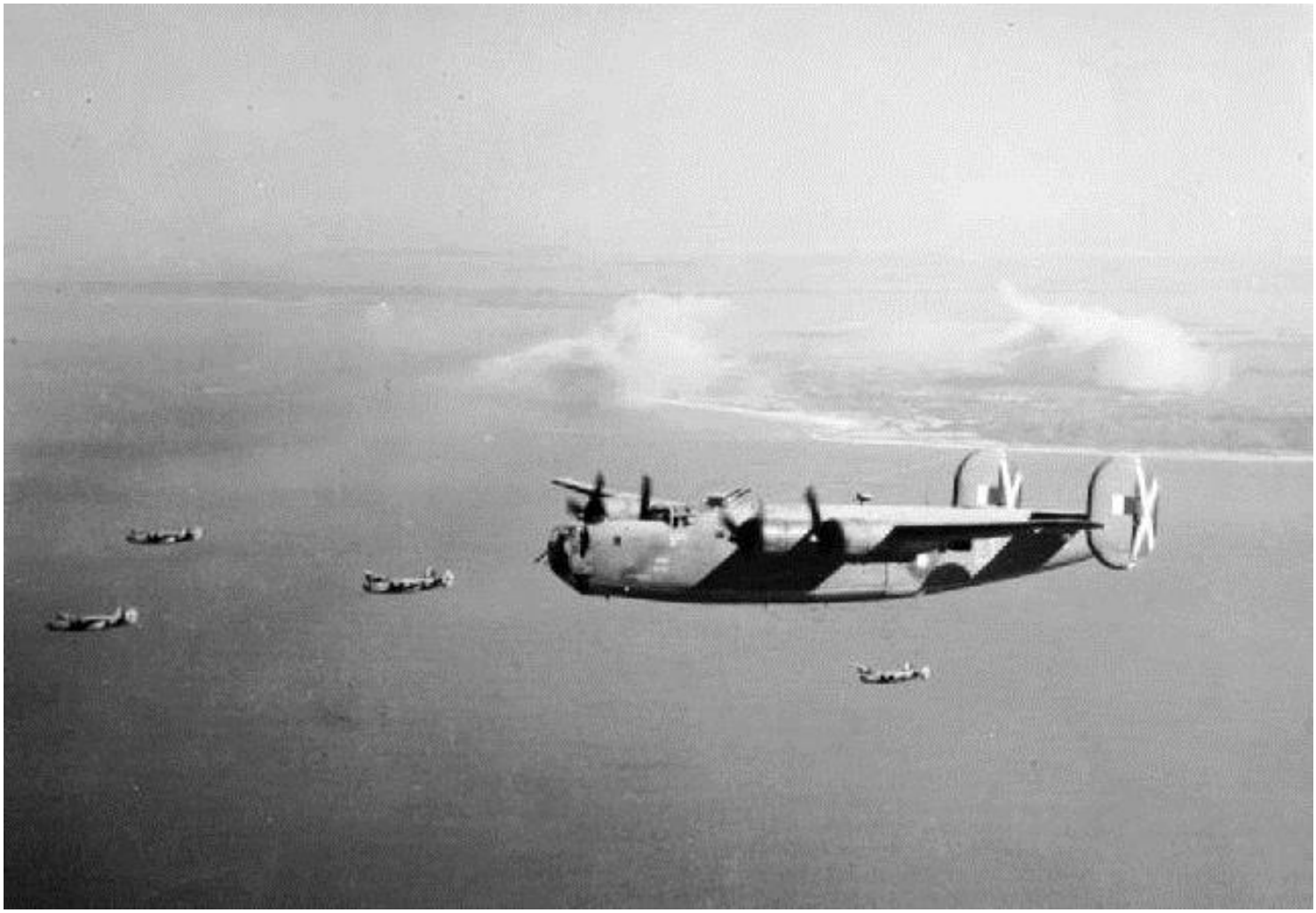
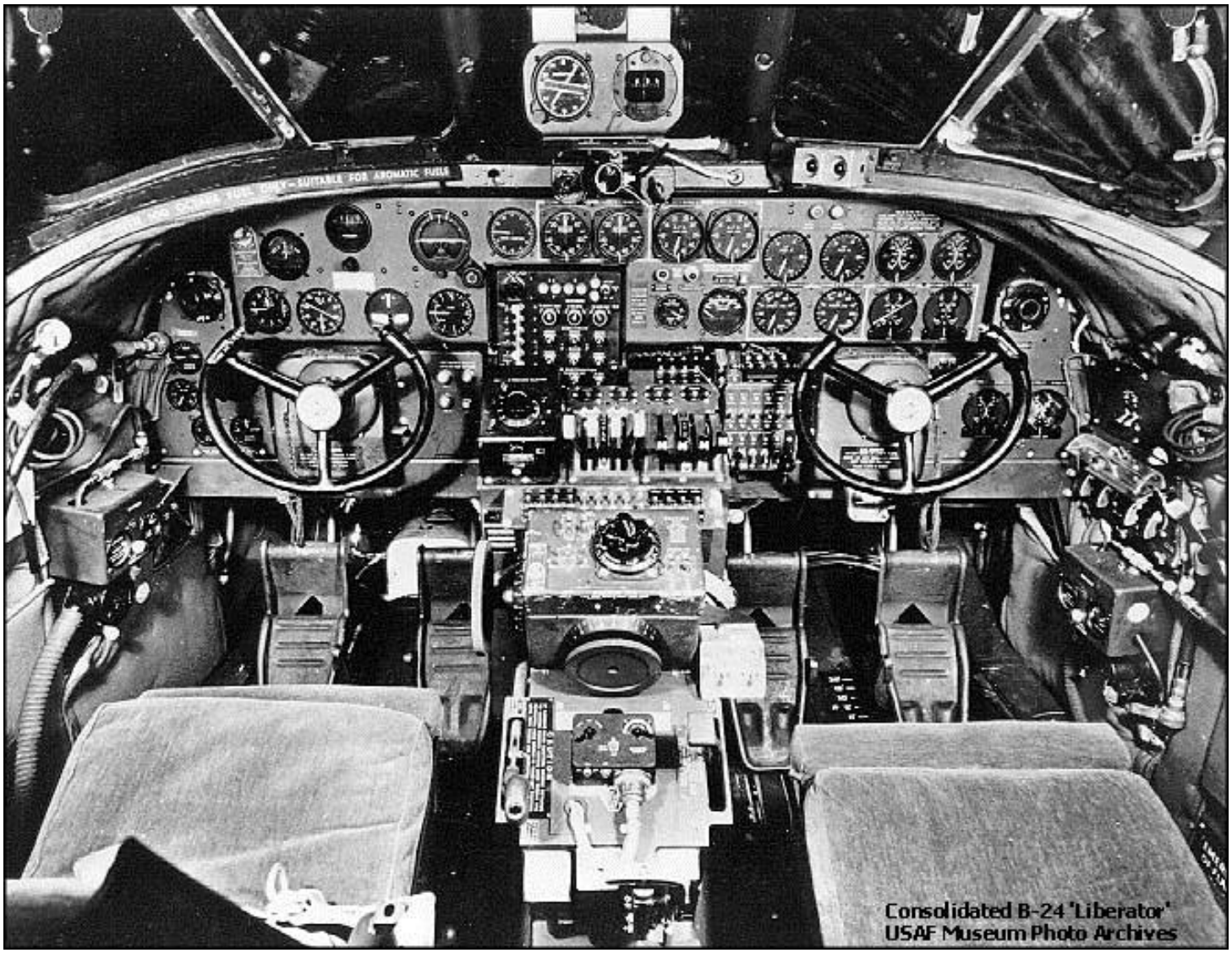
Consolidated B-24 Liberator



Consolidated B-24H Liberator B.VI de la RAF

En 1938, la firme Consolidated fut approchée par l'USAAC afin de construire le B-17, dont les cadences de production étaient encore faibles. Sauf que Consolidated ne se voyait pas en sous-traitant, encore moins pour un appareil qui montrait déjà ses limites au bout de 4 ans d'existence. La firme préféra donc concevoir son propre bombardier, plus performant. Le nouvel appareil, le Model 32, était un quadrimoteur qui combinait une aile conçue par David Davis, la double dérive du Consolidated 31 et un nouveau fuselage. Ce dernier fut conçu par Isaac M. Laddon autour de deux soutes à bombes, chacune d'entre elle ayant la capacité de celle d'un B-17. L'USAAC, intéressée, émit la spécification C-212 invitant Consolidated à lui soumettre un projet de bombardier dépassant le B-17 en plafond, vitesse et autonomie, le 1er février 1939. Le 30 mars 1939, le Consolidated 32 fit l'objet d'un contrat pour un prototype, qui fut désigné XB-24. Le B-24 apportait son long d'innovations. Il fut le premier bombardier américain à disposer d'un train d'atterrissage tricycle. Il était propulsé par 4 Pratt & Whitney R-1830 de 1000 hp. Bien que plus court que le B-17, il avait une masse au décollage de 32 tonnes, ce qui en faisait un des appareils les plus lourds de l'époque. Avant même que le prototype ne vola, il fut commandé à 36 exemplaires par l'USAAC, 120 par la France et 164 par la RAF. Le XB-24 vola pour la première fois le 29 décembre 1940. Celui-ci se montra trop lent par rapport aux spécifications requises et il fallut, entre autres modifications, changer de moteurs pour des R-1830-41. Ces modifications entraînèrent un changement de désignation, le prototype devenant XB-24B. 7 YB-24 furent commandés en avril 1939, mais ils étaient construits à la main et inaptes au combat. 6 d'entre eux furent cédés à la RAF sous la désignation LB-30A, tandis que le septième fut testé avec des blindages et des réservoirs auto-obturants. Les LB-30A furent livrés en décembre 1940 et désignés "Liberator" par la RAF. Le surnom allait rester, mais les appareils furent décevants et vite relégués à des missions de transport.



Consolidated B-24 Liberator - Cockpit

Les premiers B-24 à voir le combat furent ceux du Coastal Command, des Liberator GR.I (pour General Reconnaissance) modifiés pour la patrouille maritime et la lutte contre les sous-marins. Ils furent livrés dès mars 1941 et déployés à partir de juin. 5 sous-marins furent coulés et 4 endommagés. Quant aux B-24 français, ils arrivèrent trop tard et furent versés à la RAF. La RAF le déploya dans le Pacifique, à Java plus précisément, à partir de janvier 1942. Ils furent également employés au Moyen-Orient en 1942. L'USAAF reçut ses premiers B-24A en 1941. Un unique B-24 était à Pearl Harbor et fut détruit lors de l'attaque japonaise. Le 6 juin 1942, sa première attaque, visant l'île de Wake, se solda par un échec. Le 12 du même mois, des B-24 basés en Egypte attaquèrent les installations pétrolières de Ploesti, en Roumanie. A partir de là, et jusqu'à la fin de la guerre, le B-24 serait employé sur tous les théâtres de la seconde guerre mondiale, que ce soit en Afrique du Nord, en Italie, en Europe, dans l'Atlantique et dans le Pacifique, en Birmanie. Il remplaça dans le Pacifique le B-17 au trop faible rayon d'action. La première perte au-dessus de l'Allemagne remonte au 26 février 1943. Le B-24 se rendit célèbre pour son raid au-dessus de Ploesti le 1er août 1943 : pas moins de 177 B-24 décollèrent de Libye pour attaquer ces installations pétrolières, précieuses pour l'effort de guerre allemand. Cependant, le raid fut un désastre car l'ennemi fut sous-estimé et pleinement alerté, alors que les attaquants étaient désorganisés. Le B-24 fut utilisé dans bien des rôles, comme la guerre électronique, et un B-24 modifié servit d'avion personnel pour Churchill. Il donnera naissance à un dérivé pour l'US Navy, le PB4Y Privateer, et à des versions de transport, comme le C-87. La RAF utilisa 2100 B-24 et l'USAAF, pas moins de 12000. Il constitua à lui seul le tiers de la force de frappe de la 8e Air Force (le B-17 constituant les deux autres tiers). Le Canada reçut 1200 B-24J. Il fut l'unique bombardier stratégique de l'Australie, qui en posséda 287. La Nouvelle-Zélande en aurait aussi possédé. L'Afrique du Sud engagea 16 B-24, notamment lors de l'insurrection de Varsovie en 1944. Les pilotes tchèques et polonais en exil au Royaume-Uni l'utilisèrent au sein de la RAF. Un seul B-24 fut officiellement livré à l'URSS, mais 73 exemplaires furent forcés d'y atterrir au cours de raids. 30 furent remis en état de vol.

Consolidated B-24A Liberator I de la RAF

La Luftwaffe en captura un certain nombre, qui furent réutilisés pour des missions de transport. La Regia Aeronautica captura un B-24D en février 1943, qui fut testé avant d'être transféré à la Luftwaffe. La Roumanie en captura un lors de l'opération Tidal Wave (l'attaque sur Ploesti). D'autres furent capturés et la Roumanie envisagea de créer une escadrille de B-24. Seuls 3 B-24D et un B-24J étaient en état de vol lors du coup d'Etat par le roi Michel le 23 août 1944. Le projet fut alors abandonné. Des exemplaires contraints d'atterrir furent internés par le Portugal (6 B-24D) et la Turquie (11 B-24D, lors de l'opération Tidal Wave). A la fin de la guerre, le B-24 fut rapidement considéré comme obsolète par l'USAAF. Un seul B-24D fut conservé et préservé dès 1950. Il fut également utilisé par la Chine nationaliste (37 B-24J et M de 1944 à 1958), et la Chine communiste en captura 3 exemplaires (utilisés de 1946 à 1949). Israël essaya d'obtenir 25 exemplaires auprès de l'Australie, mais sans succès : les appareils étaient en trop mauvais état. C'est en Inde que le B-24 accomplit sa carrière d'après-guerre : 42 exemplaires furent remis en état de vol par HAL en 1947. Ils furent retirés du service en 1968, et 5 des B-24 qui existent encore viennent de la force aérienne indienne. 18482 B-24 furent construits jusqu'en septembre 1945, ce qui en faisait (et en fait toujours) l'appareil militaire américain le plus produit, devant le B-17 qui ne possède que la 2e place. Le pari de Consolidated fut payant, même si le B-24 est moins connu que la Forteresse volante. Il fut une étape importante dans la conception de bombardiers stratégiques intercontinentaux comme les B-29 ou B-36. Très peu ont survécu : 9 appareils sont exposés complets, et 3 autres sont en état de vol, dont… un B-24A, "Diamond Lil", appartenant à la Commemorative Air Force. Un B-24M est en cours de restauration en Australie.

Source : https://aviationsmilitaires.net/v3/kb/aircraft/show/2418/consolidated-b-24-liberator

Version anglaise Wikipédia

The **Consolidated B-24 Liberator** is an American heavy bomber, designed by Consolidated Aircraft of San Diego, California. It was known within the company as the Model 32, and some initial production aircraft were laid down as export models designated as various LB-30s, in the Land Bomber design category. At its inception, the B-24 was a modern design featuring a highly efficient shoulder-mounted, high aspect ratio Davis wing. The wing gave the Liberator a high cruise speed, long range and the ability to carry a heavy bomb load. In comparison with its contemporaries, the B-24 was relatively difficult to fly and had poor low-speed performance; it also had a lower ceiling and was less robust than the Boeing B-17 Flying Fortress. While aircrews tended to prefer the B-17, General Staff favored the B-24 and procured it in huge numbers for a wide variety of roles.[3][4] At approximately 18,500 units – including 8,685 manufactured by Ford Motor Company – it holds records as the world's most produced bomber, heavy bomber, multi-engine aircraft, and American military aircraft in history. The B-24 was used extensively in World War II where it served in every branch of the American armed forces, as well as several Allied air forces and navies. It saw use in every theater of operations. Along with the B-17, the B-24 was the mainstay of the US strategic bombing campaign in the Western European theater. Due to its range, it proved useful in bombing operations in the Pacific, including the bombing of Japan. Long-range anti-submarine Liberators played an instrumental role in closing the Mid-Atlantic gap in the Battle of the Atlantic. The C-87 transport derivative served as a longer range, higher capacity counterpart to the Douglas C-47 Skytrain. By the end of World War II, the technological breakthroughs of the Boeing B-29 Superfortress and other modern types had surpassed the bombers that served from the start of the war. The B-24 was rapidly phased out of U.S. service, although the PB4Y-2 Privateer maritime patrol derivative carried on in service with the U.S. Navy in the Korean War.

Design and development

XB-24 in flight

Initial specifications

The Liberator originated from a United States Army Air Corps (USAAC) request in 1938 for Consolidated to produce the B-17 under license. After company executives including President Reuben Fleet visited the Boeing factory in Seattle, Washington, Consolidated decided instead to submit a more modern design of its own.[5] The new Model 32 combined designer David R. Davis's wing, a high-efficiency airfoil design created by unorthodox means,[6] with the twin tail design from the Consolidated Model 31 flying boat, together on a new fuselage. This new fuselage was intentionally designed around twin bomb bays, each one being the same size and capacity of the B-17 bomb bays. In January 1939, the USAAC, under Specification C-212, formally invited Consolidated[7] to submit a design study for a bomber with longer range, higher speed and greater ceiling than the B-17. The specification was written such that the Model 32 would automatically be the winning design. The program was run under the umbrella group, "Project A", an Air Corps requirement for an intercontinental bomber that had been conceived in the mid-1930s. Although the B-24 did not meet Project A goals, it was a step in that direction. Project A led to the development of the Boeing B-29 and Consolidated's own B-32 and B-36.[8]

Design

The B-24 had a shoulder-mounted high aspect ratio Davis wing. This wing was highly efficient allowing a relatively high airspeed and long range. Compared to the B-17, it had a 6 feet (1.8 m) larger wingspan but a lower wing area. This gave the B-24 a 35-percent higher wing loading. The relatively thick wing held the promise of increased tankage while delivering increased lift and speed, but it became unpleasant to fly when committed to heavier loadings as experienced at high altitude and in bad weather. The Davis wing was also more susceptible to ice formation than contemporary designs, causing distortions of the aerofoil section and resulting in the loss of lift, with unpleasant experiences drawing such comments as, "The Davis wing won't hold enough ice to chill your drink".[9] The wing was also more susceptible to damage than the B-17's wing, making the aircraft less able to absorb battle damage. The wing carried four supercharged Pratt & Whitney R-1830-35 Twin Wasp engines mounted in cowlings borrowed from the PBY Catalina (similar except for being oval in cross-section allowing for oil coolers mounted on each side of the engine) that turned 3-bladed variable-pitch propellers. The tailplane featured two large oval vertical stabilizers mounted at the ends of a rectangular horizontal stabilizer. As early as 1942, it was recognized that the Liberator's handling and stability could be improved by the use of a single vertical fin. The single fin was tested by Ford on a single B-24ST variant and an experimental XB-24K: it was found to improve handling. However, all Liberators were produced with twin oval fins, with the exception of eight preproduction B-24N aircraft. The B-24N was intended as a major production variant featuring a single tail. Over 5000 orders for this version were placed in 1945, but they were cancelled due to the end of the war. The single fin did appear in production on the PB4Y Privateer derivative.[10][11][12] The B-24's spacious, slab-sided fuselage (which earned the aircraft the nickname "Flying Boxcar")[13] was built around two central bomb bays that could accommodate up to 8,000 pounds (3,600 kg) of ordnance in each compartment (but rarely did, as this decreased range and altitude). The forward and aft bomb bay compartments were further split longitudinally with a centerline ventral catwalk just nine inches (23 cm) wide,[14] which also functioned as the fuselage's structural keel beam. An unusual four-panel set of all-metal, tambour-panel "roller-type" bomb bay doors, which operated very much like the movable enclosure of a rolltop desk, retracted into the fuselage. These type of doors created a minimum of aerodynamic drag to keep speed high over the target area; they also allowed the bomb bays to be opened while on the ground since the low ground clearance prevented the use of normal bomb bay doors.[15] The occasional need during a mission for crewmen to move from fore to aft within the B-24's fuselage over the narrow catwalk was a drawback shared with other bomber designs. The Liberator carried a crew of up to ten. The pilot and co-pilot sat alongside each other in a well-glazed cockpit. The navigator and bombardier — who could also double as a nose or *wiggly ear* gunners (guns mounted in the sides of the aircraft nose) — sat in the nose, fronted on the pre-B-24H models with a well-framed "greenhouse" nose with some two dozen glazed panels and with two flexible ball-mounts built into it for forward defensive firepower using .30 caliber (7.62 mm) Browning M1919 machine guns (later versions were fitted with a powered twin-.50 caliber (12.7 mm) M2 Browning machine gun nose turret). The radio/radar operator sat behind the pilots, facing sideways and sometimes doubled as a waist gunner. The flight engineer sat adjacent to the radio operator behind the pilots; he operated the upper gun turret (when fitted), located just behind the cockpit and in front of the wing.

Up to four crew members could be located in the waist, operating waist guns, a retractable lower ball turret gun, and a tail gun turret matching the nose turret. The waist gun hatches were provided with doors. The ball turret was required to be retractable for ground clearance when preparing to land as well as for greater aerodynamic efficiency. The tail gunner's powered twin-gun turret was located at the end of the tail, behind the tailplane. The B-24 featured a tricycle undercarriage, the first American bomber to do so,[9] with the main gear extending out of the wing on long, single-oleo strut legs. It used differential braking and differential thrust for ground steering, which made taxiing difficult.[16]

Armament

The defensive armament of the B-24 varied from transport variants, which were usually unarmed, to bombers armed with up to ten .50 caliber (12.7 mm) M2 Browning machine guns located in turrets and waist gun positions. Early model Liberators were fitted with a top-mounted turret, a tail turret and single machine guns located in the waist and in the glazed nose. The B-24D initially featured upper, belly and tail turrets, plus swiveling single guns in the waist and on either side of the nose. The belly turret was a periscopically sighted Bendix model. The turret proved unsatisfactory and was soon replaced by a tunnel gun, which was itself omitted. Later D models were fitted with the retractable Sperry ball turret. The B-24H saw the replacement of the glazed 'green house' nose with a nose turret, which reduced the B-24s vulnerability to head-on attacks. The bombsight was located below the turret. Long-range naval patrol versions often carried a light defensive armament. Being on long-distance patrols, they generally flew outside the range of enemy fighters. Also, the necessity of range increased the importance of weight and aerodynamic efficiency. Thus naval patrol often omitted top, belly and nose turrets. Some were fitted with a belly pack containing fixed, forward-facing cannon.

Prototypes and service evaluation

The U.S. Army Air Corps awarded a contract for the prototype XB-24 in March 1939, with the requirement that one example should be ready before the end of the year. Consolidated finished the prototype and had it ready for its first flight two days before the end of 1939. The design was simple in concept but, nevertheless, advanced for its time. Consolidated incorporated innovative features such as a tricycle landing gear and Davis wing. Compared to the B-17, the proposed Model 32 had a shorter fuselage and 25% less wing area, but had a 6 ft (1.8 m) greater wingspan and a substantially larger carrying capacity, as well as a distinctive twin tail. Whereas the B-17 used 9-cylinder Wright R-1820 Cyclone engines, the Consolidated design used twin-row, 14-cylinder Pratt & Whitney R-1830 "Twin Wasp" radials of 1,000 hp (750 kW). The maximum takeoff weight was one of the highest of the period. The new design would be the first American heavy bomber in production to use tricycle landing gear – the North American B-25 Mitchell medium bomber's predecessor, the NA-40 introduced this feature in January 1939 – with the Consolidated Model 32 having long, thin wings with the efficient "Davis" high aspect ratio design (also used on the projected Model 31 twin-engined commercial flying boat)[17] promising to provide maximum fuel efficiency. Wind tunnel testing and experimental programs using an existing Consolidated Model 31 provided extensive data on the flight characteristics of the Davis airfoil.[18] Early orders, placed before the XB-24 had flown, included 36 for the USAAC, 120 for the French Air Force and 164 for the Royal Air Force (RAF). The name "Liberator" was originally given to it by the RAF, and subsequently adopted by the USAAF as the official name for the Model 24.[19] When France fell in 1940, their aircraft were re-directed to the RAF. One outcome of the British and French purchasing commissions was a backlog of orders amounting to $680m, of which $400m was foreign orders, US official statistics indicating tooling, plant and expansion advanced the previously anticipated volume of US aircraft production by up to a year. A consequence of the British orders went beyond requests for specific modifications: as the RAF accepted some designs while rejecting others, American production was – to some extent – re-directed along specific lines that accorded with British doctrine, the B-24's capacious bomb bay and ability to carry 8,000 lb ordnance a case in point.[9] After initial testing, the **XB-24** was found to be deficient in several areas. One major failure of the prototype was that it failed to meet the top speed requirements specified in the contract. As built, the XB-24 top speed was only 273 mph instead of the specified 311 mph. As a result, the mechanically supercharged Pratt & Whitney R-1830-33s were replaced with the turbo-supercharged R-1830s. Additionally, the tail span was widened by 2 ft (0.61 m) and the pitot-static probes were relocated from the wings to the fuselage. The XB-24 was then re-designated XB-24B—these changes became standard on all B-24s built starting with the B-24C model.

An early B-24D

In April 1939, the USAAC initially ordered seven **YB-24** under CAC contract # 12464. The US policy at the time, despite neutrality, was that American requirements could be deferred while its Allies could immediately put US production into the war effort. The added advantage was the American types could be assessed in the European war zone earlier. Thus the first six YB-24 were released for direct purchase under CAC contract # F-677 on 9 November 1940. These aircraft were redesignated **LB-30A**. The seventh aircraft was used by Consolidated and the USAAC to test armor installations as well as self-sealing fuel tanks. Initially, these aircraft were to be given USAAC serials 39–681 to 39-687. Due to deferments of the US requirements, the US purchase was twice postponed, and the serial numbers were changed to 40–696 to 40-702. When the RAF purchased the first six YB-24 aircraft, the serial numbers were reassigned to an early batch of B-24D funded by the deferment.

Flying the B-24

Lindell Hendrix, later a test pilot for Republic Aviation, flew B-24s for the Eighth Air force.[20] Hendrix preferred the B-24 to the B-17. In Eighth Air force combat configuration, the aircraft carried 8,000 pounds (3,600 kg) of bombs. It could manage an altitude of no more than 25,000 ft (7,600 m), three or four thousand feet less than a B-17, but it flew 10–15 mph (16–24 km/h) faster. Its lower altitude made it more vulnerable to flak. Hendrix figured that Germans understood it was easier to hit, and that it carried more bombs. It was necessary when flying the B-24, to get "on step". This meant climbing to about 500 ft (150 m) above cruise altitude, levelling off, achieving a cruise speed of 165–170 mph (266–274 km/h), then descending to assigned altitude. Failing to do this meant that the B-24 flew slightly nose high, and it used more fuel. The Davis wing made the B-24 sensitive to weight distribution. Hendrix claimed that a lightly loaded B-24 could out-turn a P-38 Lightning. A heavily loaded B-24 was difficult to fly at speeds of less than 160 mph (260 km/h). The B-24's controls were heavy, especially if the control rigging was not properly tensioned. B-24s leaked fuel. Crews flew with the bomb bay doors slightly open to dissipate potentially explosive fumes. Hendrix did not permit smoking on his B-24, even though he was a smoker. Chain smoker "Tex" Thornton, then in command of the US Army Air Corps' Statistical Control, flew across the Atlantic in a B-24, and was not permitted to smoke.

Thornton's Statistical Control group demonstrated that Eighth Air force B-24s were taking lower casualties than B-17s because they were being given shorter, safer missions. The B-17s actually delivered more bombs to the target than B-24s.[21]

Operational history

RAF

Consolidated LB-30A, s/n AM260, used by Atlantic Ferry Command

The first British Liberators had been ordered by the Anglo-French Purchasing Board in 1940. After the Fall of France the French orders were in most cases transferred to the United Kingdom. The RAF found, as did the US, that global war increased the need for air transports and early-type bombers and seaplanes were converted or completed as cargo carriers and transports. LB-30As were assigned to transatlantic flights by RAF Ferry Command, between Canada and Prestwick, Scotland. The first Liberators in British service were ex-USAAF YB-24s converted to Liberator GR Is (USAAF designation: LB-30A). The aircraft were all modified for logistic use in Montreal. Changes included the removal of all armament, provision for passenger seating, a revised cabin oxygen and heating system. Ferry Command's Atlantic Return Ferry Service flew civilian ferry pilots, who had delivered aircraft to the UK, back to North America. The most important role, however, for the first batch of the Liberator GR Is was in service with RAF Coastal Command on anti-submarine patrols in the Battle of the Atlantic.[22]

LB-30A (YB-24) in RAF service

Later in 1941, the first Liberators entered RAF service. This model introduced self-sealing fuel tanks, a 2 ft 7 in (79 cm) plug in the forward fuselage to create more space for crew members and, more vitally, ever more equipment such as ASV Mark II radar (anticipated early in the Liberator's development when Reuben Fleet told the engineering team he had a gut feeling the nose was too short). The Mark II was the first Liberator to be equipped with powered turrets, one plane having them installed before leaving San Diego, the remainder having them installed in the field: four Browning Boulton Paul A-type Mk IV with 600 rounds of .303 in the dorsal position; and a Boulton Paul E-type Mk II with 2200 rounds in the tail (later increased to 2500 rounds), supplemented by pairs of guns at the waist position, a single gun in the nose and another in the belly, for a total of fourteen guns. The maximum take-off weight was slightly raised to 64,250 pounds, the maximum altitude lifted from 21,200 to 24,000 feet but the maximum speed was reduced to 263 mph, largely as a result of increased drag.[9] The Liberator II (referred to as the LB-30A by the USAAF[19]) were divided between Coastal Command, Bomber Command, and British Overseas Airways Corporation (BOAC). Both BOAC and the RAF used converted Liberator IIs as unarmed long-range cargo carriers. These aircraft flew between the United Kingdom and Egypt (with an extensive detour around Spain over the Atlantic), and they were used in the evacuation of Java in the East Indies. BOAC also flew trans-Atlantic services and other various long-range air transportation routes.

Consolidated Liberator Mk.I of 120 Squadron Coastal Command RAF, used from December 1941

Two RAF bomber squadrons with Liberators were deployed to the Middle East in early 1942. While RAF Bomber Command did not use B-24s as strategic bombers over mainland North West Europe, No. 223 Squadron RAF, one of Bomber Command's 100 (Bomber Support) Group squadrons, used 20 Liberator VIs to carry electronic jamming equipment to counter German radar. In October 1944, two RAF Liberator squadrons (357 and 358) were deployed to Jessore India in support of British SAS, American OSS and French SIS underground operations throughout SE Asia. The aircraft were stripped of most armaments to allow for fuel for up to 26-hour return flights such as Jessore to Singapore.[23] Liberators were also used as anti-submarine patrol aircraft by RAF Coastal Command. RAF Liberators were also operated as bombers from India by SEAC and would have been a part of Tiger Force if the war had continued. Many of the surviving Liberators originated in this Command.

Antisubmarine and maritime patrols

AAF Antisubmarine Command (AAFAC) modifications at the Consolidated-Vultee Plant, Fort Worth, Texas in the foreground in the olive drab and white paint scheme. To the rear of this front line are partly assembled C-87 "Liberator Express Transports"

Anti-Submarine Weapons: Leigh light used for spotting U-boats on the surface at night, fitted to a Liberator aircraft of Royal Air Force Coastal Command. 26 February 1944.

The Liberators made a significant contribution to Allied victory in the Battle of the Atlantic against German U-boats. Aircraft had the ability to undertake surprise air attacks against surfaced submarines. Liberators assigned to the RAF's Coastal Command in 1941, offensively to patrol against submarines in the eastern Atlantic Ocean, produced immediate results. The introduction of Very Long Range (VLR) Liberators vastly increased the reach of the UK's maritime reconnaissance force, closing the Mid Atlantic Gap where a lack of air cover had allowed U-boats to operate without risk of aerial attack.[24][25] For 12 months, No. 120 Squadron RAF of Coastal Command with its handful of worn and modified early model Liberators supplied the only air cover for convoys in the Atlantic Gap, the Liberator being the only airplane with sufficient range. The VLR Liberators sacrificed some armor and often gun turrets to save weight, while carrying extra aviation gasoline in their bomb-bay tanks. Liberators were equipped with ASV Mk. II radar, which together with the Leigh light, gave them the ability to hunt U-boats by day and by night. Before the Leigh Light, not a single enemy submarine had been sunk in over five months, but in combination with radar, it was so overwhelmingly effective that many German submarine crews chose to surface during the day so that they could at least see the aircraft attacking them and have a chance to fire their anti-aircraft weaponry in defense.[26][27] These Liberators operated from both sides of the Atlantic with the Royal Canadian Air Force and the Army Air Forces Antisubmarine Command and later, the US Navy conducting patrols along all three American coasts and the Canal Zone. The RAF and later American patrols ranged from the east, based in Northern Ireland, Scotland, Iceland and beginning in mid-1943 from the Azores. This role was dangerous, especially after many U-boats were armed with extra anti-aircraft guns, some adopting the policy of staying on the surface to fight, rather than submerging and risking being sunk by aerial weapons such as rockets, gunfire, torpedoes and depth charges from the bombers. American Liberators flew from Nova Scotia, Greenland, the Azores, Bermuda, the Bahamas, Puerto Rico, Cuba, Panama, Trinidad, Ascension Island and from wherever else they could fly far out over the Atlantic. The sudden and decisive turning of the Battle of the Atlantic in favor of the Allies in May 1943 was the result of many factors. The gradual arrival of many more VLR and in October, PB4Y navalized Liberators for anti-submarine missions over the Mid-Atlantic gap ("black pit") and the Bay of Biscay was an important contribution to the Allies' greater success. Liberators were credited in full or in part with sinking 93 U-boats.[28] The B-24 was vital for missions of a radius less than 1,000 mi (1,600 km), in both the Atlantic and Pacific theaters where U.S. Navy PB4Y-1s and USAAF SB-24s took a heavy toll of enemy submarines and surface combatants and shipping.

USAAF

B-24s bomb the Ploiești oil fields in August 1943.

Introduction to service, 1941–1942

The United States Army Air Forces (USAAF) took delivery of its first B-24As in mid-1941. Over the next three years, B-24 squadrons deployed to all theaters of the war: African, European, China-Burma-India, the Anti-submarine Campaign, the Southwest Pacific Theater and the Pacific Theater. In the Pacific, to simplify logistics and to take advantage of its longer range, the B-24 (and its twin, the U.S. Navy PB4Y) was the chosen standard heavy bomber. By mid-1943, the shorter-range B-17 was phased out. The Liberators which had served early in the war in the Pacific continued the efforts from the Philippines, Australia, Espiritu Santo, Guadalcanal, Hawaii, and Midway Island. The Liberator peak overseas deployment was 45.5 bomb groups in June 1944. Additionally, the Liberator equipped a number of independent squadrons in a variety of special combat roles. The cargo versions, C-87 and C-109 tanker, further increased its overseas presence, especially in Asia in support of the XX Bomber Command air offensive against Japan. So vital was the need for long-range operations, that at first USAAF used the type as transports. The sole B-24 in Hawaii was destroyed by the Japanese attack on Pearl Harbor on 7 December 1941. It had been sent to the Central Pacific for a very long-range reconnaissance mission that was preempted by the Japanese attack. The first USAAF Liberators to carry out combat missions were 12 repossessed LB-30s deployed to Java with the 11th Bombardment Squadron (7th Bombardment Group) that flew their first combat mission in mid-January. Two were shot up by Japanese fighters, but both managed to land safely. One was written off due to battle damage and the other crash-landed on a beach. US-based Liberators entered combat service in 1942 when on 6 June, four LB-30s from Hawaii staging through Midway Island attempted an attack on Wake Island, but were unable to find it.[29] The B-24 came to dominate the heavy bombardment role in the Pacific because compared to the B-17, the B-24 was faster, had longer range, and could carry a ton more bombs.[30]

Strategic bombing, 1942–1945

The bomb bay of a surviving B-24J Liberator in 2016

On 12 June 1942, 13 B-24s of the Halverson Project (HALPRO) flying from Egypt attacked the Axis-controlled oil fields and refineries around Ploiești, Romania. Within weeks, the First Provisional Bombardment Group formed from the remnants of the Halverson and China detachments. This unit then was formalized as the 376th Bombardment Group, Heavy, and along with the 98th BG formed the nucleus of the IX Bomber Command of the Ninth Air Force, operating from Africa until absorbed into the Twelfth Air Force briefly, and then the Fifteenth Air Force, operating from Italy. The Ninth Air Force moved to England in late 1943. This was a major component of the USSTAF and took a major role in strategic bombing. Fifteen of the 15th AF's 21 bombardment groups flew B-24s. For much of 1944, the B-24 was the predominant bomber of U.S. Strategic Air Forces (USSTAF) formerly the Eighth Air Force in the Combined Bomber Offensive against Germany, forming nearly half of its heavy bomber strength in the ETO prior to August and most of the Italian-based force. Thousands of B-24s flying from bases in Europe dropped hundreds of thousands of tons of high explosive and incendiary bombs on German military and industrial targets. The 44th Bombardment Group was one of the first two heavy bombardment groups flying the B-24 with the 8th Air Force in the fall/winter air campaigns in the European Theater of Operations.[13] The 44th Bomb Group flew the first of its 344 combat missions against the Axis powers in World War II on 7 November 1942.[13] 15th Air Force B-24s fly through flak and over the destruction created by preceding waves of bombers. The first B-24 loss over German territory occurred on 26 February 1943. Earlier in the war, both the Luftwaffe and the Royal Air Force had abandoned daylight bombing raids because neither could sustain the losses suffered. The Americans persisted, however, at great cost in men and aircraft. In the period between 7 November 1942 and 8 March 1943, the 44th Bomb Group lost 13 of its original 27 B-24s.[13] For some time, newspapers had been requesting permission for a reporter to go on one of the missions. Robert B. Post and five other reporters of *The New York Times* were granted permission. Post was the only reporter assigned to a B-24-equipped group, the 44th Bomb Group. He flew in B-24 41-23777 ("Maisey") on Mission No. 37 to Bremen, Germany. Intercepted just short of the target, the B-24 came under attack from JG 1's Messerschmitt Bf 109s. *Leutnant* Heinz Knoke (who finished the war with 31 kills) shot down the Liberator. Post and all but two of the 11 men aboard were killed. Knoke reported: "The fire spread out along the right wing. The inboard propeller windmilled to a stop. And then, suddenly, the whole wing broke off. At an altitude of 900 metres there was a tremendous explosion. The bomber had disintegrated. The blazing wreckage landed just outside Bad Zwischenahn airfield."[31]

A B-24M of the 448th Bombardment Group, serial number 44-50838, downed by a Messerschmitt Me 262 jet fighter

A total of 177 B-24s carried out the famous second attack on Ploiești (Operation Tidal Wave) on 1 August 1943. This was the B-24's most costly mission. In late June 1943, the three B-24 Liberator groups of the 8th Air Force were sent to North Africa on temporary duty with the 9th Air Force:[13] the 44th Bomb Group joined the 93rd and the 389th Bomb Groups. These three units then joined the two 9th Air Force B-24 Liberator groups for low-level attack on the German-held Romanian oil complex at Ploiești. This daring assault by high-altitude bombers at treetop level was a costly success. The attack became disorganized after a navigational error which alerted the defenders and protracted the bomb run from the initial point. The 44th destroyed both of its assigned targets, but lost 11 of its 37 bombers and their crews. Colonel Leon W. Johnson, the 44th's commander, was awarded the Medal of Honor for his leadership, as was Col. John Riley "Killer" Kane, commander of the 98th Bomb Group. Kane and Johnson survived the mission but three other recipients of the Medal of Honor for their actions in the mission—Lt. Lloyd H. Hughes, Maj. John L. Jerstad and Col. Addison E. Baker—were killed in action. For its actions on the Ploiești mission, the 44th was awarded its second Distinguished Unit Citation.[13] Of the 177 B-24s that were dispatched on this operation, 54 were lost.[13]

Radar/Electronic warfare and PGM deployment

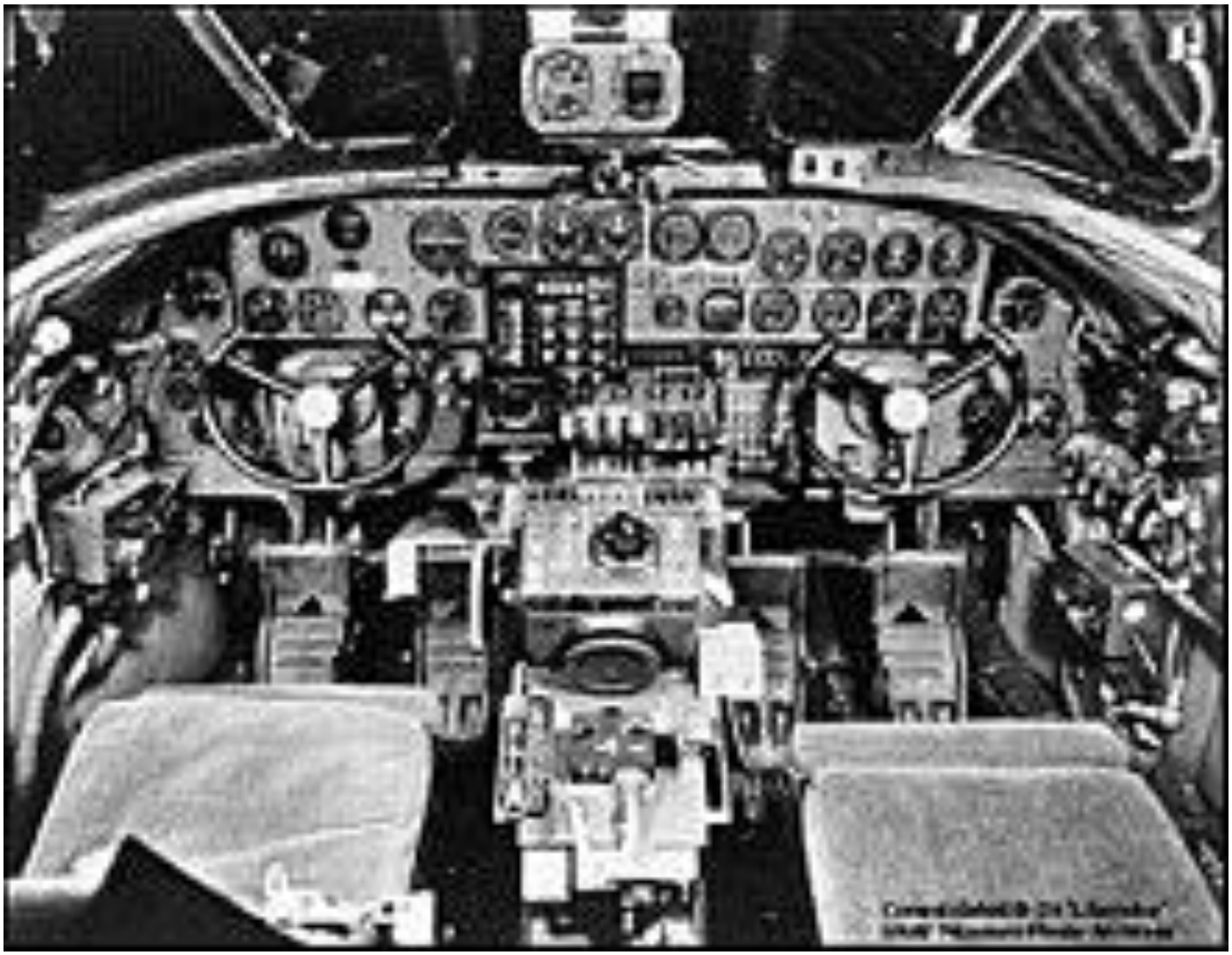
The B-24 advanced the use of electronic warfare and equipped Search Bomber (SB), Low Altitude (LAB) and Radar Counter Measure (RCM) squadrons in addition to high-altitude bombing. Among the specialized squadrons were the 20th RS (RCM), 36th BS (RCM), 406th NLS, 63rd BS (SB) SeaHawks, 373rdBS (LAB) and 868th BS (SB) Snoopers. The 36th Bombardment Squadron was the Eighth Air Force's only electronic warfare squadron using specially equipped B-24s to jam German VHF communications during large Eighth Air Force daylight raids. In addition, the 36th BS flew night missions with the RAF Bomber Command 100 Group at RAF Sculthorpe. Radar Counter Measures (RCM) was code-named CARPET, however, this should not be confused with agent and supply drops, code-named "Carpetbaggers". The B-24 was the platform for the pioneering use of the Americans' Azon laterally-guidable precision-guided munition ordnance design, a pioneering Allied radio-guided munition system during World War II. The ordnance of 1,000 lb weight, was deployed operationally by USAAF B-24s in both Europe and the CBI theaters. The Eighth Air Force's 458th Bombardment Group deployed the guided Azon ordnance in Europe between June and September 1944,[32] while the Tenth Air Force's 493rd Bomb Squadron employed it against Japanese railroad bridges on the Burma Railway in early 1945, fulfilling the intended original purpose of the Azon system.[33]

Assembly ships

B-24D-30-CO assembly ship *First Sergeant*, 458th Bomb Group

In February 1944, the 2nd Division authorized the use of "Assembly Ships" (or "Formation Ships") specially fitted to aid the assembly of individual group formations. They were equipped with signal lighting, provision for quantity discharge of pyrotechnics, and were painted with distinctive group-specific high-contrast patterns of stripes, checkers or polka dots to enable easy recognition by their flock of bombers. The aircraft used in the first allocation were B-24Ds retired by the 44th, 93rd and 389th Groups. Arrangements for signal lighting varied from group to group, but generally consisted of white flashing lamps on both sides of the fuselage arranged to form the identification letter of the group. All armament and armor were removed and in some cases the tail turret. In the B-24Hs used for this purpose, the nose turret was removed and replaced by a "carpetbagger" type nose. Following incidents when flare guns were accidentally discharged inside the rear fuselage, some assembly (formation) ships had pyrotechnic guns fixed through the fuselage sides. As these aircraft normally returned to base once a formation had been established, a skeleton crew of two pilots, navigator, radio operator and one or two flare discharge operators were carried. In some groups an observer officer flew in the tail position to monitor the formation. These aircraft became known as Judas goats.[34]

"Carpetbaggers"



B-24 cockpit

From August 1943 until the end of the war in Europe, specially modified B-24Ds were used in classified missions. In a joint venture between the Army Air Forces and the Office of Strategic Services (OSS) code-named Operation Carpetbagger, pilots and crews flew specially modified B-24Ds painted with a glossy black anti-searchlight paint to supply friendly underground forces throughout German-occupied Europe. They also flew C-47s, Douglas A-26 Invaders, and British de Havilland Mosquitos. Carpetbagger aircraft flew spies called "Joes" and commando groups prior to the Allied invasion of Europe on D-Day and afterward, and retrieved over 5,000 officers and enlisted men who had escaped capture after being shot down.

The low-altitude, nighttime operation was extremely dangerous and took its toll on these airmen. The first aircrews chosen for this operation came from the anti-submarine bomb groups because of their special training in low altitude flying and pinpoint navigation skills. Because of their special skills, they were called upon to fly fuel to General George Patton's army during the summer and early autumn of 1944 when it outran its fuel supply. When this mission was completed, it was recorded that 822,791 US gallons (3,114,264 L) of 80 octane gasoline had been delivered to three different airfields in France and Belgium.[35] The 859 BS was converted from day bombardment to these operations and then transferred to the 15th Air Force.

Transport variants

C-87 Liberator Express

In early 1942, with the need for a purpose-built transport with better high-altitude performance and longer range than the Douglas C-47 Skytrain, the San Diego plant began sending B-24D models to Fort Worth for conversion into the C-87 transport. The conversion had a hinged cargo door at the nose eliminating transparent nose and large cargo doors installed in the waist area. The C-87 had a large cargo floor, less powerful supercharged engines, no gun turrets, a floor in the bomb bay for freight, and some side windows. The navigator's position was relocated behind the pilot. Indigenous Fort Worth C-87 and AT-22 production began with the FY 1943 order for 80 serial-numbered airframes 43-30548 through 43–30627. The C-87A was a dedicated VIP series built in small quantity. Early versions were fitted with a single .50 caliber (12.7 mm) Browning machine gun in their tails, and a XC-87B version proposed two .50 caliber (12.7 mm) fixed machine guns for the nose, operable by the pilot, though these were eventually removed. The XC-87B also designated a resurrected crash victim B-24D (42-40355) fitted with low altitude power packages and a forward fuselage extension. The extended nose earned it the name Pinocchio. Later modifications gave it a single tail and yet another type of engine packages bring it to near C-87C configuration. Other C-87 designations were the U.S. Navy designation **RY** and Lend Lease Liberator Cargo VII. Although only 287 C-87 and eight U.S. Navy RY variants were produced, they were still important in the Army Air Forces' airlift operations early in the war when aircraft with high-altitude, long-range heavy hauling abilities were in short supply. The C-87 flew in many theaters of war, including much hazardous duty in flights from Labrador to Greenland and Iceland in the North Atlantic. In the China Burma India Theater (CBI), the C-87 was used to airlift cargo and fuel over the Hump (the Himalayas) from India to China. Early in the campaign, the C-87 was the only readily available American transport that could fly over the Himalayas while heavily loaded, rather than relying on circuitous and highly dangerous routes through valleys and mountain passes, but the type was not very popular with crews: they complained of various hazards including the fuel system, engines and cockpit accessories, while the type was notorious for leaking fuel tanks and mid-air fires a constant danger.[9] The C-87 also shared the Liberator's dangerous sensitivity to icing, particularly prevalent over Himalayan routes.[7] With these difficulties in mind it is little wonder the ATC India China Division was the only unit in the Command to be combat decorated during WWII, having been awarded a Distinguished Unit Citation. The C-87 was not always popular with the aircrews assigned to fly it. The aircraft had the distressing habit of losing all cockpit electrical power on takeoff or at landings, its engine power and reliability with the less-powerful superchargers also often left much to be desired. It proved to be quite vulnerable to icing conditions, and was prone to fall into a spin with even small amounts of ice accumulated onto its Davis wing. Since the aircraft had been designed to be a bomber that dropped its loads while airborne, the C-87's nose landing gear was not designed for landing with a heavy load, and frequently it collapsed from the stress. Fuel leaks inside the crew compartment from the hastily modified long-range fuel system were an all-too-common occurrence. Lastly, unlike a typical purpose-designed transport, the B-24 was not designed to tolerate large loading variations because most of its load was held on fixed bomb racks. Consequently, it was relatively easy for a poorly trained ground crew to load a C-87 with its center of gravity too far forward or aft, rendering the aircraft difficult to control due to inadequate or excessive longitudinal stability. In his autobiography, *Fate is the Hunter*, the writer Ernest K. Gann reported that, while flying air cargo in India, he barely avoided crashing an improperly loaded C-87 into the Taj Mahal. As soon as more dependable Douglas C-54 Skymaster and Curtiss-Wright C-46 Commando transports became available in large numbers, C-87s were rapidly phased out of combat zone service, with some later used as VIP transports or B-24 flight crew trainers.

C-109 version

C-109 tanker unloading

The C-109 was a dedicated fuel transport version of the B-24 conceived as a support aircraft for Boeing B-29 Superfortress operations in central China.[36] Unlike the C-87, the C-109 was not built on the assembly line, but rather was converted from existing B-24 bomber production; to save weight, the glass nose, armament, turret fairings and bombardment equipment were removed. Several storage tanks were added, allowing a C-109 to carry 2,900 gal (11,000 L) of fuel weighing over 22,000 pounds (10,000 kg). Plans originally called for 2,000 C-109s to support 10 groups of B-29s (approximately 400) in China, but the capture of the Mariana Islands provided a far more easily resupplied location for raids on mainland Japan, and the plans were greatly scaled back. Only 218 C-109s were actually converted. After the transfer of the B-29s, the C-109s were reassigned to the Air Transport Command. According to the history of the U.S. Army Air Forces in World War II, at least one squadron was assigned to the IX Troop Carrier Command in Europe to transport gasoline to advancing ground and air forces on the Continent after the Normandy invasion. However, whereas a combat-loaded B-24 could safely take off with room to spare from a 6,000 ft (1,800 m) runway, a loaded C-109 required every foot of such a runway to break ground, and crashes on takeoff were not uncommon. The aircraft demonstrated unstable flight characteristics with all storage tanks filled, and proved very difficult to land fully loaded at airfields above 6,000 ft (1,800 m) MSL in elevation, such as those around Chengdu. After it was discovered that these problems could be alleviated by flying with the forward storage tank empty, this practice became fairly routine, enhancing aircrew safety at the cost of some fuel-carrying capacity.[37] Many C-109s were lost in flying the Hump airlift to China. The *Singing Cowboy* Gene Autry served in the Air Transport Command (in the same squadron as Barry Goldwater), and described flying the C-109 over "The Hump" as "the thrill that lasts a lifetime".[38] B-24 bombers were also extensively used in the Pacific area after the end of World War II to transport cargo and supplies during the rebuilding of Japan, China, and the Philippines.

U.S. Navy and U.S. Marine Corps

PB4Y-1

PB4Y-1 Liberator

B-24s were also used by the U.S. Navy and U.S. Marine Corps for ASW, anti-ship patrol, and photographic reconnaissance in the Pacific Theater, and by the U.S. Coast Guard for patrol and SAR. Naval B-24s were redesignated **PB4Y-1**, meaning the fourth patrol bomber design built by Consolidated Aircraft. Navy PB4Y-1s assigned to Atlantic ASW and all Coast Guard PB4Y-1s had the ventral turret replaced by a retractable radome. Also, most naval aircraft had an Erco ball turret installed in the nose position, replacing the glass nose and other styles of turret. The Consolidated Aircraft Company PB4Y-2 Privateer was a U.S. Navy patrol bomber that was derived directly from the B-24 Liberator. The U.S. Navy had been using B-24s with only minor modifications as the PB4Y-1 Liberator, and along with maritime patrol B-24s used by RAF Coastal Command this type of patrol plane had been quite successful. A fully navalized design was seen as advantageous, and Consolidated Aircraft developed a purpose-built long-range patrol bomber in 1943, designated PB4Y-2. The Privateer had non-turbosupercharged engines for weight savings and optimal performance at low to medium patrol altitudes, and was visually distinguishable from the B-24 and PB4Y-1 by its longer fuselage, single tall vertical stabilizer (rather than a twin tail), two dorsal turrets, and teardrop-shaped waist gun blisters (similar in appearance to those on Consolidated's own PBY Catalina).

Australia

The crew of a No. 21 Squadron RAAF Liberator with their aircraft

RAAF

Australian aircrew seconded to the Royal Air Force flew Liberators in all theatres of the war, including with RAF Coastal Command, in the Middle East, and with South East Asia Command, while some flew in South African Air Force squadrons. Liberators were introduced into service in the Royal Australian Air Force (RAAF) in 1944, after the American commander of the Far East Air Forces (FEAF), General George C. Kenney, suggested that seven heavy bomber squadrons be raised to supplement the efforts of American Liberator squadrons. The USAAF transferred some aircraft to the RAAF, while the remainder would be delivered from the US under Lend-Lease. Some RAAF aircrew were given operational experience in Liberators while attached to USAAF squadrons. Seven flying squadrons, an operational training unit, and two special duties flights were equipped with the aircraft by the end of World War II in August 1945. The RAAF Liberators saw service in the South West Pacific theatre of World War II. Flying mainly from bases in the Northern Territory, Queensland and Western Australia, aircraft conducted bombing raids against Japanese positions, ships and strategic targets in New Guinea, Borneo and the Netherlands East Indies. In addition, the small number of Liberators operated by No. 200 Flight played an important role in supporting covert operations conducted by the Allied Intelligence Bureau; and other Liberators were converted to VIP transports. A total of 287 B-24D, B-24J, B-24L and B-24M aircraft were supplied to the RAAF, of which 33 were lost in action or accidents, with more than 200 Australians killed. Following the Japanese surrender, the RAAF's Liberators participated in flying former prisoners of war and other personnel back to Australia. Liberators remained in service until 1948, when they were replaced by Avro Lincolns.[39]

Qantas

In June 1944, Qantas Empire Airways began service with the first of two converted LB-30 Liberators on the Perth to Colombo route to augment PBY Catalinas that had been used since May 1943. The Double Sunrise route across the Indian Ocean was 3,513 mi (5,654 km) long, the longest non-stop airline route in the world at the time. The Liberators flew a shorter 3,077 mi (4,952 km) over-water route from Learmonth to an airfield northeast of Colombo, but they could make the flight in 17 hours with a 5,500 pounds (2,500 kg) payload, whereas the Catalinas required 27 hours and had to carry so much auxiliary fuel that their payload was limited to only 1,000 pounds (450 kg). The route was named *Kangaroo Service* and marked the first time that Qantas's now-famous Kangaroo logo was used; passengers received a certificate proclaiming them as members of *The Order of the Longest Hop*. The Liberators were later replaced by Avro Lancastrians.[40]

SAAF

Two squadrons of the South African Air Force (SAAF) also flew B-24s: 31 and 34 Squadrons under No 2 Wing SAAF based at Foggia, Italy. These two squadrons engaged in relief flights to Warsaw and Kraków in Poland to support the Polish Uprising against Nazi Occupation.[41]

Luftwaffe use

Three B-24s were captured and then operated by the German secret operations unit KG 200, which also tested, evaluated and sometimes clandestinely operated captured enemy aircraft during World War II.[42] One of these was captured at Venegono, Italy, on 29 March 1944. It was used on penetration missions in RAF bomber streams at night in Luftwaffe markings. On a ferry flight from Hildesheim to Bavaria on 6 April 1945, it was shot down – by German anti-aircraft fire. Crashed B-24s were the source of the landing gear units for the strictly experimental Junkers Ju 287 V1 first prototype jet bomber airframe in 1945.

Soviet use

Only one B-24 was officially delivered to the USSR according to the Lend-Lease agreements, stranded in Yakutsk while flying a government mission to the Soviet Union in November 1942. In addition, 73 Liberators of various models that had force-landed on European airfields were recovered and 30 of them were repaired and used by the 45th Bomber Aviation Division.[43] The regiment concerned appears to have been the 890th Bomber Aviation Regiment at Baranovichi until 1944, and then Kazan.

Chinese use

B-24 Bomber flying over China during WW2

The B-24 bombers of the 308th Bombardment Group (Heavy) joined the battlefield in March 1944 as the heavy bombers of the Fourteenth Air Force to fight against the Japanese during the Second Sino-Japanese War (WW2 in China). About 48 B-24Ms were provided by the U.S. to the Chinese Nationalist Air Force after WW2 and were used during the Chinese Civil War. The PLAAF had two B-24Ms captured from the Chinese Nationalists during the Chinese Civil War and operated until 1952.

Production

Approximately 18,500 B-24s were produced across a number of versions, including over 4,600 manufactured by Ford. It holds records as the world's most-produced bomber, heavy bomber, multi-engine aircraft, and American military aircraft in history.[44] Production took place at 5 plants. At Ford's Ypsilanti, Michigan based Willow Run Bomber plant alone, one B-24 was being produced every 59 minutes at its peak, a rate so large that production exceeded the military's ability to use the aircraft. Such were the production numbers it has been said that more aluminum, aircrew, and effort went into the B-24 than any other aircraft in history.[45] Looking up one of the assembly lines at Ford's big Willow Run plant, where B-24E (Liberator) bombers are being made. Continued development work by Consolidated produced a handful of transitional B-24Cs with turbocharged instead of supercharged engines. The turbocharged engines were the reason for the flattened oval shape of the nacelles that distinguished all subsequent Liberator models. The B-24D was the first mass-produced series. The B-24D was the Liberator III in British service. It entered US service in early 1942. It had turbocharged engines and increased fuel capacity. Three more 0.50 caliber (12.7 mm) machine guns brought the defensive armament up to 10 machine guns. At 59,524 pounds (27,000 kg)[*dubious* – *discuss*] (29.76 short tons) maximum takeoff weight, it was one of the heaviest aircraft in the world; comparable with the British "heavies", with fully loaded weights of 30 short tons for (and nearly identical to) the Stirling, the 34 short ton Lancaster and the 27 short ton Halifax.

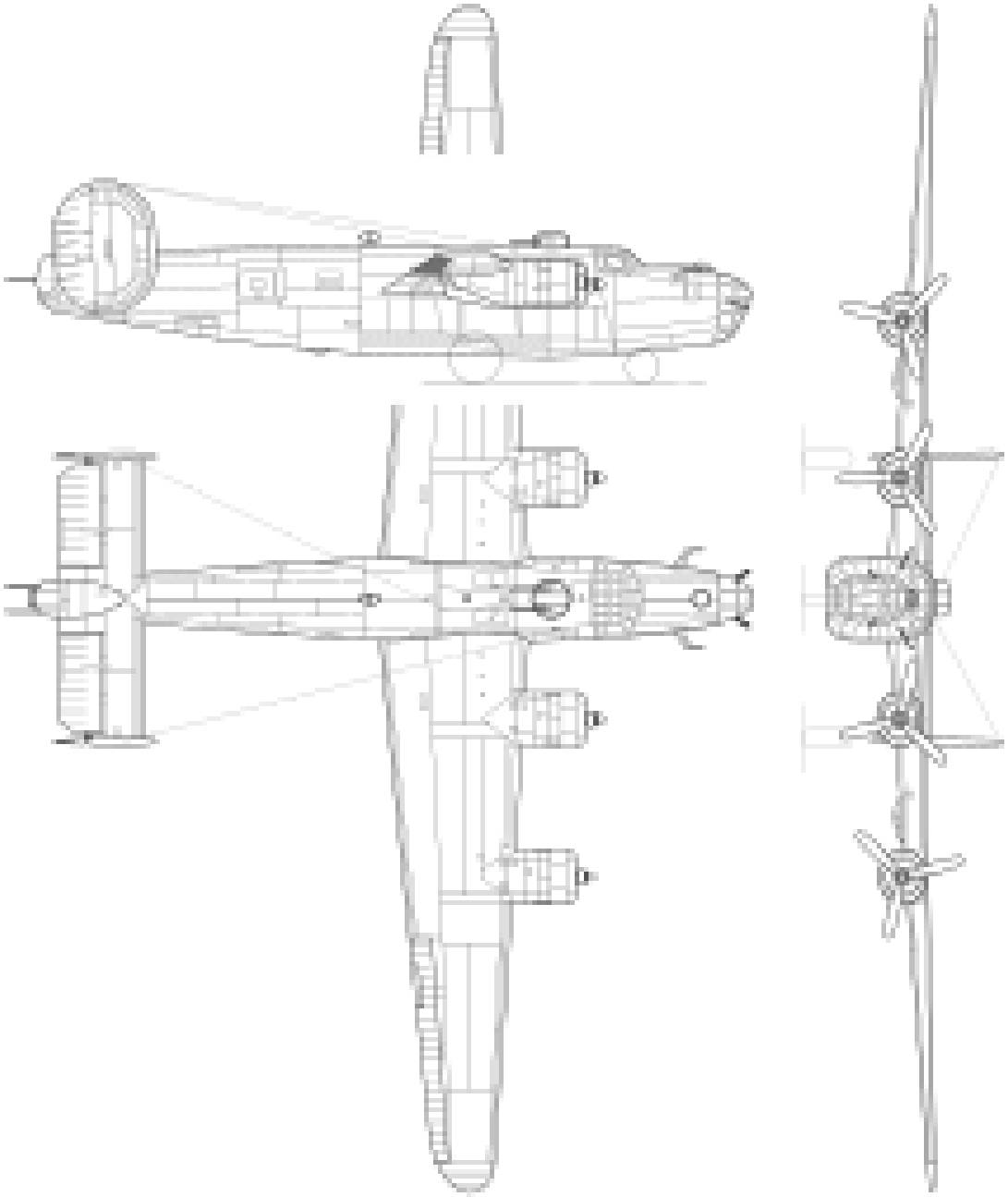
B-24s under construction at Ford Motor's Willow Run plant

Production of B-24s increased at an astonishing rate throughout 1942 and 1943. Consolidated Aircraft tripled the size of its plant in San Diego and built a large new plant outside Fort Worth, Texas in order to receive the massive amounts of knock-down kits that the Ford Motor Company shipped via truck from its Ypsilanti Michigan Facility.[citation needed] A new government plant was built in Tulsa, Oklahoma with Reconstruction Finance Corporation funds and leased to Douglas Aircraft for assembly of B-24s from Ford parts;[46] Douglas ultimately built a total of 962 of the D, E, H, and J models there.[47] Bell Aircraft built the B-24 under license at a factory near Marietta, Georgia, just northwest of Atlanta. Online by mid-1943, the new plant produced hundreds of B-24 Liberator bombers.[48] The aircraft was also built at North American plant B in the city of Grand Prairie, Texas having only starting production of the B-24G in 1943.[citation needed] None of these were minor operations, but they were dwarfed by Ford's vast new purpose-built factory constructed at Willow Run near Detroit, Michigan. According to the Willow Run Reference Book published 1 February 1945, Ford broke ground on Willow Run on 18 April 1941, with the first plane coming off the line on 10 September 1942. Willow Run had the largest assembly line in the world (3,500,000 sq ft; 330,000 m^2). At its peak in 1944, the Willow Run plant produced one B-24 per hour and 650 B-24s per month.[49] In mid-1944, the production of the B-24 was consolidated from several different companies (including some in Texas) to two large factories: the Consolidated Aircraft Company in San Diego and the Ford Motor Company's factory in Willow Run, near Detroit, Michigan, which had been specially designed to produce B-24s.[48] By 1945, Ford made 70% of all B-24s in two nine-hour shifts. Pilots and crews slept on 1,300 cots at Willow Run waiting for their B-24s to roll off the assembly line. At Willow Run, Ford produced half of 18,000 total B-24s alone.[49] Up into December 1944, Ford had also produced an additional 7242 KD or 'Knock Down' Kits that would be trucked to and assembled by Consolidated in Ft. Worth and Douglas Aircraft in Tulsa. Each of the B-24 factories was identified with a production code suffix: Consolidated/San Diego, CO; Consolidated/Fort Worth, CF; Ford/Willow Run, FO; North American, NT; and Douglas/Tulsa, DT.

WASP pilots (left to right) Eloise Huffines Bailey, Millie Davidson Dalrymple, Elizabeth McKethan Magid and Clara Jo Marsh Stember, with a B-24 in the background

In 1943, the model of Liberator considered by many the "definitive" version was introduced. The B-24H was 10 inches (25 cm) longer, had a powered gun turret in the upper nose to reduce vulnerability to head-on attack, and was fitted with an improved bomb sight (behind a simpler, three-panel glazed lower nose), autopilot, and fuel transfer system. Consolidated, Douglas and Ford all manufactured the B-24H, while North American made the slightly different B-24G. All five plants switched over to the almost identical B-24J in August 1943. The later B-24L and B-24M were lighter-weight versions and differed mainly in defensive armament. As the war progressed, the complexity of servicing the Liberator continued to increase. The B-24 variants made by each company differed slightly, so repair depots had to stock many different parts to support various models. Fortunately, this problem was eased in the summer of 1944, when North American, Douglas and Consolidated Aircraft at Fort Worth stopped making B-24s, leaving only the Consolidated plant in San Diego and the Ford plant in Willow Run. In all, 18,482 B-24s were built by September 1945. Twelve thousand saw service with the USAAF, with a peak inventory in September 1944 of 6,043. The U.S. Navy received 977 PB4Y-1s (Liberators originally ordered by the USAAF) and 739 PB4Y-2 Privateers, derived from the B-24. The Royal Air Force received about 2,100 B-24s equipping 46 bomber groups and 41 squadrons; the Royal Canadian Air Force 1,200 B-24Js; and the Royal Australian Air Force 287 B-24Js, B-24Ls, and B-24Ms. Liberators were the only heavy bomber flown by the RAAF in the Pacific.

Specifications (B-24J)



General characteristics

- **Crew:** 11 (pilot, co-pilot, navigator, bombardier, radio operator, nose turret, top turret, 2 waist gunners, ball turret, tail gunner)
- **Length:** 67 ft 2 in (20.47 m)
- **Wingspan:** 110 ft (34 m)
- **Height:** 17 ft 7.5 in (5.372 m)
- **Wing area:** 1,048 sq ft (97.4 m^2)
- **Aspect ratio:** 11.55
- **Zero-lift drag coefficient:** C_D0.0406
- **Frontal area:** 42.54 sq ft (3.952 m^2)
- **Airfoil: root:** Davis (22%); **tip:** Davis (9.3%)[60]
- **Empty weight:** 36,500 lb (16,556 kg)
- **Gross weight:** 55,000 lb (24,948 kg)
- **Max takeoff weight:** 65,000 lb (29,484 kg) plus
- **Fuel capacity:** 2,344 US gal (1,952 imp gal; 8,870 L) normal capacity; 3,614 US gal (3,009 imp gal; 13,680 L) with long-range tanks in the bomb bay; Oil capacity 131.6 US gal (109.6 imp gal; 498 L) in four self-sealing nacelle hopper tanks
- **Powerplant:** 4 × Pratt & Whitney R-1830-35 Twin Wasp, R-1830-41 or R-1830-65 14-cylinder two-row air-cooled supercharged radial piston engines, 1,200 hp (890 kW) each
- **Propellers:** 3-bladed Hamilton Standard, 11 ft 7 in (3.53 m) diameter constant-speed fully-feathering propellers

Performance

- **Maximum speed:** 297 mph (478 km/h, 258 kn) at 25,000 ft (7,600 m)
- **Cruise speed:** 215 mph (346 km/h, 187 kn)
- **Stall speed:** 95 mph (153 km/h, 83 kn)
- **Range:** 1,540 mi (2,480 km, 1,340 nmi) at 237 mph (206 kn; 381 km/h) and 25,000 ft (7,600 m) with normal fuel and maximum internal bomb load
- **Ferry range:** 3,700 mi (6,000 km, 3,200 nmi)
- **Service ceiling:** 28,000 ft (8,500 m)
- **Rate of climb:** 1,025 ft/min (5.21 m/s)
- **Time to altitude:** 20,000 ft (6,100 m) in 25 minutes
- **Lift-to-drag:** 12.9
- **Wing loading:** 52.5 lb/sq ft (256 kg/m^2)
- **Power/mass:** 0.0873 hp/lb (0.1435 kW/kg)

Armament

- **Guns:** 10 × .50 caliber (12.7 mm) M2 Browning machine guns in 4 turrets and two waist positions
- **Bombs:**
  - Short range (400 mi [640 km]): 8,000 pounds (3,600 kg)
  - Long range (800 mi [1,300 km]): 5,000 pounds (2,300 kg)
  - Very long range (1,200 mi [1,900 km]): 2,700 pounds (1,200 kg)

Source : https://en.wikipedia.org/wiki/Consolidated_B-24_Liberator