armament at the expense of bombload. It also developed a reputation for toughness based upon stories and photos of badly damaged B-17s safely returning to base. The B-17 saw early action in the Pacific War, where it conducted raids against Japanese shipping and airfields.[6] But it was primarily employed by the USAAF in the daylight strategic bombing campaign over Europe, complementing RAF Bomber Command's night-time area bombing of German industrial, military and civilian targets.[7] Of the roughly 1.5 million tons of bombs dropped on Nazi Germany and its occupied territories by U.S. aircraft, over 640 000 tons (42.6%) were dropped from B-17s.[8] As of November 2022, four aircraft remain airworthy, none flown in combat. Dozens more are in storage or on static display. The oldest of these is *The Swoose*, a B-17D which was flown in combat in the Pacific on the first day of the United States' involvement in World War II.

Development

Origins

Model 299 *NX13372*

Gun turret atop the Model 299's nose glazing

Crashed Model 299

Boeing Y1B-17 in flight

On 8 August 1934, the USAAC tendered a proposal for a multiengine bomber to replace the Martin B-10. The Air Corps was looking for a bomber capable of reinforcing the air forces in Hawaii, Panama, and Alaska.[9] Requirements were for it to carry a "useful bombload" at an altitude of 10,000 ft (3,000 m) for 10 hours with a top speed of at least 200 mph (320 km/h).[10] They also desired, but did not require, a range of 2,000 mi (3,200 km) and a speed of 250 mph (400 km/h). The competition for the air corps contract was to be decided by a "fly-off" between Boeing's design, the Douglas DB-1, and the Martin Model 146 at Wilbur Wright Field in Dayton, Ohio. The prototype B-17, with the Boeing factory designation of Model 299, was designed by a team of engineers led by E. Gifford Emery and Edward Curtis Wells, and was built at Boeing's own expense.[11] It combined features of the company's experimental XB-15 bomber and 247 transport.[10] The B-17's armament consisted of five .30 caliber (7.62 mm) machine guns, with a payload up to 4,800 lb (2,200 kg) of bombs on two racks in the bomb bay behind the cockpit. The aircraft was powered by four Pratt & Whitney R-1690 Hornet radial engines, each producing 750 hp (600 kW) at 7,000 ft (2,100 m).[12] The first flight of the Model 299 was on 28 July 1935 with Boeing chief test pilot Leslie Tower at the controls.[1][13] The day before, Richard Williams, a reporter for *The Seattle Times*, coined the name "Flying Fortress" when – observing the large number of machine guns sticking out from the new airplane – he described it as a "15-ton flying fortress" in a picture caption.[14] The most distinct mount was in the nose, which allowed the single machine gun to be fired toward nearly all frontal angles.[15] Boeing was quick to see the value of the name and had it trademarked for use.[note 1] Boeing also claimed in some of the early press releases that Model 299 was the first combat aircraft that could continue its mission if one of its four engines failed.[16] On 20 August 1935, the prototype flew from Seattle to Wright Field in nine hours and three minutes with an average cruising speed of 252 miles per hour (406 km/h), much faster than the competition.[17] At the fly-off, the four-engined Boeing's performance was superior to those of the twin-engine DB-1 and Model 146. Major General Frank Maxwell Andrews of the GHQ Air Force believed that the capabilities of large four-engined aircraft exceeded those of shorter-ranged, twin-engine aircraft, and that the B-17 was better suited to new, emerging USAAC doctrine.[18] His opinions were shared by the air corps procurement officers, and even before the competition had finished, they suggested buying 65 B-17s.[19][20] On 30 October 1935, a test flight determining the rate of climb and service ceiling was planned. The command pilot was Major Ployer Peter Hill, Wright Field Material Division Chief of the Flying Branch, his first flight in the Model 299. Copilot was Lieutenant Donald Putt, while Boeing chief test pilot Leslie R. Tower was behind the pilots in an advisory role. Also on board were Wright Field test observer John Cutting and mechanic Mark Koegler. Tragically, the plane stalled and spun into the ground soon after takeoff, bursting into flames. Though initially surviving the impact, Hill died within a few hours, and Tower on 19 November. Post-accident interviews with Tower and Putt determined the control surface gust lock had not been released.[21] Doyle notes, "The loss of Hill and Tower, and the Model 299, was directly responsible for the creation of the modern written checklist used by pilots to this day."[22][23] The crashed Model 299 could not finish the evaluation, thus disqualifying it from the competition.[20] While the Air Corps was still enthusiastic about the aircraft's potential, Army officials were daunted by its cost;[24] Douglas quoted a unit price of $58,200 (equivalent to $916,000 in 2021) based on a production order of 220 aircraft, compared with $99,620 (equivalent to $1,568,000 in 2021) from Boeing.[25] Army Chief of Staff Malin Craig canceled the order for 65 YB-17s and ordered 133 of the twin-engined Douglas B-18 Bolo, instead.[19][20] The loss was not total... but Boeing's hopes for a substantial bomber contract were dashed.

Initial orders

Installation of fixtures and assemblies on a tail fuselage section of a B-17 at the Douglas plant in Long Beach, California, October 1942

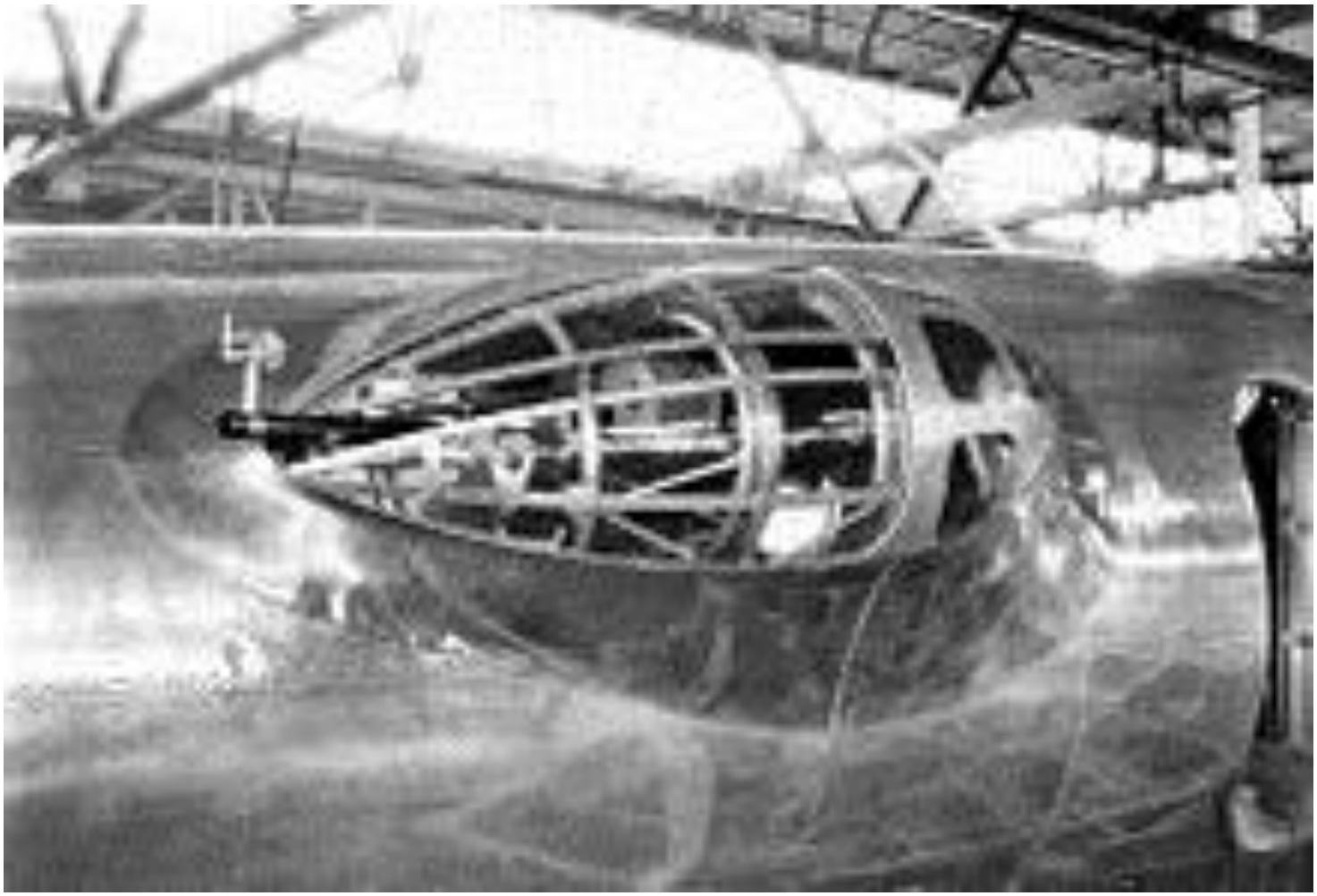
B-17Bs at March Field, California, prior to attack on Pearl Harbor, with framed nose glazing of the style retained through the B-17E model

Nose of a B-17G being restored at the Mighty Eighth Air Force Museum

Despite the crash, the USAAC had been impressed by the prototype's performance, and on 17 January 1936, through a legal loophole,[27][28] the Air Corps ordered 13 YB-17s (designated Y1B-17 after November 1936 to denote its special F-1 funding) for service testing.[20] The YB-17 incorporated a number of significant changes from the Model 299, including more powerful Wright R-1820-39 Cyclone engines. Although the prototype was company-owned and never received a military serial (the B-17 designation itself did not appear officially until January 1936, nearly three months after the prototype crashed),[29] the term "XB-17" was retroactively applied to the *NX13372's* airframe and has entered the lexicon to describe the first Flying Fortress. Between 1 March and 4 August 1937, 12 of the 13 Y1B-17s were delivered to the 2nd Bombardment Group at Langley Field in Virginia for operational development and flight tests.[30] One suggestion adopted was the use of a preflight checklist to avoid accidents such as that which befell the Model 299.[28][31][note 2] In one of their first missions, three B-17s, directed by lead navigator Lieutenant Curtis LeMay, were sent by General Andrews to "intercept" and photograph the Italian ocean liner *Rex* 610 miles (980 km) off the Atlantic coast.[33] The mission was successful and widely publicized.[34][35] The 13th Y1B-17 was delivered to the Material Division at Wright Field, Ohio, to be used for flight testing.[36] A 14th Y1B-17 (*37-369*), originally constructed for ground testing of the airframe's strength, was upgraded by Boeing with exhaust-driven General Electric turbo-superchargers, and designated Y1B-17A. Designed by Sanford Moss, engine exhaust gases turned the turbine's steel-alloy blades, forcing high-pressure ram air into the Wright Cyclone GR-1820-39 engine supercharger.[37] Scheduled to fly in 1937, it encountered problems with the turbochargers, and its first flight was delayed until 29 April 1938.[38] The aircraft was delivered to the Army on 31 January 1939.[39] Once service testing was complete, the Y1B-17s and Y1B-17A were redesignated B-17 and B-17A, respectively, to signify the change to operational status.[40] The Y1B-17A had a maximum speed of 311 miles per hour (501 km/h), at its best operational altitude, compared to 239 miles per hour (385 km/h) for the Y1B-17. Also, the Y1B-17A's new service ceiling was more than 2 miles (3.2 km) higher at 38,000 feet (12,000 m), compared to the Y1B-17's 27,800 feet (8,500 m). These turbo-superchargers were incorporated into the B-17B.[41] Opposition to the Air Corps' ambitions for the acquisition of more B-17s faded, and in late 1937, 10 more aircraft designated B-17B were ordered to equip two bombardment groups, one on each U.S. coast.[42]

Improved with larger flaps and rudder and a well-framed, 10 panel plexiglass nose, the B-17Bs were delivered in five small batches between July 1939 and March 1940. In July 1940, an order for 512 B-17s was issued,[43] but at the time of the attack on Pearl Harbor, fewer than 200 were in service with the army.[28] A total of 155 B-17s of all variants were delivered between 11 January 1937 and 30 November 1941, but production quickly accelerated, with the B-17 once holding the record for the highest production rate for any large aircraft.[44][note 3] The aircraft went on to serve in every World War II combat zone, and by the time production ended in May 1945, 12,731 B-17s had been built by Boeing, Douglas, and Vega (a subsidiary of Lockheed).[45][46][47][48] Though the crash of the prototype 299 in 1935 had almost wiped out Boeing, now it was seen as a boon. Instead of building models based on experimental engineering, Boeing had been hard at work developing their bomber and now had versions ready for production far better than would have been possible otherwise. One of the most significant weapons of World War II would be ready, but only by a hair.

Design and variants



Waist position gun blister of Model 299, not adopted for production

The aircraft went through several alterations in each of its design stages and variants. Of the 13 YB-17s ordered for service testing, 12 were used by the 2nd Bomb Group of Langley Field, Virginia, to develop heavy bombing techniques, and the 13th was used for flight testing at the Material Division at Wright Field, Ohio.[36] Experiments on this aircraft led to the use of a quartet of General Electric turbo-superchargers, which later became standard on the B-17 line. A 14th aircraft, the YB-17A, originally destined for ground testing only and upgraded with the turbochargers,[57] was redesignated B-17A after testing had finished.[39][40] As the production line developed, Boeing engineers continued to improve upon the basic design. To enhance performance at slower speeds, the B-17B was altered to include larger rudders and flaps.[50] The B-17C changed from three bulged, oval-shaped gun blisters to two flush, oval-shaped gun window openings, and on the lower fuselage, a single "bathtub" gun gondola housing,[51] which resembled the similarly configured and located *Bodenlafette*/"Bola" ventral defensive emplacement on the German Heinkel He 111P-series medium bomber. While models

A through D of the B-17 were designed defensively, the large-tailed B-17E was the first model primarily focused on offensive warfare.[57] The B-17E was an extensive revision of the Model 299 design: The fuselage was extended by 10 ft (3.0 m); a much larger rear fuselage, vertical tailfin, rudder, and horizontal stabilizer were added; a gunner's position was added in the new tail;[note 4] the nose (especially the bombardier's framed, 10-panel nose glazing) remained relatively the same as the earlier B through D versions had; a Sperry electrically powered manned dorsal gun turret just behind the cockpit was added; a similarly powered (also built by Sperry) manned ventral ball turret just aft of the bomb bay – replaced the relatively hard-to-use, Sperry model 645705-D[60] remotely operated ventral turret on the earliest examples of the E variant. These modifications resulted in a 20% increase in aircraft weight.[57] The B-17's turbocharged Wright R-1820 Cyclone 9 engines were upgraded to increasingly more powerful versions of the same powerplants throughout its production, and similarly, the number of machine gun emplacement locations was increased.[61] Boeing-built B-17Fs, with the clear-view two-piece Plexiglas bombardier's nose. The B-17F variants were the primary versions flying for the Eighth Air Force to face the Germans in 1943 and had standardized the manned Sperry ball turret for ventral defense, also replacing the earlier, 10-panel framed bombardier's nose glazing from the B subtype with an enlarged, nearly frameless Plexiglas bombardier's nose enclosure for improved forward vision. Two experimental versions of the B-17 were flown under different designations, the XB-38 Flying Fortress and the YB-40 Flying Fortress. The XB-38 was an engine testbed for Allison V-1710 liquid-cooled engines, should the Wright engines normally used on the B-17 become unavailable. The only prototype XB-38 to fly crashed on its ninth flight, and the type was abandoned. The Allison V-1710 was allocated to fighter aircraft.[62][63] The YB-40 was a heavily armed modification of the standard B-17 used before the North American P-51 Mustang, an effective long-range fighter, became available to act as escort. Additional armament included an additional dorsal turret in the radio room, a remotely operated and fired Bendix-built "chin turret" directly below the bombardier's accommodation, and twin .50 in (12.7 mm) guns in each of the waist positions. The ammunition load was over 11,000 rounds. All of these modifications made the YB-40 well over 10,000 lb (4,500 kg) heavier than a fully loaded B-17F. The YB-40s with their numerous heavy modifications had trouble keeping up with the lighter bombers once they had dropped their bombs, so the project was abandoned and finally phased out in July 1943.[64][65][66] The final production blocks of the B-17F from Douglas' plants did, however, adopt the YB-40's "chin turret", giving them a much-improved forward defense capability.[67]

B-17G nose detail

By the time the definitive B-17G appeared, the number of guns had been increased from seven to 13, the designs of the gun stations were finalized, and other adjustments were completed. The B-17G was the final version of the Flying Fortress, incorporating all changes made to its predecessor, the B-17F,[57] and in total, 8,680 were built,[68] the last (by Lockheed) on 28 July 1945.[69] Many B-17Gs were converted for other missions such as cargo hauling, engine testing, and reconnaissance.[70] Initially designated SB-17G, a number of B-17Gs were also converted for search-and-rescue duties, later to be redesignated B-17H.[71]

Postwar SB-17G-95DL (ser. no. *44-83722*), assigned to the 2nd ERS as a search-and-rescue aircraft, beside a Stinson L-5

Late in World War II, at least 25 B-17s were fitted with radio controls and television cameras, loaded with 20,000 lb (9,100 kg) of high explosives and designated BQ-7 "Aphrodite missiles" for Operation Aphrodite against bombing-resistant German bunkers. The operation, which involved remotely flying the Aphrodite drones onto their targets by accompanying CQ-17 "mothership" control aircraft, was approved on 26 June 1944, and assigned to the 388th Bombardment Group stationed at RAF Fersfield, a satellite of RAF Knettishall.[72] The first four drones were sent to Mimoyecques (V-3 site), the Siracourt V-1 bunker, and the V-2 Blockhaus d'Éperlecques at Watten, and La Coupole at Wizernes on 4 August, causing little damage and two pilots were killed. On August 12, a Consolidated B-24 Liberator, part of the United States Navy's contribution ("Project Anvil") , en route for Heligoland piloted by Lieutenant Joseph P. Kennedy Jr. (future U.S. president John F. Kennedy's elder brother) exploded over the Blyth estuary. Blast damage was caused over a radius of 5 miles (8.0 km). Naval flights stopped but a few more missions were flown by the USAAF. The Aphrodite project was effectively scrapped in early 1945.[72]

Operational history

Boeing B-17E Flying Fortress of the 19th Bombardment Group USAAF, summer 1942

B-17 Flying Fortresses from the 398th Bombardment Group flying a bombing mission to Neumünster, Germany, on 13 April 1945.

The B-17 began operations in World War II with the Royal Air Force (RAF) in 1941, and in the Southwest Pacific with the U.S. Army. The 19th Bombardment Group had deployed to Clark Field in the Philippines a few weeks before the Japanese attack on Pearl Harbor as the first of a planned heavy bomber buildup in the Pacific.

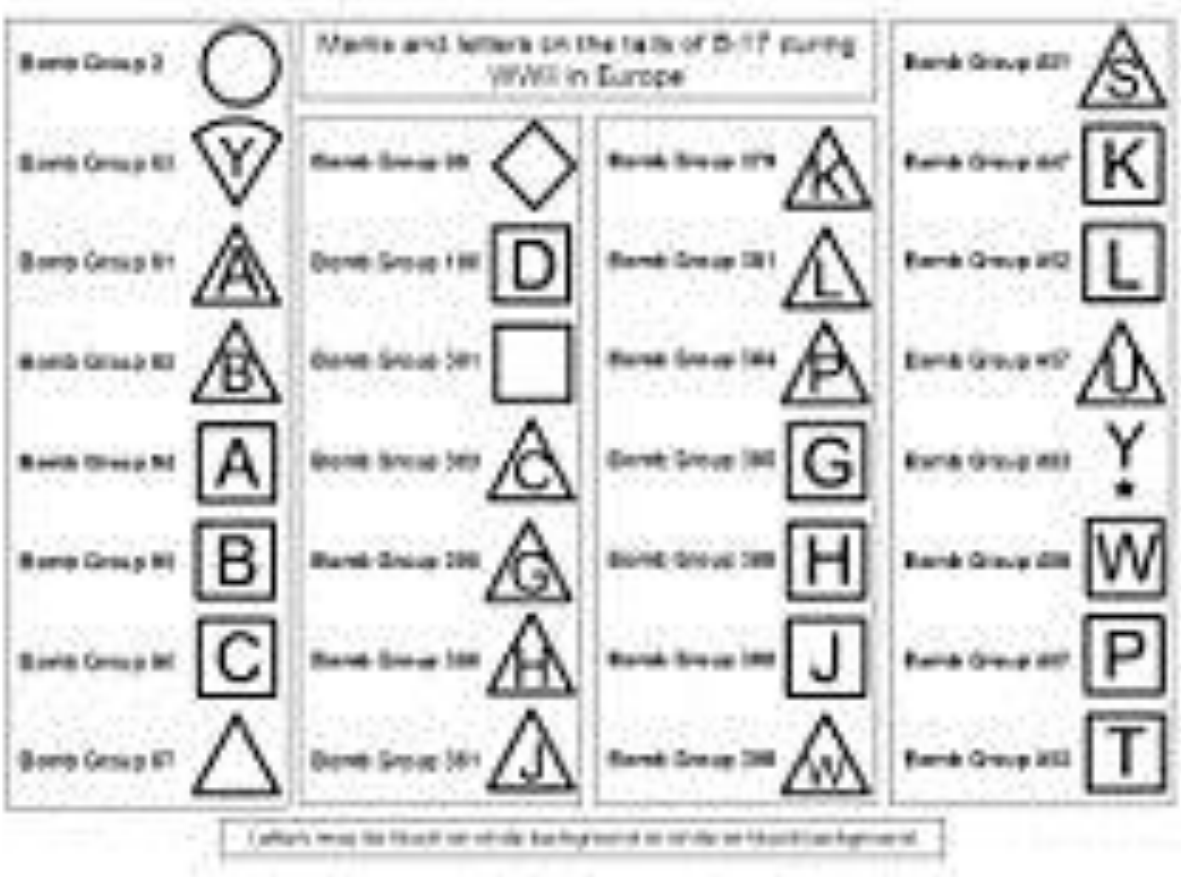
Half of the group's B-17s were wiped out on 8 December 1941 when they were caught on the ground during refueling and rearming for a planned attack on Japanese airfields on Formosa. The small force of B-17s operated against the Japanese invasion force until they were withdrawn to Darwin, in Australia's Northern Territory. In early 1942, the 7th Bombardment Group began arriving in Java with a mixed force of B-17s and LB-30/B-24s.[73] A squadron of B-17s from this force detached to the Middle East to join the First Provisional Bombardment Group, thus becoming the first American B-17 squadron to go to war against the Germans.[*citation needed*] After the defeat in Java, the 19th withdrew to Australia, where it continued in combat until it was sent home by General George C. Kenney when he arrived in Australia in mid-1942.[74] In July 1942, the first USAAF B-17s were sent to England to join the Eighth Air Force. Later that year, two groups moved to Algeria to join Twelfth Air Force for operations in North Africa. The B-17s were primarily involved in the daylight precision strategic bombing campaign against German targets ranging from U-boat pens, docks, warehouses, and airfields to industrial targets such as aircraft factories.[75] In the campaign against German aircraft forces in preparation for the invasion of France, B-17 and B-24 raids were directed against German aircraft production while their presence drew the Luftwaffe fighters into battle with Allied fighters.[7] During World War II, the B-17 equipped 32 overseas combat groups, inventory peaking in August 1944 at 4,574 USAAF aircraft worldwide.[76] The British heavy bombers, the Avro Lancaster and Handley Page Halifax, dropped 608,612 long tons (681,645 short tons) and 224,207 long tons (251,112 short tons)[77] respectively.

RAF use

RAF Fortress I serial *AN529*, with He 111H-style "bathtub" ventral gondola

The RAF entered World War II with no heavy bomber of its own in service; the biggest available were long-range medium bombers such as the Vickers Wellington, which could carry up to 4,500 pounds (2,000 kg) of bombs.[78] While the Short Stirling and Handley Page Halifax became its primary bombers by 1941, in early 1940, the RAF agreed with the U.S. Army Air Corps to acquire 20 B-17Cs, which were given the service name Fortress I. Their first operation, against Wilhelmshaven on 8 July 1941 was unsuccessful.[79][80] On 24 July three B-17s of 90 Squadron took part in a raid on the German capital ship Gneisenau and Prinz Eugen anchored in Brest from 30,000 ft (9,100 m), to draw German fighters away from 18 Handley Page Hampdens attacking at lower altitudes, and in time for 79 Vickers Wellingtons to attack later with the German fighters refueling. The operation did not work as expected, with 90 Squadron's Fortresses being unopposed.[81][82][83] By September, the RAF had lost eight B-17Cs in combat and had experienced numerous mechanical problems, and Bomber Command abandoned daylight bombing raids using the Fortress I because of the aircraft's poor performance. The experience showed both the RAF and USAAF that the B-17C was not ready for combat, and that improved defenses, larger bomb loads, and more accurate bombing methods were required. However, the USAAF continued using the B-17 as a day bomber, despite misgivings by the RAF that attempts at daylight bombing would be ineffective.[84] As use by Bomber Command had been curtailed, the RAF transferred its remaining Fortress I aircraft to Coastal Command for use as a long-range maritime patrol aircraft.[85] These were augmented starting in July 1942 by 45 Fortress Mk IIA (B-17E) followed by 19 Fortress Mk II (B-17F) and three Fortress Mk III (B-17G). A Fortress IIA from No. 206 Squadron RAF sank U-627 on 27 October 1942, the first of 11 U-boat kills credited to RAF Fortress bombers during the war.[86] As sufficient Consolidated Liberators finally became available, Coastal Command withdrew the Fortress from the Azores, transferring the type to the meteorological reconnaissance role. Three squadrons undertook Met profiles from airfields in Iceland, Scotland, and England, gathering data for vital weather forecasting purposes. The RAF's No. 223 Squadron, as part of 100 Group, operated several Fortresses equipped with an electronic warfare system known as "Airborne Cigar" (ABC). This was operated by German-speaking radio operators to identify and jam German ground controllers' broadcasts to their nightfighters. They could also pose as ground controllers themselves to steer nightfighters away from the bomber streams.[87]

Initial USAAF operations over Europe



Marks and letters on the tails of B-17 during WWII in Europe

The air corps – renamed United States Army Air Forces (USAAF) on 20 June 1941 – used the B-17 and other bombers to bomb from high altitudes with the aid of the then-secret Norden bombsight, known as the "Blue Ox",[88][89] which was an optical electromechanical gyrostabilized analog computer.[90] The device was able to determine, from variables put in by the bombardier, the point at which the aircraft's bombs should be released to hit the target. The bombardier essentially took over flight control of the aircraft during the bomb run, maintaining a level altitude during the final moments before release.[91] The USAAF began building up its air forces in Europe using B-17Es soon after entering the war. The first Eighth Air Force units arrived in High Wycombe, England, on 12 May 1942, to form the 97th Bomb Group.[92] On 17 August 1942, 12 B-17Es of the 97th, with the lead aircraft piloted by Major Paul Tibbets and carrying Brigadier General Ira Eaker as an observer, were close escorted by four squadrons of RAF Spitfire IXs (and a further five squadrons of Spitfire Vs to cover the withdrawal) on the first USAAF heavy bomber raid over Europe, against the large railroad marshalling yards at Rouen-Sotteville in France, while a further six aircraft flew a diversionary raid along the French coast.[93][94] The operation, carried out in good visibility, was a success, with only minor damage to one aircraft, unrelated to enemy action, and half the bombs landing in the target area.[95] The raid helped allay British doubts about the capabilities of American heavy bombers in operations over Europe. Two additional groups arrived in Britain at the same time, bringing with them the first B-17Fs, which served as the primary AAF heavy bomber fighting the Germans until September 1943. As the raids of the American bombing campaign grew in numbers and frequency, German interception efforts grew in strength (such as during the attempted bombing of Kiel on 13 June 1943[96]), such that unescorted bombing missions came to be discouraged.[97]

Combined offensive

The two different strategies of the American and British bomber commands were organized at the Casablanca Conference in January 1943. The resulting "Combined Bomber Offensive" weakened the Wehrmacht, destroyed German morale, and established air superiority through Operation Pointblank's destruction of German fighter strength in preparation for a ground offensive.[7] The USAAF bombers attacked by day, with British operations – chiefly against industrial cities – by night.[98]

B-17F formation over Schweinfurt, Germany, 17 August 1943

Boeing B-17F radar bombing through clouds: Bremen, Germany, on 13 November 1943

Operation Pointblank opened with attacks on targets in Western Europe. General Ira C. Eaker and the Eighth Air Force placed highest priority on attacks on the German aircraft industry, especially fighter assembly plants, engine factories, and ball-bearing manufacturers.[7] Attacks began in April 1943 on heavily fortified key industrial plants in Bremen and Recklinghausen.[99] Since the airfield bombings were not appreciably reducing German fighter strength, additional B-17 groups were formed, and Eaker ordered major missions deeper into Germany against important industrial targets. The 8th Air Force then targeted the ball-bearing factories in Schweinfurt, hoping to cripple the war effort there. The first raid on 17 August 1943 did not result in critical damage to the factories, with the 230 attacking B-17s being intercepted by an estimated 300 Luftwaffe fighters. The Germans shot down 36 aircraft with the loss of 200 men, and coupled with a raid earlier in the day against Regensburg, a total of 60 B-17s were lost that day.[100] A second attempt on Schweinfurt on 14 October 1943 later came to be known as "Black Thursday".[101] While the attack was successful at disrupting the entire works, severely curtailing work there for the remainder of the war, it was at an extreme cost.[102] Of the 291 attacking Fortresses, 60 were shot down over Germany, five crashed on approach to Britain, and 12 more were scrapped due to damage – a loss of 77 B-17s.[103] Additionally, 122 bombers were damaged and needed repairs before their next flights. Of 2,900 men in the crews, about 650 did not return, although some survived as prisoners of war. Only 33 bombers landed without damage. These losses were a result of concentrated attacks by over 300 German fighters.[104]

B-17G of the 384th Bomb Group on the bomb run

Such high losses of aircrews could not be sustained, and the USAAF, recognizing the vulnerability of heavy bombers to interceptors when operating alone, suspended daylight bomber raids deep into Germany until the development of an escort fighter that could protect the bombers all the way from the United Kingdom to Germany and back. At the same time, the German nightfighting ability noticeably improved to counter the nighttime strikes, challenging the conventional faith in the cover of darkness.[105] The 8th Air Force alone lost 176 bombers in October 1943,[106] and was to suffer similar casualties on 11 January 1944 on missions to Oschersleben, Halberstadt, and Brunswick. Lieutenant General James Doolittle, commander of the 8th, had ordered the second Schweinfurt mission to be cancelled as the weather deteriorated, but the lead units had already entered hostile air space and continued with the mission. Most of the escorts turned back or missed the rendezvous, and as a result, 60 B-17s were destroyed.[107][108] A third raid on Schweinfurt on 24 February 1944 highlighted what came to be known as "Big Week",[109] during which the bombing missions were directed against German aircraft production.[105] German fighters needed to respond, and the North American P-51 Mustang and Republic P-47 Thunderbolt fighters (equipped with improved drop tanks to extend their range) accompanying the American heavies all the way to and from the targets engaged them.[110] The escort fighters reduced the loss rate to below 7%, with a total of 247 B-17s lost in 3,500 sorties while taking part in the Big Week raids.[111] By September 1944, 27 of the 42 bomb groups of the 8th Air Force and six of the 21 groups of the 15th Air Force used B-17s. Losses to flak continued to take a high toll of heavy bombers through 1944, but the war in Europe was being won by the Allies. And by 27 April 1945, 2 days after the last heavy bombing mission in Europe, the rate of aircraft loss was so low that replacement aircraft were no longer arriving and the number of bombers per bomb group was reduced. The Combined Bomber Offensive was effectively complete.[112]

Pacific Theater

B-17C AAF S/N *40-2074* at Hickam Field: An onboard fire burnt the aircraft in two shortly after landing on 7 December 1941. One crewman was killed by a Zero attack.[113]

On 7 December 1941, a group of 12 B-17s of the 38th (four B-17C) and 88th (eight B-17E) Reconnaissance Squadrons, en route to reinforce the Philippines, was flown into Pearl Harbor from Hamilton Field, California, arriving while the surprise attack on Pearl Harbor was going on. Leonard "Smitty" Smith Humiston, co-pilot on First Lieutenant Robert H. Richards' B-17C, AAF S/N *40-2049*, reported that he thought the U.S. Navy was giving the flight a 21-gun salute to celebrate the arrival of the bombers, after which he realized that Pearl Harbor was under attack. The Fortress came under fire from Japanese fighter aircraft, though the crew was unharmed with the exception of one member who suffered an abrasion on his hand. Japanese activity forced them to divert from Hickam Field to Bellows Field. On landing, the aircraft overran the runway and ran into a ditch, where it was then strafed. Although initially deemed repairable, *40-2049* (11th BG / 38th RS) received more than 200 bullet holes and never flew again. Ten of the 12 Fortresses survived the attack.[114]

B-17E BO AAF S/N *41-9211*
Typhoon McGoon II of the 11th BG / 98th BS, taken in January 1943 in New Caledonia: The antennae mounted upon the nose were used for radar tracking surface vessels.

By 1941, the Far East Air Force (FEAF) based at Clark Field in the Philippines had 35 B-17s, with the War Department eventually planning to raise that to 165.[115] When the FEAF received word of the attack on Pearl Harbor, General Lewis H. Brereton sent his bombers and fighters on various patrol missions to prevent them from being caught on the ground. Brereton planned B-17 raids on Japanese airfields in Formosa, in accordance with Rainbow 5 war plan directives, but this was overruled by General Douglas MacArthur.[116] A series of disputed discussions and decisions, followed by several confusing and false reports of air attacks, delayed the authorization of the sortie. By the time the B-17s and escorting Curtiss P-40 Warhawk fighters were about to get airborne, they were destroyed by Japanese bombers of the 11th Air Fleet.

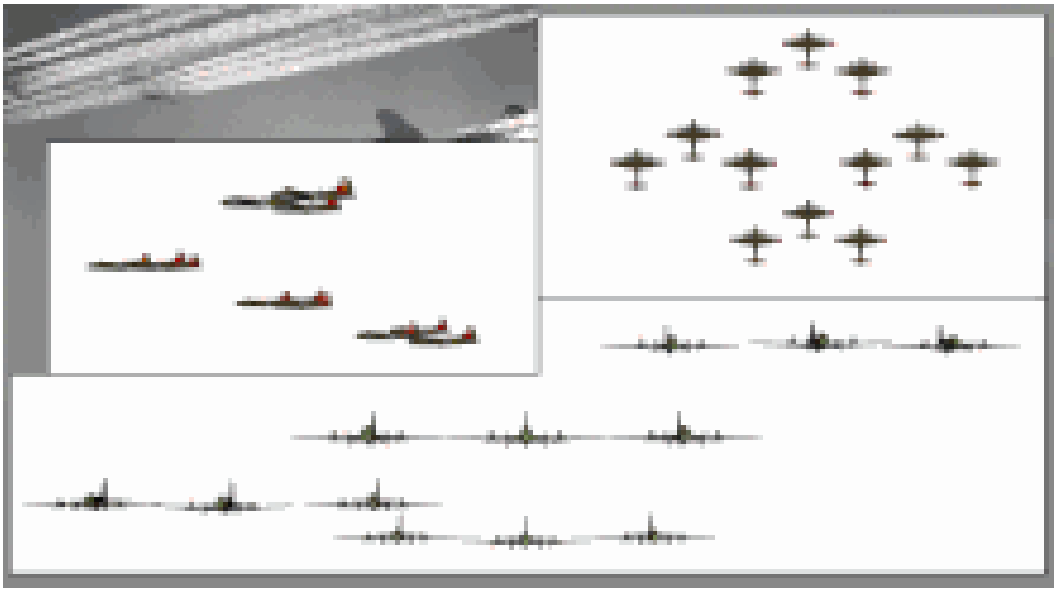
The FEAF lost half its aircraft during the first strike,[117] and was all but destroyed over the next few days. Another early World War II Pacific engagement, on 10 December 1941, involved Colin Kelly, who reportedly crashed his B-17 into the Japanese battleship *Haruna*, which was later acknowledged as a near bomb miss on the heavy cruiser *Ashigara*. Nonetheless, this deed made him a celebrated war hero. Kelly's B-17C AAF S/N *40-2045* (19th BG / 30th BS) crashed about 6 mi (10 km) from Clark Field after he held the burning Fortress steady long enough for the surviving crew to bail out. Kelly was posthumously awarded the Distinguished Service Cross.[118] Noted Japanese ace Saburō Sakai is credited with this kill, and in the process, came to respect the ability of the Fortress to absorb punishment.[119] B-17s were used in early battles of the Pacific with little success, notably the Battle of Coral Sea[120] and Battle of Midway.[121] While there, the Fifth Air Force B-17s were tasked with disrupting the Japanese sea lanes. Air Corps doctrine dictated bombing runs from high altitude, but they soon found only 1% of their bombs hit targets. However, B-17s were operating at heights too great for most A6M Zero fighters to reach. The B-17's greatest success in the Pacific was in the Battle of the Bismarck Sea, in which aircraft of this type were responsible for damaging and sinking several Japanese transport ships. On 2 March 1943, six B-17s of the 64th Squadron flying at 10,000 ft (3,000 m) attacked a major Japanese troop convoy off New Guinea, using skip bombing to sink *Kyokusei Maru*, which carried 1,200 army troops, and damage two other transports, *Teiyo Maru* and *Nojima*. On 3 March 1943, 13 B-17s flying at 7,000 ft (2,000 m) bombed the convoy, forcing the convoy to disperse and reducing the concentration of their anti-aircraft defenses. The B-17s attracted a number of Mitsubishi A6M Zero fighters, which were in turn attacked by the P-38 Lightning escorts. One B-17 broke up in the air, and its crew was forced to take to their parachutes. Japanese fighter pilots machine-gunned some of the B-17 crew members as they descended and attacked others in the water after they landed.[122] Five of the Japanese fighters strafing the B-17 aircrew were promptly engaged and shot down by three Lightnings, though these were also then lost.[123] The allied fighter pilots claimed 15 Zeros destroyed, while the B-17 crews claimed five more.[122][124] Actual Japanese fighter losses for the day were seven destroyed and three damaged.[125][126] The remaining seven transports and three of the eight destroyers were then sunk by a combination of low level strafing runs by Royal Australian Air Force Beaufighters, and skip bombing by USAAF North American B-25 Mitchells at 100 ft (30 m), while B-17s claimed five hits from higher altitudes.[127] On the morning of 4 March 1943, a B-17 sank the destroyer *Asashio* with a 500 lb (230 kg) bomb while she was picking up survivors from *Arashio*.[128] At their peak, 168 B-17 bombers were in the Pacific theater in September 1942, but already in mid-1942 Gen. Arnold had decided that the B-17 was unsuitable for the kind of operations required in the Pacific and made plans to replace all of the B-17s in the theater with B-24s (and later, B-29s) as soon as they became available. Although the conversion was not complete until mid-1943, B-17 combat operations in the Pacific theater came to an end after a little over a year.[129] Surviving aircraft were reassigned to the 54th Troop Carrier Wing's special airdrop section and were used to drop supplies to ground forces operating in close contact with the enemy. Special airdrop B-17s supported Australian commandos operating near the Japanese stronghold at Rabaul, which had been the primary B-17 target in 1942 and early 1943.[130] B-17s were still used in the Pacific later in the war, however, mainly in the combat search and rescue role. A number of B-17Gs, redesignated B-17Hs and later SB-17Gs, were used in the Pacific during the final year of the war to carry and drop lifeboats to stranded bomber crews who had been shot down or crashed at sea.[131] These aircraft were nicknamed Dumbos, and remained in service for many years after the end of World War II.[132]

Bomber defense

Part of a USAAF stream of over 1,000 B-17s

Before the advent of long-range fighter escorts, B-17s had only their .50 caliber M2 Browning machine guns to rely on for defense during the bombing runs over Europe. As the war intensified, Boeing used feedback from aircrews to improve each new variant with increased armament and armor.[133] Defensive armament increased from four 0.50 in (12.7 mm) machine guns and one 0.30 in (7.62 mm) nose machine gun in the B-17C, to thirteen 0.50 in (12.7 mm) machine guns in the B-17G. But because the bombers could not maneuver when attacked by fighters and needed to be flown straight and level during their final bomb run, individual aircraft struggled to fend off a direct attack.

German training model on how to attack a "flying porcupine" (*fliegendes Stachelschwein*)



"Combat boxes" of 12 B-17 during bombing missions

A 1943 survey by the USAAF found that over half the bombers shot down by the Germans had left the protection of the main formation.[134] To address this problem, the United States developed the bomb-group formation, which evolved into the staggered combat box formation in which all the B-17s could safely cover any others in their formation with their machine guns. This made a formation of bombers a dangerous target to engage by enemy fighters.[135] In order to more quickly form these formations, assembly ships, planes with distinctive paint schemes, were utilized to guide bombers into formation, saving assembly time.[136][137] *Luftwaffe* fighter pilots likened attacking a B-17 combat box formation to encountering a *fliegendes Stachelschwein*, "flying porcupine", with dozens of machine guns in a combat box aimed at them from almost every direction. However, the use of this rigid formation meant that individual aircraft could not engage in evasive maneuvers: they had to fly constantly in a straight line, which made them vulnerable to German flak. Moreover, German fighter aircraft later developed the tactic of high-speed strafing passes rather than engaging with individual aircraft to inflict damage with minimum risk. As a result, the B-17s' loss rate was up to 25% on some early missions. It was not until the advent of long-range fighter escorts (particularly the North American P-51 Mustang) and the resulting degradation of the *Luftwaffe* as an effective interceptor force between February and June 1944, that the B-17 became strategically potent.

Formation flying through dense flak over Merseburg, Germany

The B-17 was noted for its ability to absorb battle damage, still reach its target and bring its crew home safely.[138][139][140] Wally Hoffman, a B-17 pilot with the Eighth Air Force during World War II, said, "The plane can be cut and slashed almost to pieces by enemy fire and bring its crew home."[141] Martin Caidin reported one instance in which a B-17 suffered a midair collision with a Focke-Wulf Fw 190, losing an engine and suffering serious damage to both the starboard horizontal stabilizer and the vertical stabilizer, and being knocked out of formation by the impact. The B-17 was reported as shot down by observers, but it survived and brought its crew home without injury.[142]

Its toughness was compensation for its shorter range and lighter bomb load compared to the B-24 and British Avro Lancaster heavy bombers.[*clarification needed*] Stories circulated of B-17s returning to base with tails shredded, engines destroyed and large portions of their wings destroyed by flak.[143] This durability, together with the large operational numbers in the Eighth Air Force and the fame achieved by the *Memphis Belle*, made the B-17 a key bomber aircraft of the war. Other factors such as combat effectiveness and political issues also contributed to the B-17's success.[144]

Luftwaffe attacks

B-17G *43-38172* of the 8th AF 398th BG 601st BS which was damaged on a bombing mission over Cologne, Germany, on 15 October 1944; the bombardier was killed.[145]

After examining wrecked B-17s and B-24s, Luftwaffe officers discovered that on average it took about 20 hits with 20 mm shells fired from the rear to bring them down.[103] Pilots of average ability hit the bombers with only about two percent of the rounds they fired, so to obtain 20 hits, the average pilot had to fire one thousand 20 mm (0.79 in) rounds at a bomber.[103] Early versions of the Fw 190, one of the best German interceptor fighters, were equipped with two 20 mm (0.79 in) MG FF cannons, which carried only 500 rounds when belt-fed (normally using 60-round drum magazines in earlier installations), and later with the better Mauser MG 151/20 cannons, which had a longer effective range than the MG FF weapon. Later versions carried four or even six MG 151/20 cannon and twin 13 mm machine guns. The German fighters found that when attacking from the front, where fewer defensive guns were mounted (and where the pilot was exposed and not protected by armor as he was from the rear), it took only four or five hits to bring a bomber down.[103] To rectify the Fw 190's shortcomings, the number of cannons fitted was doubled to four, with a corresponding increase in the amount of ammunition carried, creating the *Sturmbock* bomber destroyer version. This type replaced the vulnerable twin-engine *Zerstörer* heavy fighters which could not survive interception by P-51 Mustangs flying well ahead of the combat boxes in an air supremacy role starting very early in 1944 to clear any Luftwaffe defensive fighters from the skies. By 1944, a further upgrade to Rheinmetall-Borsig's 30 mm (1.2 in) MK 108 cannons mounted either in the wing, or in underwing, conformal mount gun pods, was made for the *Sturmbock* Focke-Wulfs as either the /R2 or /R8 field modification kits, enabling aircraft to bring a bomber down with just a few hits.[103]

B-17G-15-BO *Wee Willie*, 322d BS, 91st BG, after direct flak hit on her 128th mission.[146]

The adoption of the 21 cm Nebelwerfer-derived *Werfer-Granate 21* (Wfr. Gr. 21) rocket mortar by the Luftwaffe in mid-August 1943 promised the introduction of a major "stand-off" style of offensive weapon – one strut-mounted tubular launcher was fixed under each wing panel on the Luftwaffe's single-engine fighters, and two under each wing panel of a few twin-engine Bf 110 daylight *Zerstörer* aircraft.[103] However, due to the slow 715 mph velocity and characteristic ballistic drop of the fired rocket (despite the usual mounting of the launcher at about 15° upward orientation), and the small number of fighters fitted with the weapons, the Wfr. Gr. 21 never had a major effect on the combat box formations of Fortresses.[103] The Luftwaffe also fitted heavy-caliber *Bordkanone*-series 37, 50 and even 75 mm (2.95 in) cannon as anti-bomber weapons on twin-engine aircraft such as the special Ju 88P fighters, as well as one model of the Me 410 *Hornisse* but these measures did not have much effect on the American strategic bomber offensive. The Me 262, however, had moderate success against the B-17 late in the war. With its usual nose-mounted armament of four MK 108 cannons, and with some examples later equipped with the R4M rocket, launched from underwing racks, it could fire from outside the range of the bombers' .50 in (12.7 mm) defensive guns and bring an aircraft down with one hit,[147] as both the MK 108's shells and the R4M's warheads were filled with the "shattering" force of the strongly brisant Hexogen military explosive.

Luftwaffe-captured B-17

Captured B-17F-27-BO in *Luftwaffe* markings, the USAAF-named "Wulfe-Hound", *41-24585*, of the 360th BS/303rd BG, was downed on 12 December 1942 near Leeuwarden, Netherlands, while on a raid on Rouen, France. The first Flying Fortress to fall intact into German hands, it was operated by *Kampfgeschwader 200* from March 1944.[148]

During World War II approximately 40 B-17s were captured and refurbished by Germany after crash-landing or being forced down, with about a dozen put back into the air. Given German *Balkenkreuz* national markings on their wings and fuselage sides, and swastika tail fin–flashes, the captured B-17s were used to determine the B-17's vulnerabilities and to train German interceptor pilots in attack tactics.[149] Others, with the cover designations Dornier Do 200 and Do 288, were used as long-range transports by the *Kampfgeschwader* 200 special duties unit, carrying out agent drops and supplying secret airstrips in the Middle East and North Africa. They were chosen specifically for these missions as being more suitable for this role than other available German aircraft; they never attempted to deceive the Allies and always wore full *Luftwaffe* markings.[150][151] One B-17 of KG200, bearing the *Luftwaffe's* KG 200 *Geschwaderkennung* (combat wing code) markings *A3+FB*, was interned by Spain when it landed at Valencia airfield, 27 June 1944, remaining there for the rest of the war.[92] It has been alleged that some B-17s kept their Allied markings and were used by the *Luftwaffe* in attempts to infiltrate B-17 bombing formations and report on their positions and altitudes.[152] According to these allegations, the practice was initially successful, but Army Air Force combat aircrews quickly developed and established standard procedures to first warn off, and then fire upon any "stranger" trying to join a group's formation.[92]

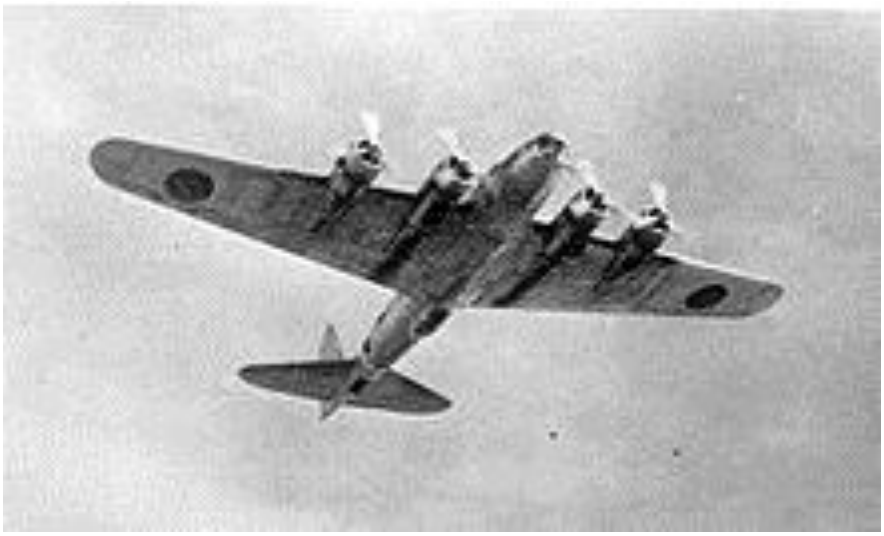
Soviet-interned B-17

The U.S. did not offer B-17s to the Soviet Union as part of its war materiel assistance program, but at least 73 aircraft were acquired by the Soviet Air Force. These aircraft had landed with mechanical trouble during the shuttle bombing raids over Germany or had been damaged by a *Luftwaffe* raid in Poltava. The Soviets restored 23 to flying condition and concentrated them in the 890th Bomber Regiment of the 45th Bomber Aviation Division,[153] but they never saw combat. In 1946 (or 1947, according to Holm), the regiment was assigned to the Kazan factory (moving from Baranovichi) to help the Soviet effort to reproduce the more advanced Boeing B-29 as the Tupolev Tu-4.[154]

Swiss-interned B-17

During the Allied bomber offensive, U.S. and British bombers sometimes flew into Swiss airspace, either because they were damaged or, on rare occasions, accidentally bombing Swiss cities. Swiss aircraft attempted to intercept and force individual aircraft to land, interning their crews; one Swiss pilot was killed, shot down by a U.S. bomber crew in September 1944. Official Swiss records identify 6,501 airspace violations during the course of the war, with 198 foreign aircraft landing on Swiss territory and 56 aircraft crashing there. In October 1943, the Swiss interned Boeing B-17F-25-VE, tail number 25841, and its U.S. flight crew after the Flying Fortress developed engine trouble after a raid over Germany and was forced to land. The aircraft was turned over to the Swiss Air Force, who then flew the bomber until the end of the war, using other interned but non-airworthy B-17s for spare parts. The bomber's topside surfaces were repainted a dark olive drab, but retained its light gray under wing and lower fuselage surfaces. It carried Swiss national white cross insignia in red squares on both sides of its rudder, fuselage sides, and on the topside and underside wings. The B-17F also carried light gray flash letters "RD" and "I" on either side of the fuselage's Swiss national insignia.[75]

Japanese-captured B-17



This captured USAAF Boeing B-17D, in Japanese livery, was flown to Japan for technical evaluation

In 1942, Japanese technicians and mechanics rebuilt three damaged B-17s, one "D" and two "E" series, using parts salvaged from abandoned B-17 wrecks in the Philippines and the Java East Indies.[155] The three bombers, which still contained their top-secret Norden bombsights, were ferried to Japan where they underwent extensive technical evaluation by the *Giken*, the Imperial Japanese Army Air Force's Air Technical Research Institute (Koku Gijutsu Kenkyujo) at Tachikawa's air field. The "D" model, later deemed an obsolescent design, was used in Japanese training and propaganda films. The two "E"s were used to develop air combat tactics for use against B-17s; they were also used as enemy aircraft in pilot and crew training films. One of the two "E"s was photographed late in the war by U. S. aerial recon. It was code-named "Tachikawa 105" after the mystery aircraft's wingspan (104 feet) but not correctly identified as a captured B-17 until after the war. No traces of the three captured Flying Fortresses were ever found in Japan by Allied occupation forces. The bombers were assumed either lost by various means or scrapped late in the war for their vital war materials.[156]

Postwar history

U.S. Air Force

BQ-17 Flying Fortress drones over New Mexico, April 1946

After World War II, the B-17 was quickly phased out of use as a bomber and the Army Air Forces retired most of its fleet. Flight crews ferried the bombers back across the Atlantic to the United States where the majority were sold for scrap and melted down, although many remained in use in second-line roles such as VIP transports, air-sea rescue and photo-reconnaissance.[157][158] Strategic Air Command (SAC), established in 1946, used reconnaissance B-17s (at first called F-9 [*F* for *Fotorecon*], later RB-17) until 1949.[159][160]

SB-17G of the USAF 5th Rescue Squadron c. 1950

The USAF Air Rescue Service of the Military Air Transport Service (MATS) operated B-17s as so-called "Dumbo" air-sea rescue aircraft. Work on using B-17s to carry airborne lifeboats had begun in 1943, but they entered service in the European theater only in February 1945. They were also used to provide search and rescue support for B-29 raids against Japan. About 130 B-17s were converted to the air-sea rescue role, at first designated B-17H and later SB-17G. Some SB-17s had their defensive guns removed, while others retained their guns to allow use close to combat areas. The SB-17 served through the Korean War, remaining in service with USAF until the mid-1950s.[71][161][162] In 1946, surplus B-17s were chosen as drone aircraft for atmospheric sampling during the Operation Crossroads atomic bomb tests, being able to fly close to or even through the mushroom clouds without endangering a crew. This led to more widespread conversion of B-17s as drones and drone control aircraft, both for further use in atomic testing and as targets for testing surface-to-air and air-to-air missiles.[163] One hundred and seven B-17s were converted to drones.[164] The last operational mission flown by a USAF Fortress was conducted on 6 August 1959, when a DB-17P, serial *44-83684* , directed a QB-17G, out of Holloman Air Force Base, New Mexico, as a target for an AIM-4 Falcon air-to-air missile fired from a McDonnell F-101 Voodoo. A retirement ceremony was held several days later at Holloman AFB, after which *44-83684* was retired.[*citation needed*] It was subsequently used in various films and in the 1960s television show *12 O'Clock High* before being retired to the Planes of Fame aviation museum in Chino, California.[165] Perhaps the most famous B-17, the *Memphis Belle*, has been restored – with the B-17D *The Swoose* under way – to her World War II wartime appearance by the National Museum of the United States Air Force at Wright-Patterson Air Force Base, Ohio.[166]

U.S. Navy and Coast Guard

Under project **Cadillac II**, an AN/APS-20 radar was fitted onto the B-17G, making the PB-1W one of the first Airborne early warning aircraft.

During the last year of World War II and shortly thereafter, the United States Navy (USN) acquired 48 ex-USAAF B-17s for patrol and air-sea rescue work. The first two ex-USAAF B-17s, a B-17F (later modified to B-17G standard) and a B-17G were obtained by the Navy for various development programs.[159]

At first, these aircraft operated under their original USAAF designations, but on 31 July 1945 they were assigned the naval aircraft designation PB-1, a designation which had originally been used in 1925 for the Boeing Model 50 experimental flying boat.[167] Thirty-two B-17Gs[168] were used by the Navy under the designation PB-1W, the suffix -W indicating an airborne early warning role. A large radome for an S-band AN/APS-20 search radar was fitted underneath the fuselage and additional internal fuel tanks were added for longer range, with the provision for additional underwing fuel tanks. Originally, the B-17 was also chosen because of its heavy defensive armament, but this was later removed. These aircraft were painted dark blue, the standard Navy paint scheme which had been adopted in late 1944.[159][167] PB-1Ws continued in USN service until 1955, gradually being phased out in favor of the Lockheed WV-2 (known in the USAF as the EC-121, a designation adopted by the USN in 1962), a military version of the Lockheed 1049 Constellation commercial airliner.

The U.S. Coast Guard PB-1G carried a droppable lifeboat.

In July 1945, 16 B-17s were transferred to the Coast Guard via the Navy; these aircraft were initially assigned U.S. Navy Bureau Numbers (BuNo), but were delivered to the Coast Guard designated as PB-1Gs beginning in July 1946.[159][162] Coast Guard PB-1Gs were stationed at a number of bases in the U.S. and Newfoundland, with five at Coast Guard Air Station Elizabeth City, North Carolina, two at CGAS San Francisco, two at NAS Argentia, Newfoundland, one at CGAS Kodiak, Alaska, and one in Washington state.[162] They were used primarily in the "Dumbo" air-sea rescue role, but were also used for iceberg patrol duties and for photo mapping. The Coast Guard PB-1Gs served throughout the 1950s, the last example not being withdrawn from service until 14 October 1959.[159][169]

Special operations

B-17s were used by the CIA front companies Civil Air Transport, Air America and Intermountain Aviation for special missions. These included B-17G *44-85531*, registered as N809Z. These aircraft were primarily used for agent drop missions over the People's Republic of China, flying from Taiwan, with Taiwanese crews. Four B-17s were shot down in these operations.[170] In 1957 the surviving B-17s had been stripped of all weapons and painted black. One of these Taiwan-based B-17s was flown to Clark Air Base in the Philippines in mid-September, assigned for covert missions into Tibet. On 28 May 1962, N809Z, piloted by Connie Seigrist and Douglas Price, flew Major James Smith, USAF and Lieutenant Leonard A. LeSchack, USNR to the abandoned Soviet arctic ice station NP 8, as Operation Coldfeet. Smith and LeSchack parachuted from the B-17 and searched the station for several days. On 1 June, Seigrist and Price returned and picked up Smith and LeSchack using a Fulton Skyhook system installed on the B-17.[171] N809Z was used to perform a Skyhook pick up in the James Bond movie *Thunderball* in 1965. This aircraft, now restored to its original B-17G configuration, was on display in the Evergreen Aviation & Space Museum in McMinnville, Oregon until it was sold to the Collings Foundation in 2015.[172]

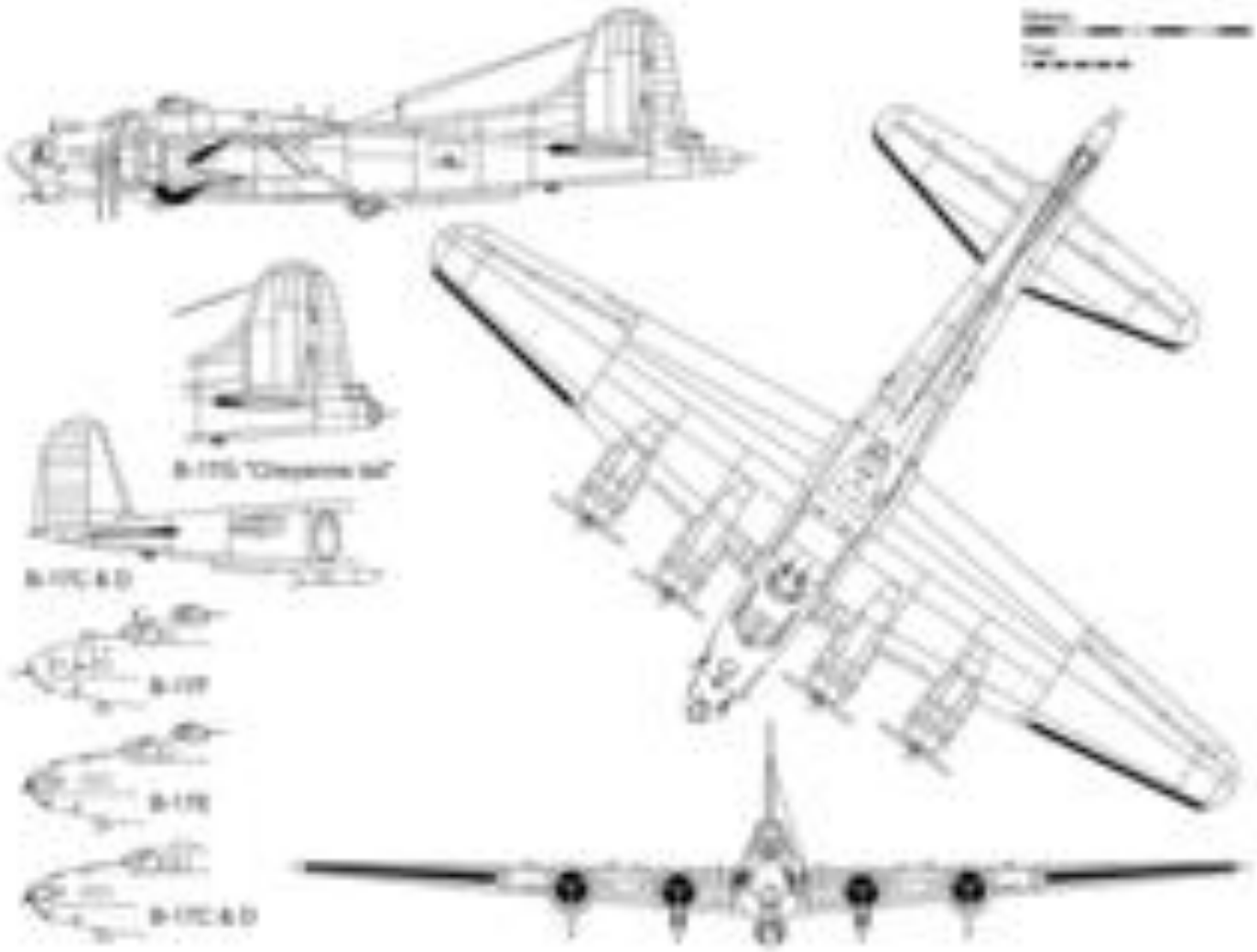
Fortresses as a symbol

The B-17's capacity to repel enemy attacks and still inflict heavy damage upon German military capability and production centers is rendered in this caricature.

The B-17 Flying Fortress became symbolic of the United States of America's air power. In a 1943 Consolidated Aircraft poll of 2,500 men in cities where Consolidated advertisements had been run in newspapers, 73% had heard of the B-24 and 90% knew of the B-17.[140] After the first Y1B-17s were delivered to the Army Air Corps 2nd Bombardment Group, they were used on flights to promote their long range and navigational capabilities. In January 1938, group commander Colonel Robert Olds flew a Y1B-17 from the U.S. east coast to the west coast, setting a transcontinental record of 13 hours 27 minutes. He also broke the west-to-east coast record on the return trip, averaging 245 mph (394 km/h) in 11 hours 1 minute.[174] Six bombers of the 2nd Bombardment Group took off from Langley Field on 15 February 1938 as part of a goodwill flight to Buenos Aires, Argentina. Covering 12,000 miles (19,000 km) they returned on 27 February, with seven aircraft setting off on a flight to Rio de Janeiro, Brazil, three days later.[175] In a well-publicized mission on 12 May of the same year, three Y1B-17s "intercepted" and took photographs of the Italian ocean liner SS *Rex* 610 miles (980 km) off the Atlantic coast.[176][note 5]

Many pilots who flew both the B-17 and the B-24 preferred the B-17 for its greater stability and ease in formation flying. The electrical systems were less vulnerable to damage than the B-24's hydraulics, and the B-17 was easier to fly than a B-24 when missing an engine.[177] During the war, the largest offensive bombing force, the Eighth Air Force, had an open preference for the B-17. Lieutenant General Jimmy Doolittle wrote about his preference for equipping the Eighth with B-17s, citing the logistical advantage in keeping field forces down to a minimum number of aircraft types with their individual servicing and spares. For this reason, he wanted B-17 bombers and P-51 fighters for the Eighth. His views were supported by Eighth Air Force statisticians, whose mission studies showed that the Flying Fortress's utility and survivability was much greater than those of the B-24 Liberator.[140] Making it back to base on numerous occasions, despite extensive battle damage, the B-17's durability became legendary;[138][139] stories and photos of B-17s surviving battle damage were widely circulated during the war.[140] Despite an inferior performance and smaller bombload than the more numerous B-24 Liberators,[178] a survey of Eighth Air Force crews showed a much higher rate of satisfaction with the B-17.[179]

Specifications (B-17G)



3-view projection of a B-17G, with inset detail showing the "Cheyenne tail" and some major differences with other B-17 variants

B-17G nose guns

General characteristics

- **Crew:** 10: Pilot, co-pilot, navigator, bombardier/nose gunner, flight engineer/top turret gunner, radio operator, waist gunners (2), ball turret gunner, tail gunner[219]
- **Length:** 74 ft 4 in (22.66 m)
- **Wingspan:** 103 ft 9 in (31.62 m)
- **Height:** 19 ft 1 in (5.82 m)
- **Wing area:** 1,420 sq ft (131.92 m^2)
- **Airfoil:** NACA 0018 / NACA 0010
- **Empty weight:** 36,135 lb (16,391 kg)
- **Gross weight:** 54,000 lb (24,500 kg)
- **Max takeoff weight:** 65,500 lb (29,700 kg)
- **Aspect ratio:** 7.57
- **Powerplant:** 4 × Wright R-1820-97 "Cyclone" turbosupercharged radial engines, 1,200 hp (895 kW) each
- **Propellers:** 3-bladed Hamilton-Standard constant-speed propeller

Performance

- **Maximum speed:** 287 mph (462 km/h, 249 kn)
- **Cruise speed:** 182 mph (293 km/h, 158 kn)
- **Range:** 2,000 mi (3,219 km, 1,738 nmi) with 6,000 lb (2,700 kg) bombload
- **Ferry range:** 3,750 mi (6,040 km, 3,260 nmi)
- **Service ceiling:** 35,600 ft (10,850 m)
- **Rate of climb:** 900 ft/min (4.6 m/s)
- **Wing loading:** 38.0 lb/sq ft (185.7 kg/m^2)
- **Power/mass:** 0.089 hp/lb (150 W/kg)

Armament

- **Guns:** 13 × .50 in (12.7 mm) M2 Browning machine guns in 9 positions (2 in the Bendix chin turret, 2 on nose cheeks, 2 staggered waist guns, 2 in upper Sperry turret, 2 in Sperry ball turret in belly, 2 in the tail and one firing upwards from radio compartment behind bomb bay)
- **Bombs:**
  - **Short range missions; Internal load only (<400 mi):** 8,000 lb (3,600 kg)
  - **Long range missions; Internal load only (≈800 mi):** 4,500 lb (2,000 kg)
  - **Max Internal and External load:** 17,600 lb (7,800 kg)

Source : https://en.wikipedia.org/wiki/Boeing_B-17_Flying_Fortress