Curtiss P-40 Kittyhawk

National origin: United States
Role: Fighter, Fighter-bomber
Manufacturer: Curtiss-Wright Corporation
Location: Buffalo, New York.
First flight: 14 October 1938
Retired Brazilian Air Force (1958)
Introduction: January 1944
Primary users: United States Army Air Forces, Royal Air Force, Royal Australian Air Force, Royal Canadian Air Force, USSR
Produced between 1939–1944: 13,738
Unit cost: USD $44,892 in 1944
Development: Curtiss P-36 Hawk
Variants: Curtiss XP-46

The Curtiss P-40 Warhawk is an American single-engined, single-seat, all-metal fighter and ground-attack aircraft that first flew in 1938. The P-40 design was a modification of the previous Curtiss P-36 Hawk which reduced development time and enabled a rapid entry into production and operational service. The Warhawk was used by most Allied powers during World War II, and remained in frontline service until the end of the war. It was the third-most produced American fighter, after the P-51 and P-47; by November 1944, when production of the P-40 ceased, 13,738 had been built, all at Curtiss-Wright Corporation's main production facilities at Buffalo, New York.

P-40 Warhawk was the name the United States Army Air Corps and after June 1941, USAAF-adopted name for all models, making it the official name in the U.S. for all P-40s. The British Commonwealth and Soviet air forces used the name Tomahawk for models equivalent to the P-40B and P-40C, and the name Kittyhawk for models equivalent to the P-40D and all later variants.

P-40s first saw combat with the British Commonwealth squadrons of the Desert Air Force in the Middle East and North African campaigns, during June 1941. No. 112 Squadron Royal Air Force, was among the first to operate Tomahawks in North Africa and the unit was the first Allied military aviation unit to feature the "shark mouth" logo, copying similar markings on some Luftwaffe Messerschmitt Bf 110 twin-engine fighters.

The P-40's lack of a two-speed supercharger made it inferior to Luftwaffe fighters such as the Messerschmitt Bf 109 or the Focke-Wulf Fw 190 in high-altitude combat and it was rarely used in operations in Northwest Europe. However, between 1941 and 1944, the P-40 played a critical role with Allied air forces in three major theaters: North Africa, the Southwest Pacific, and China. It also had a significant role in the Middle East, Southeast Asia, Eastern Europe, Alaska and Italy. The P-40's performance at high altitudes was not as important in those theaters, where it served as an air superiority fighter, bomber escort and fighter-bomber. Although it gained a postwar reputation as a mediocre design, suitable only for close air support, recent research including scrutiny of the records of individual Allied squadrons indicates that this was not the case: the P-40 performed surprisingly well as an air superiority fighter, at times suffering severe losses but also taking a very heavy toll of enemy aircraft. The P-40 offered the additional advantage of low cost, which kept it in production as a ground-attack aircraft long after it was obsolete as a fighter.
Design and development

Origins

On 14 October 1938, Curtiss test pilot Edward Elliott flew the prototype XP-40, on its first flight in Buffalo. [11] The XP-40 was the 10th production Curtiss P-36 Hawk, [12] with its Pratt & Whitney R-1830 (Twin Wasp) 14-cylinder air-cooled radial engine replaced at the direction of Chief Engineer Don R. Berlin by a liquid-cooled, supercharged Allison V-1710 V-12 engine. The first prototype used the glycol coolant radiator in an underbelly position on the fighter, just aft of the wing's trailing edge. [13] USAAC Fighter Projects Officer Lieutenant Benjamin S. Kelsey flew this prototype some 300 miles in 57 minutes, approximately 315 miles per hour (507 km/h). Hiding his disappointment, he told reporters that future versions would likely go 100 miles per hour (160 km/h) faster. [14] Kelsey was interested in the Allison engine because it was sturdy and dependable, and it had a smooth, predictable power curve. The V-12 engine offered as much power as a radial engine but had a smaller frontal area and allowed a more streamlined cowl than an aircraft with radial engines, promising a theoretical 5% increase in top speed. [15]

Curtiss engineers worked to improve the XP-40's speed by moving the radiator forward in steps. Seeing little gain, Kelsey ordered the aircraft to be evaluated in a NACA wind tunnel to identify solutions for better aerodynamic qualities. From 28 March to 11 April 1939, the prototype was studied by NACA. [14] Based on the data obtained, Curtiss moved the glycol coolant radiator forward to the chin; its new air scoop also accommodated the oil cooler air intake. Other improvements to the landing gear doors and the exhaust manifold combined to give performance that was satisfactory to the USAAC. [19] Without beneficial tail winds, Kelsey flew the XP-40 from Wright Field back to Curtiss's plant in Buffalo at an average speed of 354 mph (570 km/h). [92] Further tests in December 1939 proved the fighter could reach 366 mph (598 km/h). [16]

An unusual production feature was a special truck rig to speed delivery at the main Curtiss plant in Buffalo, New York. The rig moved the newly built P-40s in two main components, the main wing and the fuselage, the eight miles from the plant to the airport where the two units were mated for flight and delivery. [19]

Performance characteristics

Evidence of the P-40's durability: in 1944 F/O T. R. Jacklin (pictured) flew this No. 75 Squadron RAAF P-40N-5 more than 200 mi (322 km) after the loss of the port aileron and 25% of its wing area, due to a mid-air collision with another P-40N-5. [20] [80]

The P-40 was originally conceived as a pursuit aircraft and was very agile at low and medium altitudes but suffered due to lack of power at higher altitudes. At medium and high speeds it was one of the tightest turning early monoplane designs of the war, [20] and it could out turn most opponents it faced in North Africa and the Russian Front. In the Pacific Theater, like all Allied Fighters it was out turned at lower speeds by the lightweight fighters A6M Zero and Nakajima Ki-43 "Oscar" which did not possess the structural strength of the P-40 for high speed hard turns. The American Volunteer Group Commander Claire Chennault advised against prolonged dog fighting with the Japanese fighters due to the resulting airspeed reduction which favored the lightweight Japanese designs' low speed turning superiorly. [21]

Allison V-1710 engines produced about 1,040 hp (780 kW) at sea level and at 14,000 ft (4,300 m): not powerful by the standards of the time and the early P-40 variants' top speeds were only average. Also, the single-stage, single-speed supercharger meant that the P-40 could not compete with contemporary designs as a high-altitude fighter. Later versions, with 1,200 hp (890 kW) Allison or more powerful 1,400 hp Packard Merlin engines were more capable. Climb performance was fair to poor, depending on the subtype. [18] Dive acceleration was good and dive speed was excellent. [19] The highest-scoring P-40 ace, Clive Caldwell (RAAF), who claimed 22 of his 28½ kills in the type, said that the P-40 had "almost no vices", although "it was a little difficult to control in terminal velocity." [20] Caldwell added that the P-40 was "faster downhill than almost any other aeroplane with a propeller." The P-40 had one of the fastest maximum dive speeds of any fighter of the early war period and good high speed handling.

The P-40 tolerated harsh conditions in the widest possible variety of climates. It was a semi-modular design and thus easy to maintain in the field. It lacked innovations of the time, such as bolstered ailerons or automatic leading edge slats, but it had a strong structure including a five-spar wing, which enabled P-40s to pull high G turns and even survive some midair collisions: both accidental impacts and intentional ramming attacks against enemy aircraft were occasionally

Operational history

In April 1939, the U.S. Army Air Corps, having witnessed the new, sleek, high-speed, in-line-engined fighters of the European air forces, placed the largest single fighter order it had ever made: 524 P-40s.

French Air Force

An early order came from the French Armée de l'Air, which was already operating P-36s. The Armée de l'Air initially ordered 100 (later the order was increased to 230) as the Hawk 81A-1 but the French military had been defeated before the aircraft had left the factory, consequently, the aircraft were diverted to British and Commonwealth service (as the Tomahawk I), in some cases complete with metric flight instruments.

In late 1942, as French forces in North Africa split from the Vichy government to side with the Allies, U.S. forces transferred P-40Fs from 33rd FG to the GC II/5, a squadron that was historically associated with the Lafayette Escadrille. GC II/5 used its P-40Fs and Ls in combat in Tunisia and, later, for patrol duty off the Mediterranean coast until mid-1944 when they were replaced by Republic P-47D Thunderbolts.

British Commonwealth units in Mediterranean and European theatres

 Deployment

In all, 18 Royal Air Force (RAF) squadrons, as well as four Royal Canadian Air Force (RCAF), three South African Air Force (SAAF), and two Royal Australian Air Force (RAAF) squadrons serving with RAF formations, used P-40s. [27] [28]

The first units to convert were Hawker Hurricane squadrons of the Desert Air Force (DAF), in early 1941. The first Tomahawks delivered came without armor, bulletproof windscreen or self-sealing fuel tanks. These were installed in subsequent shipments. Pilots used to British-designed fighters sometimes found it difficult to adapt to the P-40's rear-folding landing gear, which was more prone to collapse than the lateral-folding landing gear found on the Hawker Hurricane or Supermarine Spitfire. In contrast to the "three-point landing" commonly employed with British types, P-40 pilots were obliged to use a "wheels landing": a longer, low angle approach that touched down on the main wheels first.
testing the aircraft did not have adequate performance for use in northwest Europe in high-altitude combat due to the effective service ceiling limitation. Spitfires used in the theater operated at heights around 30,000 ft (9,100 m), while the P-40’s Allison engine, with its single-stage, low altitude rated supercharger, worked best at 15,000 ft (4,600 m) or lower. When the Tomahawk was used by Allied units based in the UK from February 1941, this limitation relegated the Tomahawk to low-level reconnaissance with RAF Army Cooperation Command and only one squadron, No. 403 Squadron RCAF was used in the fighter role. Subsequently, the British Air Ministry deemed the P-40 completely unsuitable for the theater. UK P-40 squadrons from mid-1942 were equipped with aircraft such as Mustangs.

The Tomahawk was superseded in North Africa by the more powerful Kittyhawk (“D”-mark onwards) types from early 1942, though some Tomahawks remained in service until 1943. Kittyhawks included many major improvements, and were the DAF’s air superiority fighter for the critical first few months of 1942, until “tropicalised” Spitfires were available. In 2012, the virtually intact remains of a Kittyhawk were found; it had run out of fuel in the Egyptian Sahara in June 1942. [29]

DAF units received nearly 330 Packard V-1650 Merlin-powered P-40Fs, called Kittyhawk IIs, most of which went to the USAAF, and the majority of the 700 “lightweight” L models, also powered by the Packard Merlin, in which the armament was reduced to four .50 in (12.7 mm) Brownings (Kittyhawk IIA). The DAF also received some 21 of the later P-40K and the majority of the 600 P-40Ms built; these were known as Kittyhawk IIIIs. The “lightweight” P-40Ns (Kittyhawk IV) arrived from early 1943 and were used mostly in the fighter-bomber role. [34]

From July 1942 until mid-1943, elements of the U.S. 57th Fighter Group (57th FG) were attached to DAF P-40 units. The British government also donated 23 P-40s to the Soviet Union.

Combat performance

Tomahawks and Kittyhawks bore the brunt of Luftwaffe and Regia Aeronautica fighter attacks during the North African campaign. The P-40s were considered superior to the Hurricane, which they replaced as the primary fighter of the Desert Air Force. [19]
Caldwell believed that Operational Training Units did not properly prepare pilots for air combat in the P-40, and as a commander, stressed the importance of training novice pilots properly. [45]

Nevertheless, competent pilots who took advantage of the P-40's strengths were effective against the best of the Luftwaffe and Regia Aeronautica. [10] [46] For example, on one occasion in August 1941, Caldwell was attacked by two Bf 109s, one of them piloted by German ace Werner Schröer. Although Caldwell was wounded three times, and his Tomahawk was hit by more than 100 7.92 mm (0.312 in) bullets and 20 mm cannon shells, Caldwell shot down Schröer's wingman and returned to base. Some sources also claim that in December 1941, Caldwell killed a prominent German Expertise, Erbo von Kageneck (69 kills), while flying a P-40. [47] Caldwell's victories in North Africa included 10 Bf 109s and two Macchi C.202s. [48] Billy Drake of 112 Squadron was the leading British P-40 ace with 13 victories. [49] James "Stocky" Edwards (RCAF), who achieved 12 kills in the P-40 in North Africa, shot down German ace Otto Schulz (51 kills) while flying a Kittyhawk with No. 260 Squadron RAF. [50] Caldwell, Drake, Edwards and Nicky Barr were among at least a dozen pilots who achieved ace status twice over while flying the P-40. [40] [49] A total of 46 British Commonwealth pilots became aces in P-40s, including seven double aces. [44]

**Chinese Air Force**

**Flying Tigers (American Volunteer Group)**

3rd Squadron Hell's Angels, Flying Tigers over China, photographed in 1942 by AVG pilot Robert T. Smith. [46]

The Flying Tigers, known officially as the 1st American Volunteer Group (AVG), were a unit of the Chinese Air Force, recruited from U.S. aviators. From late 1941, the P-40B was used by the Flying Tigers. They were divided into three pursuit squadrons, the "Adam & Eves", the "Panda Bears" and the "Hell's Angels". [51]

Compared to opposing Japanese fighters, the P-40's strengths were that it was sturdy, well armed, faster in a dive and possessed an excellent rate of roll. While the P-40s could not match the maneuverability of the Japanese Army arm's Nakajima Ki-27s and Ki-43s, nor the much more famous Zero naval fighter in a slow speed turning dogfight, at higher speeds the P-40s were more than a match. AVG leader Claire Chennault trained his pilots to use the P-40's particular performance advantages. [51] The P-40 had a higher dive speed than any Japanese fighter aircraft of the early war years, for example, and could be used to exploit so-called "boom-and-zoom" tactics. The AVG was highly successful, and its feats were widely published, to boost sagging public morale at home, by an active cadre of international journalists. According to their official records, in just 6 1/2 months, the Flying Tigers destroyed 115 enemy aircraft for the loss of just four of their own in air-to-air combat.

The Model B's received by Chennault and assembled in Burma at the end of 1941 were not well liked. There were no auxiliary fuel tanks that could be dropped before going into combat, and there were no bomb racks on the wings. Chennault considered the liquid-cooled engine vulnerable in combat because a single bullet through the coolant tank would cause the engine to overheat in minutes. The Tomahawks also had no radios, so the AVG improvised by installing a fragile radio transceiver, RCA-7-H, which had been built for a Piper Cub. Because the plane lacked a turbo-supercharger, its effective ceiling was about 25,000 feet. The most critical problem was the lack of spare parts; the only source of spare parts was damaged aircraft. The planes were thought to be what no one else wanted, dangerous and difficult to fly. But the plane had advantages: its gas tanks were self-sealing and could take hits without catching on fire. There were two heavy sheets of steel behind the pilot's head and back. The plane as a whole was ruggedly constructed. [52]

In the spring of 1942, the AVG received a small number of Model E's, each equipped with a radio, six .50-caliber machine guns, and auxiliary bomb racks that could hold 35-lb fragmentation bombs. Chennault's armorer fitted the new planes with additional bomb racks that held the 570-lb Russian bombs, which the Chinese had in abundance. These planes were used in the battle of the Salween River Gorge in late May, 1942, which kept the Japanese from entering China from Burma and threatening Kunming. Spare parts were still a problem. "Scores of new planes...were now in India, and there they stayed—in case the Japanese decided to invade....the AVG was lucky to get a few tires and spark plugs with which to carry on its daily war." [53]

**4th Air Group**

China received 27 P-40E in early 1943. These were assigned to squadrons of the 4th Air Group. [44]

**United States Army Air Forces**

P-40B G-CDWH at Duxford 2011. It is the only airworthy P-40B in the world and the only survivor from the Pearl Harbor attack. [53]

A total of 15 entire USAF pursuit/fighter groups (FG), along with other pursuit/fighter squadrons and a few tactical reconnaissance (TR) units, operated the P-40 during 1941–45. [40] [55] [57]

As was also the case with the Bell P-39 Airacobra, many USAF officers considered the P-40 exceptional, but it was gradually replaced by the Lockheed P-38 Lightning, the Republic P-47 Thunderbolt and the North American P-51 Mustang. However, the bulk of the fighter operations by the USAAF in 1942–43 were borne by the P-40 and the P-39. In the Pacific, these two fighters, along with the U.S. Navy's Grumman F4F Wildcat, contributed more than any other U.S. types to breaking Japanese air power during this critical period.

**Pacific theaters**

By mid-1943, the USAF was phasing out the P-40F (pictured); the two nearest aircraft, "White 116" and "White 111" were flown by the aces 1Lt Henry E. Matson and 1Lt Jack Bade, 44th FS, at the time part of AirSols, on Guadalcanal. The P-40 was the main USAF fighter aircraft in the South West Pacific and Pacific Ocean theaters during 1941–42.

In the first major battles, at Pearl Harbor [58] and in the Philippines, [48] USAF P-40 squadrons suffered crippling losses on the ground and in the air to Japanese fighters such as the Ki-43 Oscar and A6M Zero. During the attack on Pearl Harbor, a few P-40s managed to shoot down several Japanese planes, most notably by George Welch and Kenneth Taylor.

However, in the Dutch East Indies campaign, the 17th Pursuit Squadron (Provisional), formed from USAF pilots evacuated from the Philippines, claimed 49 Japanese aircraft destroyed, for the loss of 17 P-40s [57] [58]. The seaplane tender USS Langley was sunk by Japanese planes while delivering P-40s to Tjilatjap, Java. [49] In the Solomon Islands and New Guinea Campaigns, as well as the air defence of Australia, improved tactics and training allowed the USAAF to more effectively utilize the strengths of the P-40.

Due to aircraft fatigue, scarcity of spare parts and replacement problems, the US Fifth Air Force and Royal Australian Air Force created a joint P-40 management and replacement pool on 30 July 1942 and many P-40s went back and forth between the air forces. [51]
the P-40 with the 49th FG. He compared the P-40 favorably with the P-38: "If you flew wisely, the P-40 was a very capable aircraft. I could outrun a Zero, a fact that some pilots didn't realize when they made the transition between the two aircraft. [...] The real problem with it was lack of range. As we pushed the Japanese back, P-40 pilots were slowly left out of the war. So when I moved to P-38s, an excellent aircraft, I did not [believe] that the P-40 was an inferior fighter, but because I knew the P-38 would allow us to reach the enemy. I was a fighter pilot and that was what I was supposed to do."  

The 8th, 15th, 16th, 24th, 49th, 343rd and 347th FGs/FGs, flew P-40s in the Pacific theaters between 1941 and 1945, with most units converting to P-38s during 1943-44. In 1945, the 71st Reconnaissance Group employed them as armed forward air controllers during ground operations in the Philippines until it received delivery of P-51s. [66] They claimed 655 aerial victories.  

Contrary to conventional wisdom, with sufficient altitude, the P-40 could actually turn with the A6M and other Japanese fighters, using a combination of a nose-down vertical turn with a bank turn, a technique known as a low-jo-Jo. Robert DeHaven describes how this tactic was used in the 49th Fighter group: You could fight a Jap on even terms, but you had to make him fight your way. He could outrun you at slow speed. You could outrun him at high speed. When you got into a turning fight with him, you dropped your nose down so you kept your airspeed up, you could outrun him. At low speed he could outrun you because of those big ailerons ... on the Zero. If your speed was up over 275, you could outroll [a Zero]. His big ailerons didn't have the strength to make high speed rolls... You could push things, too. Because ... if you decided to go home, you could go home. He couldn't because you could outrun him. [...] That left you in control of the fight.

China Burma India Theater

USAAF and Chinese P-40 pilots performed well in this theater, scoring high kill ratios against Japanese types such as the Ki-43, Nakajima Ki-44 "Tojo" and the Zero. The P-40 remained in use in the China Burma India Theater (CBI) until 1944, and was reportedly preferred over the P-51 Mustang by some US pilots flying in China.  

The American Volunteer Group (Flying Tigers) was integrated into the USAAF as the 23rd Fighter Group in June 1942. The unit continued to fly newer model P-40s until the end of the war, racking up a high kill-to-loss ratio. [46] [63] In the very important Battle of the Salween River Gorge of May 1942 the AVG used the P-40E model equipped with wing racks that could carry six 35-pound fragmentation bombs; in addition, Chennault's armorer developed belly racks for the planes that could carry the Russian 570-pound bombs, which the Chinese had in large quantity... [94]  

Units arriving in the CBI after the AVG in the 10th and 14th Air Forces continued to perform well with the P-40, claiming 973 kills in the theater, or 64.8 percent of all enemy aircraft shot down. Aviation historian Carl Molesworth stated that "...the P-40 simply dominated the skies over Burma and China. They were able to establish air superiority over free China, northern Burma and the Assam valley of India in 1942, and they never relinquished it." [90]  

In addition to the 23rd FG, the 3rd, 5th, 51st and 80th FGs, along with the 10th TRS, operated the P-40 in the CBI. [70] In addition to its role as a fighter aircraft, CBI P-40 pilots used the aircraft very effectively as a fighter-bomber. The 80th Fighter Group in particular used its so-called B-40 (P-40s carrying 1,000-pound high explosive bombs) to destroy Japanese-held bridges and kill bridge repair crews, sometimes demolishing their target with a single bomb. [95] At least 40 U.S. pilots reached ace status while flying the P-40 in the CBI.

Europe and Mediterranean theaters

On 14 August 1942, the first confirmed victory by a USAAF unit over a German aircraft in World War II was achieved by a P-40C pilot, 2nd Lt Joseph D. Shaffer, of the 33rd Fighter Squadron, intercepted a Focke-Wulf Fw 200C-3 maritime patrol plane that overflew his base at Reykjavík, Iceland. Shaffer damaged the Fw 200, which was finished off by a P-38F.

Warhawks were used extensively in the Mediterranean Theater of Operations (MTO) by USAAF units, including the 33rd, 57th, 58th, 79th, 324th and 325th Fighter Groups. [94]  

While the P-40 suffered heavy losses in the MTO, many USAAF P-40 units achieved high kill-to-loss ratios against Axis aircraft. For example, the 324th FG scored better than a 2:1 ratio in the MTO. [94] In all, 23 U.S. pilots became aces in the MTO while flying the P-40, most of them during the first half of 1943. [94] As in the Pacific, success in combat depended in part on experience and effective tactics.

Individual pilots from the 57th FG were the first USAAF P-40 pilots to see action in the MTO, while attached to Desert Air Force Kittyhawk squadrons, from July 1942. The 57th was also the main unit involved in the "Palm Sunday Massacre"; on 18 April 1943. Decoded Ultra signals had given away a plan for a large formation of German Junkers Ju 52 transports to cross the Mediterranean, escorted by German and Italian fighters. Between 1630 and 1830 hours, all wings of the group were engaged in an intensive effort against the enemy air transports. Of the four Kittyhawk wings, three had left the patrol area before a convoy of a 100+ enemy transports were sighted by 57 Group, which tallied 74 aircraft destroyed. 57 Group was last in the area, and intercepted the Ju 52s escorted by large numbers of BF 109s, BF 110s and Macchi C.202s. In all, they claimed 58 Ju 52s, 14 BF 109s and two BF 110s destroyed, with a number of others probably destroyed and damaged. Between 20 and 40 of the Axis aircraft landed on the beaches around Cap Bon to avoid being shot down. Six Allied fighters were lost, five of them P-40s.

On 22 April, in Operation Flax, a similar force of P-40s attacked a formation of 14 Messerschmitt Me 323 Gigant ("Giant") six-engine transports, covered by seven Bf 109s from II./JG 27. All the transports were shot down, for a loss of three P-40s destroyed. The 57th FG was equipped with the Curtiss fighter until early 1944, during which time they were credited with at least 140 air-to-air kills. [87]  

On 23 February 1943, during Operation Torch, the pilots of the 58th FG flew 75 P-40Ls off the aircraft carrier USS Ranger to the newly captured Vichy French airfield, Casas, near Casablanca, in French Morocco. The aircraft resupplied the 33rd FG and the pilots were reassigned. [94]  

The 325th FG (known as the "Checkpoint Clar") flew P-40s in the MTO. The 325th was credited with at least 133 air-to-air kills in October–November 1943, of which 95 were BF 109s and 26 were Macchi C.202s, for the loss of 17 P-40s in combat. [66] [69] An anecdote concerning the 325th FG, indicates what could happen if BF 109 pilots made the mistake of trying to out-turn the P-40. 325th FG historian Carol Cathcart wrote: "On 30 July, 20 P-40s of the 317th [Fighter Squadron] ... took off on a fighter sweep ... over Sardinia. As they turned to fly south over the west part of the island, they were attacked near Sassari... The attacking force consisted of 25 to 30 BF 109s and Macchi C.202s... In the brief, intense battle that occurred ... [the 317th claimed] 21 enemy aircraft." [70] Cathcart states that Lt. Robert Sederberg who assisted a comrade being attacked by five BF 109s, destroyed at least one German aircraft, and may have shot down as many as five. Sederberg was shot down in the dogfight and became a prisoner of war. [70]  

A famous African-American unit, the 99th FS, better known as the "Tuskegee Airmen" or "Redtails", flew P-40s in stateside training and for their initial eight months in the MTO. On 9 June 1943, they became the first African-American fighter pilots to engage enemy aircraft, over Pantelleria, Italy. A single Focke Wulf Fw 190 was reported damaged by Lieutenant Willie Ashley Jr. On 2 July the squadron claimed its first verified kill; a Fw 190 destroyed by Captain Charles Hall. The 99th continued to score with P-40s until February 1944, when they were assigned P-39s and P-51 Mustangs. [71] [72]  

The much-lightened P-40L was most heavily used in the MTO, primarily by U.S. pilots. Many US pilots stripped down their P-40s even further to improve performance, often removing two or more of the wing guns from the P-40F-L.

Curtiss Kittyhawk Mk IA of 75th Squadron RAAF, which F/O Geoff Atherton flew over New Guinea in August 1942
Many RAAF pilots achieved high scores in the P-40. At least five reached "double ace" status: Clive Caldwell, Nicky Barr, John Waddy, Bob Whittle (11 kills each) and Bobby Gibbs (10 kills) in the Middle East, North African and/or New Guinea campaigns. In all, 18 RAAF pilots became aces while flying P-40s. [78]

The Kittyhawk played a crucial role in the South West Pacific theater. They fought on the front line as fighters during the critical early years of the Pacific War, and the durability and bomb-carrying abilities (1,000 lb/454 kg) of the P-40 also made it ideal for the ground attack role. For example, 75, and 76 Squadrons played a critical role during the Battle of Milne Bay, [74] [75] fending off Japanese aircraft and providing effective close air support for the Australian infantry, negating the initial Japanese advantage in light tanks and sea power.

The RAAF units that most used Kittyhawks in the South West Pacific were 75, 76, 77, 78, 80, 82, 84 and 86 Squadrons. These squadrons saw action mostly in the New Guinea and Borneo campaigns.

Late in 1945, RAAF fighter squadrons in the South West Pacific began converting to P-51Ds. However, Kittyhawks were in use with the RAAF until the end of the war, in Borneo. In all, the RAAF acquired 841 Kittyhawks (not counting the British-ordered examples used in North Africa), including 163 P-40E, 42 P-40K, 90 P-40 M and 553 P-40N models. [76] In addition, the RAAF ordered 67 Kittyhawks for use by No. 120 (Netherlands East Indies) Squadron (a joint Australian-Dutch unit in the South West Pacific). The P-40 was retired by the RAAF in 1947.

Royal Canadian Air Force

A total of 13 Royal Canadian Air Force units operated the P-40 in the North West European or Alaskan theaters.

In mid-May 1940, Canadian and US officers watched comparative tests of a XP-40 and a Spitfire, at RCAF Uplands, Ottawa. While the Spitfire was considered to have performed better, it was not available for use in Canada and the P-40 was ordered to meet home air defense requirements. In all, eight Home War Establishment Squadrons were equipped with the Kittyhawk: 72 Kittyhawk I, 12 Kittyhawk Ia, 15 Kittyhawk III and 35 Kittyhawk IV aircraft, for a total of 134 aircraft. These aircraft were mostly diverted from RAF Lend-Lease orders for service in Canada. The P-40 Kittyhawks were obtained in lieu of 144 P-39 Airacobras originally allocated to Canada but reassigned to the RAF.

However, before any home units received the P-40, three RCAF Article XV squadrons operated Tomahawk aircraft from bases in the United Kingdom. No. 403 Squadron RCAF, a fighter unit, used the Tomahawk Mk II briefly before converting to Spifires. Two Army Co-operation (close air support) squadrons: 400 and 414 Squadrons trained with Tomahawks, before converting to Mustang Mk. I aircraft and a fighter/reconnaissance role. Of these, only No. 400 Squadron used Tomahawks operationally, conducting a number of armed sweeps over France in the late 1941. RCAF pilots also flew Tomahawks or Kittyhawks with other British Commonwealth units based in North Africa, the Mediterranean, South East Asia and (in at least one case) the South West Pacific. [80]

In 1942, the Imperial Japanese Navy occupied two islands, Attu and Kiska, in the Aleutians, off Alaska. RCAF home defense P-40 squadrons saw combat over the Aleutians, assisting the USAAF. The RCAF initially sent 111 Squadron, flying the Kittyhawk I, to the US base on Adak island. During the draw-out campaign, 12 Canadian Kittyhawks operated on a rotational basis from a new, more advanced base on Amchitka, 75 mi (121 km) southeast of Kiska. 14 and 111 Squadrons took "turn-about" at the base. During a major attack on Japanese positions at Kiska on 25 September 1942, Squadron Leader Ken Boomer shot down a Nakajima A6M2-N ("Rufe") seaplane. The RCAF also purchased 12 P-40Ks directly from the USAAF while in the Aleutians. After the Japanese threat diminished, these two RCAF squadrons returned to Canada and eventually transferred to England without their Kittyhawks.

In January 1943, a further Article XV unit, 430 Squadron was formed at RAF Hartford Bridge, England and trained on obsolete Tomahawk IIA. [77] [78] The squadron converted to the Mustang I before commencing operations in mid-1943.

In early 1945 pilots from No. 133 Squadron RCAF, operating the P-40N out of RCAF Patricia Bay, (Victoria, BC), intercepted and destroyed two Japanese balloon-bombs, [79] which were designed to cause wildfires on the North American mainland. On 21 February, Pilot Officer E. E. Maxwell shot down a balloon, which landed on Sums Mountain in Washinton State. On 10 March, Pilot Officer J. 0. Patten destroyed a balloon near SaltSpring Island, BC. The last interception took place on 20 April 1945 when Pilot Officer P.V. Brodeur from 135 Squadron out of Abbotsford, British Columbia shot down a balloon over Vedder Mountain. [79]

The RCAF units that operated P-40s were, in order of conversion:

Article XV squadrons serving in the UK under direct command and control of the RAF, with RAF owned aircraft.

- 403 Squadron (Tomahawk IIA and IIB, March 1941)
- 400 Squadron (Tomahawk I, IIA and IIB, April 1941–September 1942)
- 414 Squadron (Tomahawk I, IIA and IIB, August 1941–September 1942)
- 430 Squadron (Tomahawk IIA and IIB, January 1943–February 1943)

Operational Squadrons of the Home War Establishment (HWE) (Based in Canada)

- 111 Squadron (Kittyhawk I, IV, November 1941–December 1943 and P-40K, September 1942–July 1943),
- 118 Squadron (Kittyhawk I, November 1941–October 1943),
- 14 Squadron (Kittyhawk I, January 1942–September 1943),

The Kittyhawk was the main fighter used by the RAAF in World War II, in greater numbers than the Spitfire. Two RAAF squadrons serving with the Desert Air Force, No. 3 and No. 450 Squadrons, were the first Australian units to be assigned P-40s. Other RAAF pilots served with RAF or SAAF P-40 squadrons in the theater.
Royal New Zealand Air Force F/O Geoff Fisken in front of his P-40, Wairarapa Wildcat (NZ3072/19).

Some Royal New Zealand Air Force (RNZAF) pilots and New Zealanders in other air forces flew British P-40s while serving with DAF squadrons in North Africa and Italy, including the ace Jerry Westenra.

A total of 301 P-40s were allocated to the RNZAF under Lend-Lease, for use in the Pacific Theater, although four of these were lost in transit. The aircraft equipped 14 Squadron, 15 Squadron, 16 Squadron, 17 Squadron, 18 Squadron, 19 Squadron and 20 Squadron.

RNZAF P-40 squadrons were successful in air combat against the Japanese between 1942 and 1944. Their pilots claimed 100 aerial victories in P-40s, whilst losing 20 aircraft in combat. [49] [50] Geoff Fisken, the highest scoring British Commonwealth ace in the Pacific, flew P-40s with 15 Squadron, although half of his victories were claimed with the Brewster Buffalo.

The overwhelming majority of RNZAF P-40 victories were scored against Japanese fighters, mostly Zeroes. Other victories included Aichi D3A “Val” dive bombers. The only confirmed twin engine claim, a Ki-21 “Sally” (misidentified as a G4M “Betty”) fell to Fisken in July 1943. [50]

From late 1943 and 1944, RNZAF P-40s were increasingly used against ground targets, including the innovative use of naval depth charges as improvised high-capacity bombs. The last front line RNZAF P-40s were replaced by Vought F4U Corsairs in 1944. The P-40s were relegated to use as advanced pilot trainers. [51] [50] [50]

The remaining RNZAF P-40s, excluding the 20 shot down and 154 written off, were mostly scrapped at Rukuhia in 1948.

Soviet Union

The Soviet Vovennoye-Vozduzhnaye Sily (VVS; “Military Air Forces”) and Morskaya Aviatsiya (MA; “Naval Air Service”) also referred to P-40s as “Tomahawks” and “Kittyhawks”. In fact, the Curtiss P-40 Tomahawk / Kittyhawk was the first Allied fighter supplied to the USSR under the Lend-Lease agreement. [52] The Soviet units received 247 P-40B/Cs (equivalent to the RAF II/IV in RAF service) and 2,178 P-40E, -K, -L, and -N models between 1941 and 1944. [53] The Tomahawks were shipped from Great Britain and directly from the US, many of them arriving incomplete, lacking machine guns and even the lower half of the engine cowling. In late September 1941, the first 48 P-40s were assembled and checked in USSR. [54] Test flights showed some manufacturing defects: generator and oil pump gears and generator shafts failed repeatedly, which led to emergency landings.

The test report indicated that the Tomahawk was inferior to Soviet “M-105”-powered production fighters in speed and rate of climb. However, it had good short field performance, horizontal manoeuvrability, range and endurance. [55] Nevertheless, Tomahawks and Kittyhawks were used against the Germans. The 126th IAP flying on the Western and Kalinin fronts were the first unit to receive the P-40. The regiment entered action on 12 October 1941. By November 1941, that unit had shot down 17 German aircraft. However, Lt (SG) Smirnov noted that the P-40 armament was sufficient for strafing enemy lines but rather ineffective in aerial combat. Another pilot, S.G. Richnyy (of Soviet Union), remarked that he had to shoot half the ammunition at 50–100 meters (164–339 ft) to shoot down an enemy aircraft. [56]

 Hawk 81A-3/Tomahawk Ib AK255, at the U.S. National Museum of Naval Aviation, is shown in the colors of the Flying Tigers, but never actually served with them; it began life with the RAF and was later transferred to the Soviet Union.

In January 1942, some 198 aircraft sorties were flown (334 flying hours) and 11 aerial engagements were conducted, in which five BI 109s, one Ju 88, and one He 111 were downed. These statistics reveal a surprising fact: it turns out that the Tomahawk was fully capable of successful air combat with a BI 109.

The reports of pilots about the circumstances of the engagements confirm this fact. On 18 January 1942, Lieutenants S. S. Levin and I. P. Levsha (in pair) fought an engagement with seven BI 109s and shot down two of them without loss. On 22 January, a flight of three aircraft led by Lieutenant E. E. Lozov engaged 13 enemy aircraft and shot down two BI 109Es, again without loss. Altogether, in January, two Tomahawks were lost; one downed by German antiaircraft artillery and one lost to Messerschmitts. [57]

The Soviets stripped down their P-40s significantly for combat, in many cases removing the wing guns altogether in P-40B/C types, for example. Soviet Air Force reports state that they liked the range and fuel capacity of the P-40, which were superior to most of the Soviet fighters, though they still preferred the P-39. Soviet pilot Nikolai G. Golodnikov recalled: “The cockpit was vast and high. At first it felt unpleasant to sit waist-high in glass, as the edge of the fuselage was almost at waist level. But the bullet-proof glass and armoured seat were strong and visibility was good. The radio was also good. It was powerful, reliable, but only on HF (high frequency). The American radios did not have hand microphones but throat microphones. These were good throat mikes: small, light and comfortable.” [58] The biggest complaint of some Soviet airmen was its poor climb rate and problems with maintenance, especially with burning out the engines. VVS pilots usually flew the P-40 at War Emergency Power settings while in combat, bringing the acceleration and speed performance closer to that of their German rivals, but could burn out engines in a matter of weeks. [23] They also had difficulty with the more demanding requirements for fuel quality and oil purity of the Allison engines. A fair number of burnt out P-40s were re-engined with Soviet Klimov engines but these performed relatively poorly and were relegated to rear area use. [23]

Actually, the P-40 could engage all Messerschmitts on equal terms, almost to the end of 1943. If you take into consideration all the characteristics of the P-40, its range and endurance.” [59] Nevertheless, Tomahawks and Kittyhawks were used against the Germans. The 126th IAP flying on the Western and Kalinin fronts were the first to receive the P-40. The regiment entered action on 12 October 1941. By November 1941, that unit had shot down 17 German aircraft. However, Lt (SG) Smirnov noted that the P-40 armament was sufficient for strafing enemy lines but rather ineffective in aerial combat. Another pilot, S.G. Richnyy (of Soviet Union), remarked that he had to shoot half the ammunition at 50–100 meters (164–339 ft) to shoot down an enemy aircraft. [56]

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Actually, the P-40 could engage all Messerschmitts on equal terms, almost to the end of 1943. If you take into consideration all the characteristics of the P-40, then the Tomahawk was equal to the BI 109F and the Kittyhawk was slightly better. Its speed and vertical and horizontal manoeuvrability were good and fully competitive with enemy aircraft. Acceleration rate was a bit low, but when you got used to the engine, it was OK. We considered the P-40 a decent fighter plane. [59]
The P-40 was used by over two dozen countries during and after the war. The P-40 was used by Brazil, Egypt, Finland and Turkey. The last P-40s in military service, used by the Brazilian Air Force (FAB), were retired in 1954.

In the air war over Finland, several Soviet P-40s were shot down or had to crash-land due to other reasons. The Finns, short of good aircraft, collected these and managed to repair one P-40M, P-40M-10-CU 43-5925, white 23, which received Finnish Air Force serial number KH-51 (KH denoting "Kittyhawk", as the British designation of this type was Kittyhawk III). This aircraft was attached to an operational squadron HLeLv 32 of the Finnish Air Force, but lack of spares kept it on the ground, with the exception of a few evaluation flights.

Several P-40Ns were used by the Royal Netherlands East Indies Army Air Force with No. 120 (Netherlands East Indies) Squadron RAAF against the Japanese before being used during the fighting in Indonesia until February 1949. [92]

Variants and development stages

The P-40 (Curtiss Model 81A-1) was the first production variant, 199 built.

P-40A One P-40 was modified with a camera installation in the rear fuselage and re-designated P-40A. Revised versions of the P-40 soon followed: the P-40B or Tomahawk IIA had extra .30 in (7.62 mm) U.S., or .303 in (7.7 mm) machine guns in the wings and a partially protected fuel system; the P-40C or Tomahawk IIB added underbelly drop tank and bomb shackles, self-sealing fuel tanks and other minor revisions, but the extra weight did have a negative impact on aircraft performance. (All versions of the P-40 had relatively low power-to-weight ratio compared to contemporary fighters.)

Only a small number of P-40D or Kittyhawk Mk Is were made, less than 50. With a new, larger Allison engine, slightly narrower fuselage, redesigned canopy, and improved cockpit, the P-40D eliminated the nose-mounted .50 in (12.7 mm) guns and instead had a pair of .30 in (12.7 mm) guns in each wing. The distinctive chin air scoop grew larger so they could adequately cool the large Allison engine.

Retrospective designation for a single prototype. The P-40A was a single camera-carrying aircraft.

P-40E or P-40E-1 was similar in most respects to the P-40D, except for a slightly more powerful engine and an extra .50 in (12.7 mm) gun in each wing, bringing the total to six. Some aircraft also had small underwing bomb shackles. Supplied to the Commonwealth air forces as the Kittyhawk Mk IA. The P-40E was the variant that bore the brunt of air-to-air combat by the type in the key period of early to mid 1942, for example with the first US squadrons to replace the AVG in China (the AVG was already transitioning to this type from the P-40B/C), the type used by the Australians at Milne Bay, by the New Zealand squadrons during most of their air-to-air combat, and by the RAF/Commonwealth in North Africa as the Kittyhawk IA.

P-40F and P-40L, which both featured Packard V-1650 Merlin engine in place of the normal Allison, and thus did not have the carburetor scoop on top of the nose. Performance for these models at higher altitudes was better than their Allison-engined cousins. The L in some cases also featured a fillet in front of the vertical stabilizer, or a stretched fuselage to compensate for the higher torque. The P-40L, was sometimes nicknamed "Gypsy Rose Lee", after a famous stripper of the era, due to its stripped-down condition. Supplied to the Commonwealth air forces under the designation Kittyhawk Mk II, a total of 330 Mk Is were supplied to the RAF under Lend-Lease. The first 230 aircraft are sometimes known as the Kittyhawk Mk IIA. The P-40F/L was extensively used by U.S. fighter groups operating in the Mediterranean Theater.

P-40G : 43 P-40 aircraft fitted with the wings of the Tomahawk Mk IIA. A total of 16 aircraft were supplied to the Soviet Union, and the rest to the US Army Air Forces. It was later redesignated RP-40G.

P-40K, an Allison-engined P-40L, with the nose-top scoop retained and the Allison-configured nose radiators scoop, cow flaps and vertical-stabilizer-to-fuselage fillet. Supplied to the Commonwealth air forces as the Kittyhawk Mk III, it was widely used by US units in the CBI.

P-40M, version generally similar to the P-40K, with a stretched fuselage like the P-40L and powered by an Allison V-1710-81 engine giving better performance at altitude (compared to previous versions). It had some detail improvements and it was characterized by two small air scoops just before the exhaust pipes. Most of them were supplied to Allied countries (mainly UK and USSR), while some others remained in the USA for advanced training. It was also supplied to the Commonwealth air forces as the Kittyhawk Mk. III.

P-40N (manufactured 1943–44), the final production model. The P-40N featured a stretched rear fuselage to counter the torque of the larger, late-war Allison engine, and the rear deck of the cockpit behind the pilot was cut down at a moderate slant to improve rearward visibility. A great deal of work was also done to try and eliminate excess weight to improve the Warhawk’s climb rate. Early N production blocks dropped a .50 in (12.7 mm) gun from each wing, bringing the total back to four; later production blocks reintroduced it after complaints from units in the field. Supplied to Commonwealth air forces as the Kittyhawk Mk IV. A total of 553 P-40Ns were acquired by the Royal Australian Air Force, making it the variant most commonly used by the RAAF. Subvariants of the P-40N ranged widely in specialization from stripped down four-gun "hot rods" that could reach the highest top speeds of any production variant of the P-40 (up to 380 mph), to overweight types with all the extras intended for fighter-bombing or even training missions. The 15,000th P-40 was an N model decorated with the markings of 28 nations that had employed any of Curtiss-Wright's various aircraft products, not just P-40s. "These spectacular markings gave rise to the erroneous belief that the P-40 series had been used by all 28 countries." [93] Since the P-40N was by 1944 mainly as a ground attack aircraft in Europe, it was nicknamed B-40 by pilots. [94] Survivors redesignated as ZF-40N in June 1948.

P-40P : The designation of 1,500 aircraft ordered with V-1650-1 engines, but actually built as the P-40N with V-1710-81 engines.

XP-40Q with a 4-bladed prop, cut-down rear fuselage and bubble canopy, supercharger, squared-off wingtips and tail surfaces, and improved engine with two-speed supercharger was tested, but its performance was not enough of an improvement to merit production when compared to the contemporary late model P-47Ds and P-51Ds pouring off production lines. The XP-40Q was, however, the fastest of the P-40 series with a top speed of 422 mph (679 km/h) as a result of the introduction of a high-altitude supercharger gear. (No P-40 model with a single-speed supercharger could even approach 400 mph (640 km/h))

P-40R : The designation of P-40F and P-40L aircraft, converted into training aircraft in 1944.

RP-40 : Some American P-40s were converted into reconnaissance aircraft.

TP-40 : Some P-40s were converted into two-seat trainers.

Twin P-40 : Probably the most unusual variant, it was a P-40C outfitted in 1942 with a pair of 1,300 hp (969 kW) Packard V-1650-1 Merlin engines mounted atop the wings, over the main landing gear. [95]
Survivors

On 11 May 2012, a crashed P-40 was found in the Sahara desert. No trace of the pilot has been found to date. Due to the extreme arid conditions, little corrosion of the metal surfaces occurred. The conditions in which it was found are similar to those preferred for aircraft boneyard. Plans are being made to move the aircraft to a British museum. Of the 13,738 P-40s built, only 28 P-40s remain airworthy, with three of them being converted to dual-controls/dual-seat configuration. Approximately 13 aircraft are on static display and another 36 airframes are under restoration for either display or flight.

Notable P-40 pilots

- Jackie Cochran in the cockpit of a P-40 fighter aircraft. She was head of the Women Airforce Service Pilots (WASP).
- Nicky Barr: RAAF ace (11 victories); also a member of the Australian national rugby team.
- Gregory Boyington: AVG/US Marine Corps; later commanded USMC VMF-214, the "Black Sheep Squadron".
- Clive Caldwell: RAAF, highest-scoring P-40 pilot from any air force (22 victories); highest-scoring Allied pilot in North Africa; Australia’s highest-scoring ace in World War II (28.5 victories).
- Claire Chennault: commander, 1st American Volunteer Group (AVG; better known as the "Flying Tigers"), Chinese Air Force.
- Daniel H. David: USAF; later famous as the comedian and actor Dan Rowan; scored two victories and was wounded, while flying P-40s in the Southwest Pacific.
- Billy Drake: RAF, the leading British P-40 ace, with 13 victories.
- James Francis Edwards: RCAF, 15.75 victories (12 on the P-40); also wrote two books about British Commonwealth Kittyhawk pilots.
- Geoff Fisken: RNZAF, the highest scoring British Commonwealth ace in the Pacific theater (11 victories), including five victories in Kittyhawks.
- Jack Frost: SAAF, the highest scoring air ace in a South African unit, with 15 victories (seven on the P-40); missing in action since 16 June 1942.
- John Gorton: RAAF; Prime Minister of Australia, 1968–1971; flew Kittyhawks with No. 77 Squadron in New Guinea and was an instructor on the type.
- Bruce K. Holloway: AVG/USAAF, top-scoring US P-40 pilot (13 victories), along with John F. Hampshire; later a USAF general (four-star) and commander of Strategic Air Command.
- James H. Howard: AVG/USAAF, six victories in P-40s with the AVG; later awarded the Medal of Honor following a single action in a P-51 over Europe.
- Robert Lee Scott, Jr.: USAF; commander of the 23rd FG, China; more than 10 victories in P-40s.
- Kenneth M. Taylor: USAF; one of only two US pilots to get airborne (in a P-40) during the attack on Pearl Harbor (7 December 1941), during which he shot down two aircraft and was wounded in the arm.
- Keith Truscott: RAAF; pre-war star of Australian football; became an ace in the UK during 1941 while flying Spitfires; commanded a Kittyhawk squadron at the Battle of Milne Bay (New Guinea, 1942); killed in an accident in 1943 while flying a P-40.
- Boyd Wagner: USAF; while flying P-40s, Wagner became the first USAF ace of World War II (on 17 December 1941), during the Philippines Campaign.
- Len Waters: RAAF, the only Australian Aboriginal fighter pilot of World War II.
- George Welch: USAF; one of only two U.S. pilots to get airborne (in a P-40) during the attack on Pearl Harbor. Welch destroyed three Japanese aircraft that day.

Operators

Australia: Royal Australian Air Force
Brazil: Brazilian Air Force
Canada: Royal Canadian Air Force
China: Republic of China Air Force
Egypt: Royal Egyptian Air Force
Finland: Finnish Air Force
France: French Air Force
Indonesia: Indonesian Air Force
Empire of Japan: Japanese Army Air Force - Captured P-40s.
Netherlands: Royal Netherlands East Indies Army Air Force
New Zealand: Royal New Zealand Air Force
Poland
South Africa: South African Air Force
Soviet Union: Soviet Air Force, Soviet Naval Aviation
Turkey: Turkish Air Force
United Kingdom: Royal Air Force
United States: United States Army Air Corps, United States Army Air Forces
Specifications (Curtiss P-40 Warhawk)

General characteristics

Data from Dean's America's Hundred Thousand, page 235.

General characteristics

Crew: 1
Length: 31.67 ft (9.68 m)
Wingspan: 37.33 ft (11.38 m)
Height: 12.33 ft (3.76 m)
Wing area: 235.94 ft² (21.92 m²)
Airfoil: NACA2215 / NACA2209
Empty weight: 6,070 lb (2,753 kg)
Loaded weight: 8,280 lb (3,760 kg)
Max. takeoff weight: 8,810 lb (4,000 kg)
Powerplant: 1 × Allison V-1710-39 liquid-cooled V12 engine, 1,150 hp (858 kW)

Performance
Maximum speed: 360 mph (310 kn, 580 km/h)
Cruise speed: 270 mph (235 kn, 435 km/h)
Range: 650 mi (560 nmi, 1,100 km)
Service ceiling: 29,000 ft (8,800 m)
Rate of climb: 2,100 ft/min (11 m/s)
Wing loading: 35.1 lb/ft² (171.5 kg/m²)
Power/mass: 0.14 hp/lb (228 W/kg)

Armament
Guns: 6 × .50 in (12.7 mm) M2 Browning machine guns with 235 rounds per gun in the wings
Bombs: 250 to 1,000 lb (110 to 450 kg) bombs to a total of 2,000 lb (907 kg) on three hardpoints (one under the fuselage and two underwing)