

Bell P-39 Airacobra



1) Introduction

Le **P-39 Airacobra** est un chasseur américain de la **Seconde** Guerre mondiale construit par **Bell Aircraft Corporation**. Cet **avion** de conception très moderne (train tricycle) et aux caractéristiques prometteuses sur **papier** (verrière panoramique, armement de gros calibre dans l'axe peu courant aux États-Unis, moteur au milieu du **fuselage** très facilement accessible, entrée dans l'habitacle par une portière d'auto évitant les acrobaties habituelles, enfin bonnes performances générales) se révéla particulièrement décevant par son infériorité manifeste contre les chasseurs ennemis sur tous les fronts où il fut engagé (très vite en appui au sol plutôt qu'en chasseur) : Méditerranée, Pacifique, Russie.

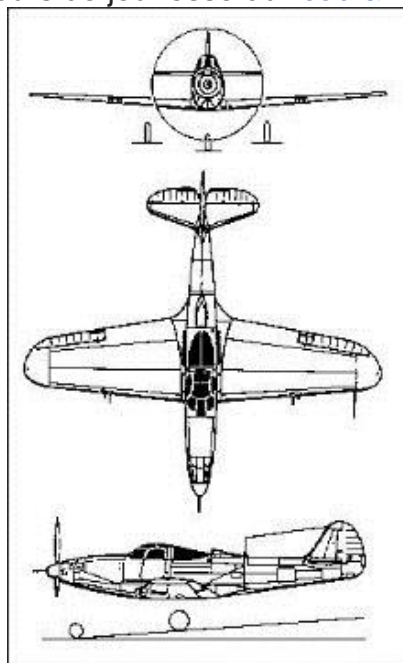


II) Engagements

Il fut utilisé pendant la Seconde Guerre mondiale avec des résultats médiocres par les Américains dans le Pacifique, puis avec une relative efficacité par les Français en **Afrique du Nord** et Italie (pour l'appui au sol et non la chasse) et surtout par les Soviétiques (qui reçurent la majorité de la production) qui appréciaient beaucoup sa puissance de **feu** en couverture à basse et **moyenne altitude** (5000 m) où il savait se montrer particulièrement percutant en attaque au sol ou contre des bombardiers. Les Britanniques en avaient commandé pour la RAF qui, en ayant équipé une escadrille, l'envoya contre la **Luftwaffe**. Les résultats ne furent pas spécialement mauvais mais la maintenance des appareils et les rapports des pilotes britanniques au sujet de son comportement en vol firent que l'escadrille en question fut immédiatement retirée du combat et rééquipée en Spitfires V.



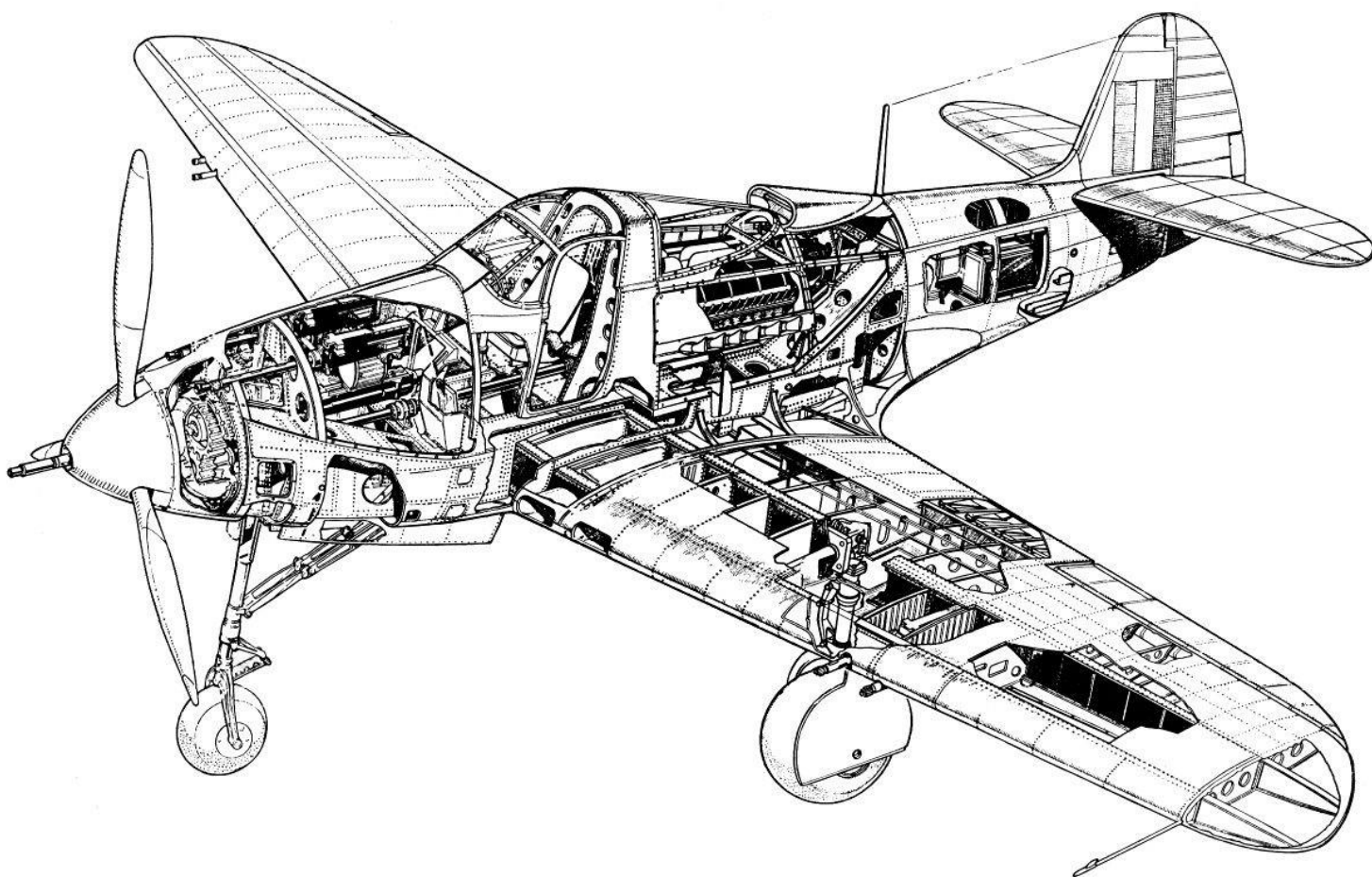
Les Américains firent une expérience analogue avec les mêmes résultats. Ils ne virent dès lors aucun inconvénient à livrer le gros de la production (car l'important plan industriel de fabrication établi pour le P-39 tournait alors à plein régime) à des alliés moins regardants comme l'URSS, la France puis l'Italie de Badoglio. Les Américains ne voulurent même pas engager au combat sous leurs couleurs le P-63 Kingcobra, successeur très amélioré du P-39 qui ne combattit que sous d'autres couleurs (France, en Indochine) malgré le fait que les erreurs de jeunesse du "cobra" avaient été corrigées.



III) Autres caractéristiques

Doté d'une construction originale (l'entrée dans le cockpit se fait par une porte), son moteur est situé derrière le pilote. Cette configuration offrait de nombreux avantages :

- l'espace libéré dans le nez permet un train d'atterrissage tricycle moderne offrant une excellente visibilité au pilote et améliorait la sécurité lors des manœuvres de décollage, atterrissage et roulage au sol (les autres avions de chasse, mis à part le Messerschmitt Me 262, avaient la vue avant totalement masquée, au point que certains devaient se laisser guider par un mécanicien couché sur l'aile lors du roulage au sol...)
- l'espace libéré dans le nez permet d'embarquer un armement puissant (canon de 37 mm tirant du milieu de l'hélice),
- la position arrière du moteur permet de placer le centre de gravité au milieu de l'appareil offrant ainsi une excellente maniabilité cependant limitée par la tendance à partir en vrille



L'appareil souffrait toutefois d'un manque de puissance à haute altitude car le turbo qui existait sur le prototype n'a pas été installé sur la production.

IV) Variantes

XP-39

Premier prototype, désarmé.

YP-39

appareils de présérie avec un moteur Allison V-1710-37 (E5) de 1 090cv (12 exemplaires)

YP-39A

Prévu avec un moteur de haute altitude Allison V-1710-31 de 1 150cv, mais finalement livré avec le même moteur que le YP-39. 1 construit.

XP-39B

Version profilée du XP-39 basée sur les essais en soufflerie du NACA concernant la [canopée](#) et les volets de trappe du train d'atterrissage. [Déplacement](#) de la prise d'[air](#) du radiateur et du bouchon de réservoir du [fuselage](#) à la base des ailes, augmentation de la [longueur](#) de l'appareil de 34 cm, raccourcissement de l'[envergure](#) de 34 cm. Turbocompresseur remplacé par un supercompresseur et moteur Allison V-1710-37 (E5), réglé pour 4 000m.

P-39C

Première version de série, identique au YP-39 excepté pour le moteur V-1710-35 de 1 150cv. Armé avec un canon de 37 mm, de 2 mitrailleuses de calibre 0.50 (12,7 mm) et 2 de calibre 0.30. Les premiers avions étaient sans blindage ou réservoir auto-obstruant.(20 exemplaires)

P-45

Désignation initialement retenue pour le P-39C

P-39D

réservoir autoétanche (863 exemplaires)

P-39F

[hélice](#) Aeroproducts (229 exemplaires)

P-39J

moteur Allison V-1710-59 (25 exemplaires)

P-39K

moteur Allison V-1710-63 (210 exemplaires)

P-39M

moteur Allison v-1710-83 (250 exemplaires)

P-39N

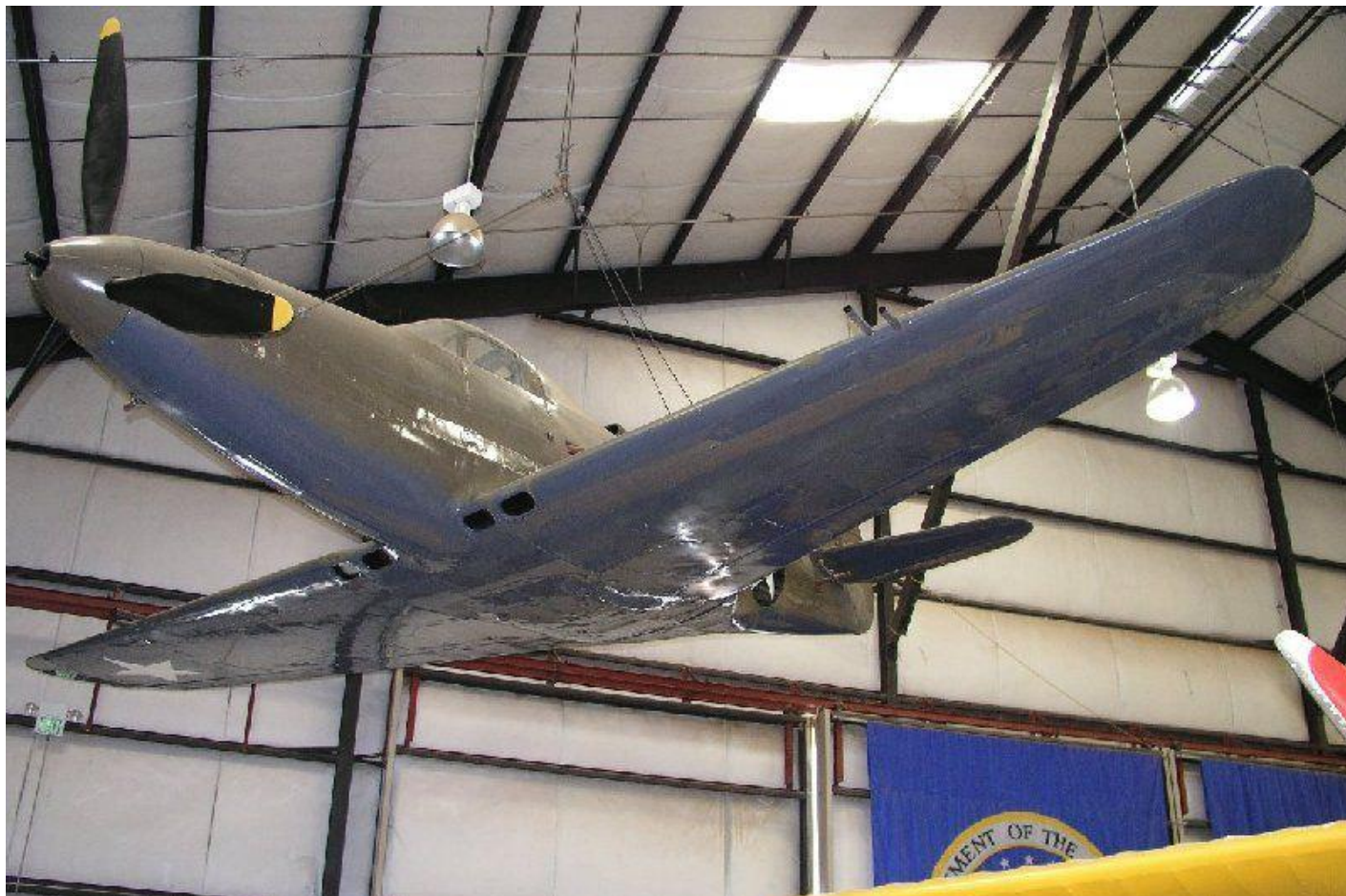
moteur Allison V-1710-85 (2 095 exemplaires)

P-39L

[hélice](#) Curtiss (250 exemplaires)

P-39O

[avion](#) d'attaque au sol



The **Bell P-39 Airacobra** is a [fighter](#) produced by [Bell Aircraft](#) for the [United States Army Air Forces](#) during [World War II](#). It was one of the principal American fighters in service when the [United States](#) entered combat. The P-39 was used by the [Soviet Air Force](#), and enabled individual Soviet pilots to collect the highest number of kills attributed to any U.S. fighter type flown by any air force in any conflict.^[N 2] Other major users of the type included the [Free French](#), the [Royal Air Force](#), and the [Italian Co-Belligerent Air Force](#).^[4] It had an unusual layout, with the engine installed in the center fuselage, behind the pilot, and driving a [tractor propeller](#) in the nose with a long shaft. It was also the first fighter fitted with a [tricycle undercarriage](#).^[5] Although its mid-engine placement was innovative, the P-39 design was handicapped by the absence of an efficient [turbo-supercharger](#), preventing it from performing high-altitude work. For this reason it was rejected by the RAF for use over western Europe but adopted by the USSR, where most air combat took place at medium and lower altitudes. Together with the derivative [P-63 Kingcobra](#), the P-39 was one of the most successful fixed-wing aircraft manufactured by Bell.^[6]

Design and development

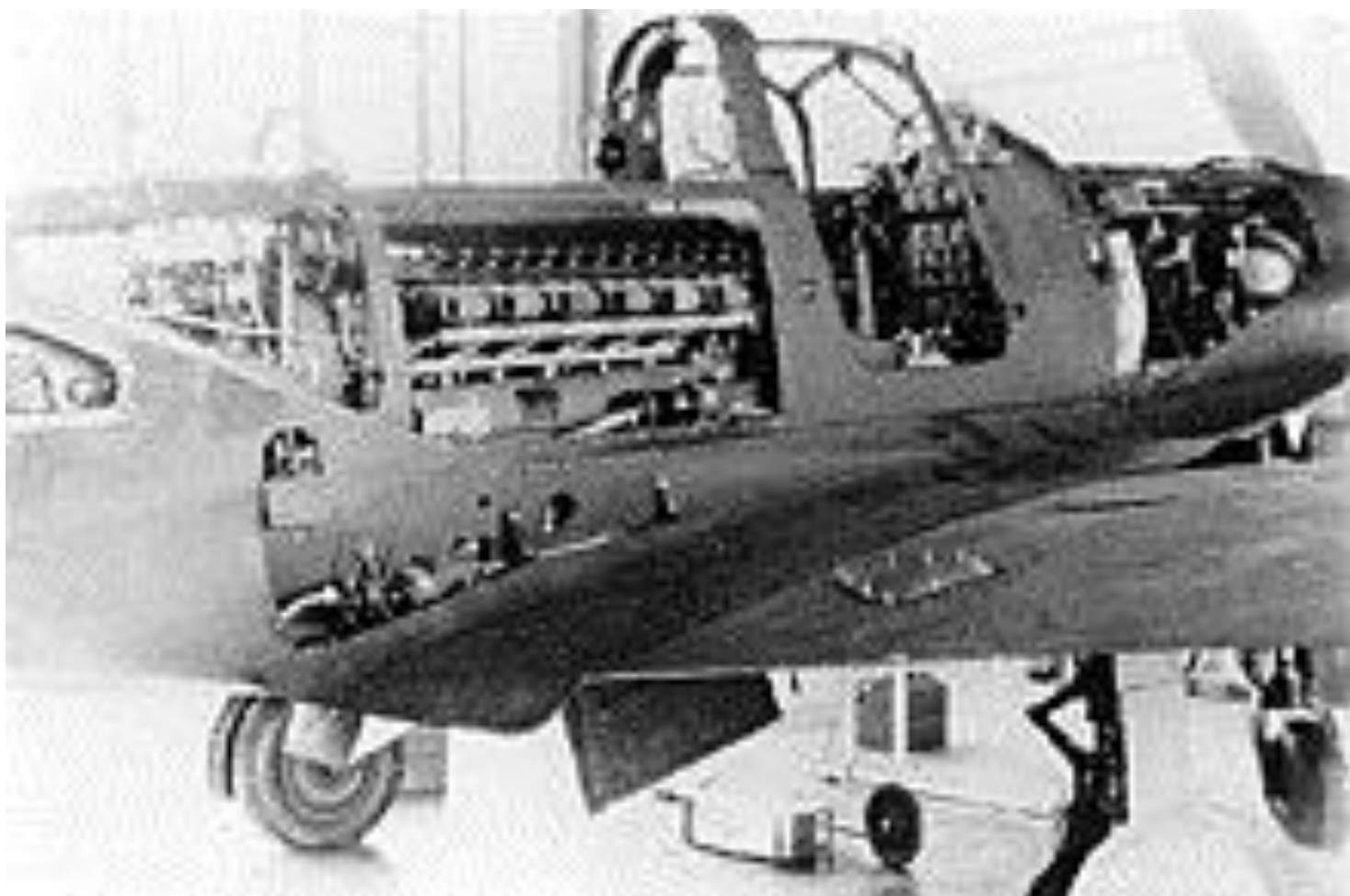
Circular Proposal X-609

In February 1937, Lieutenant [Benjamin S. Kelsey](#), Project Officer for Fighters at the [United States Army Air Corps](#) (USAAC), and Captain [Gordon P. Saville](#), fighter tactics instructor at the [Air Corps Tactical School](#), issued a specification for a new fighter via **Circular Proposal X-609**.^[7] It was a request for a single-engine high-altitude "[interceptor](#)" having "the tactical mission of interception and attack of hostile aircraft at high altitude".^[8] Despite being called an interceptor, the proposed aircraft's role was simply an extension of the traditional [pursuit \(fighter\)](#) role, using a heavier and more powerful aircraft at higher altitude. Specifications called for at least 1,000 lb (450 kg) of heavy armament including a cannon, a liquid-cooled Allison engine with a [General Electric turbo-supercharger](#), [tricycle landing gear](#), a level airspeed of at least 360 mph (580 km/h) at altitude, and a climb to 20,000 ft (6,100 m) within 6 minutes.^[9] This was the most demanding set of fighter specifications USAAC had presented to that date.^[N 3] Although Bell's limited fighter design work had previously resulted in the unusual [Bell YFM-1 Airacuda](#), the **Model 12**^[11] proposal adopted an equally original configuration with an [Allison V-12](#) engine mounted in the middle of the [fuselage](#), just behind the cockpit, and a propeller driven by a shaft passing beneath the pilot's feet under the cockpit floor.^[11]



Bell XP-39 showing the position of the supercharger air intake

The main purpose of this configuration was to free up space for a 37 mm [Browning Arms Company T9 cannon](#), later produced by [Oldsmobile](#), firing through the center of the propeller hub for optimum accuracy and stability. This happened because H.M. Poyer, designer for project leader Robert Woods, was impressed by the power of this weapon and pressed for its incorporation. This was unusual, because fighter design had previously been driven by the intended engine, not the weapon system. Although devastating when it worked, the T9 had very limited ammunition, a low rate of fire, and was prone to jamming.^{[12][13]} A secondary benefit of the mid-engine arrangement was that it created a smooth and streamlined nose profile. Much was made of the fact that this resulted in a configuration "with as trim and clean a fuselage nose as the snout of a high velocity bullet".^[14] Entry to the cockpit was through side doors (mounted on both sides of the cockpit) rather than a sliding canopy. Its unusual engine location and the long drive shaft caused some concern to pilots at first, but experience showed this was no more of a hazard in a crash landing than with an engine located forward of the cockpit. There were no problems with propeller shaft failure.



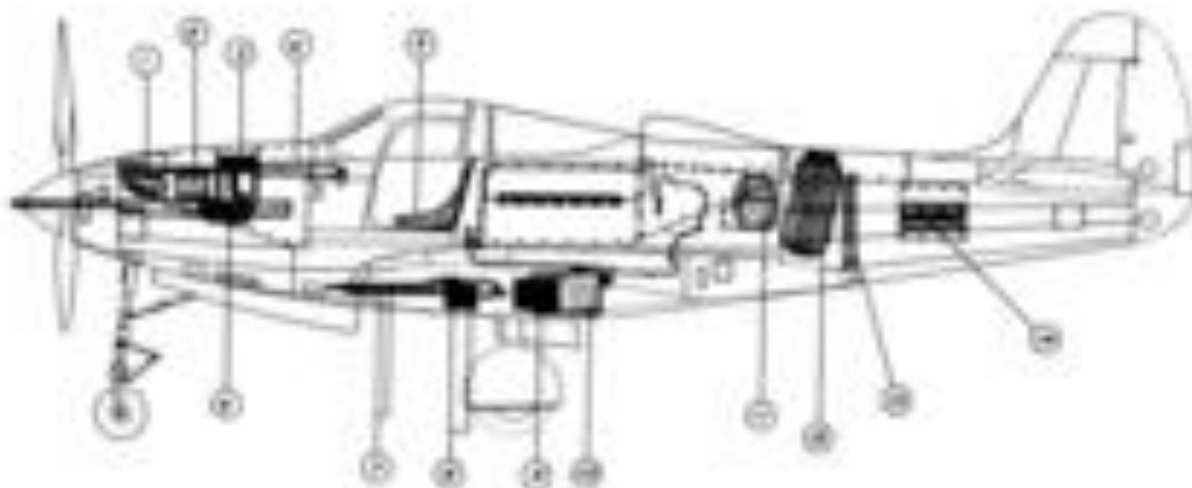
Bell P-39 Airacobra center fuselage detail with maintenance panels open

XP-39 developments

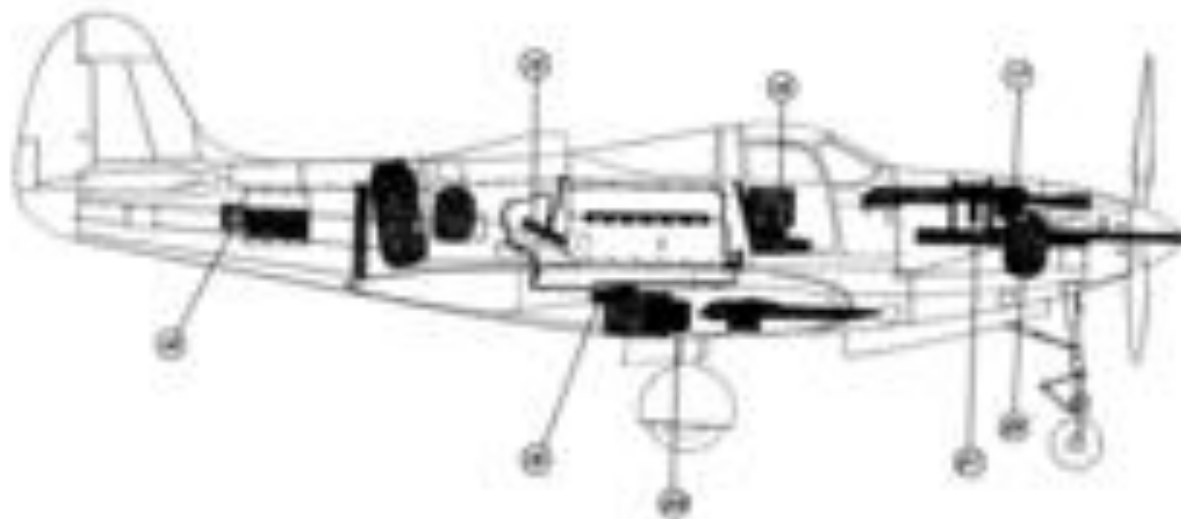
The XP-39 made its maiden flight on 6 April 1938.^[1] at [Wright Field, Ohio](#), achieving 390 mph (630 km/h) at 20,000 ft (6,100 m), reaching this altitude in only five minutes.^[15] However, the XP-39 was found to be short on performance at altitude. Flight testing had found its top speed at 20,000 ft (6,100 m) to be lower than the 400 mph (640 km/h) of the original proposal.^[2] As originally specified by Kelsey and Saville, the XP-39 had a turbo-supercharger to augment its high-altitude performance. Bell cooled the turbo with a scoop on the left side of the fuselage.^[16] Kelsey wished to shepherd the XP-39 through its early engineering teething troubles, but he was ordered to England. The XP-39 project was handed over to others, and in June 1939 the prototype was ordered by General [Henry H. Arnold](#) to be evaluated in [NACA](#) wind tunnels to find ways of increasing its speed, by reducing parasitic drag.^[17]

Tests were carried out, and Bell engineers followed the recommendations of NACA and the Army to reduce drag such that the top speed was increased 16%.^[17] NACA wrote, "it is imperative to enclose the supercharger within the airplane with an efficient duct system for cooling the rotor and discharging the cooling air and exhaust gases."^[18] In the very tightly planned XP-39, though, there was no internal space left over for the turbo. Using a drag-buildup scheme, a number of potential areas of drag reduction were found. NACA concluded that a top speed of 429 mph (690 km/h) could be realized with the aerodynamic improvements they had developed and an updated V-1710 with only a single-stage, single-speed supercharger.^[19] At a pivotal meeting with the USAAC and NACA in August 1939, Larry Bell proposed that the production P-39 aircraft be configured without the turbocharger.^[20] Some historians have questioned Bell's true motivation in reconfiguring the aircraft. The strongest hypothesis is that Bell's factory did not have an active production program and he was desperate for cash flow. Other historians mention that wind tunnel tests made the designers believe the turbocharger installation was so aerodynamically cluttered that it had more disadvantages than advantages.^{[21][22]} The Army ordered 12 YP-39s (with only a single-stage, single-speed supercharger) for service evaluation^[23] and one YP-39A. After these trials were complete, which resulted in detail changes including deletion of the external radiator,^{[23][24]} and on advice from [NACA](#),^[23] the prototype was modified as the **XP-39B**; after demonstrating a performance improvement,^[23] the 13 YP-39s were completed to this standard, adding two 0.30 in (7.62 mm) machine guns to the two existing 0.50 in (12.7 mm) guns.^[23] Lacking armor or self-sealing fuel tanks, the prototype was 2,000 lb (910 kg) lighter than the production fighters.^[25] The production P-39 retained a single-stage, single-speed supercharger with a critical altitude (above which performance declined) of about 12,000 ft (3,660 m).^[26] As a result, the aircraft was simpler to produce and maintain. However, the removal of the turbo destroyed any chance that the P-39 could serve as a high-altitude front-line fighter. When deficiencies were noticed in 1940 and 1941, the lack of a turbo made it nearly impossible to improve upon the Airacobra's performance.^[N 4] The removal of the turbocharger and its drag-inducing inlet cured the drag problem but reduced performance overall.^[18] In later years, Kelsey expressed regret at not being present to override the decision to eliminate the turbo.^[28] After completing service trials, and originally designated **P-45**, a first order for 80 aircraft was placed 10 August 1939; the designation reverted to P-39C before deliveries began. After assessing aerial combat conditions in Europe, it was evident that without armor or self-sealing tanks, the 20 production P-39Cs were not suitable for operational use. The remaining 60 machines in the order were built as P-39Ds with armor, self-sealing tanks and enhanced armament. These P-39Ds were the first Airacobras to enter into service with the Army Air Corps units and would be the first ones to see action.^[23]

Technical details



- | | |
|---|---|
| 1. OIL TANK, REDUCTOR, GEAR BOX | 12. OIL TANK |
| 2. BALL TANK | 13. MISHING KIT |
| 3. 37 mm AMMUNITION BIN | 14. RADIO |
| 4. 30 CALIBER MACHINE GUNS | 15. ENGINE TANK KIT |
| 5. PILOT'S SEAT | 16. MAP CASE |
| 6. OXYGEN SUPPLY TANK | 17. BATTERY |
| 7. 30 CALIBER MACHINE GUNS | 18. FUEL TANK KIT |
| 8. AMMUNITION BIN—30 CALIBER | 19. AIRPLANE TANK KIT |
| 9. OIL TEMPERATURE REGULATOR, LEFT HAND | 20. OIL TEMPERATURE REGULATOR, RIGHT HAND |
| 10. CONSTANT RADATOR | 21. 37 mm CANNON |
| 11. PRESSURE TANK | 22. OIL TANK (DUAL INSTALLATION) |



Bell P-39K-L internal layout from *Pilot's Flight Operating Instructions P-39K-1 and P-39L-1 (T.O. No. 01-110FG-1)*

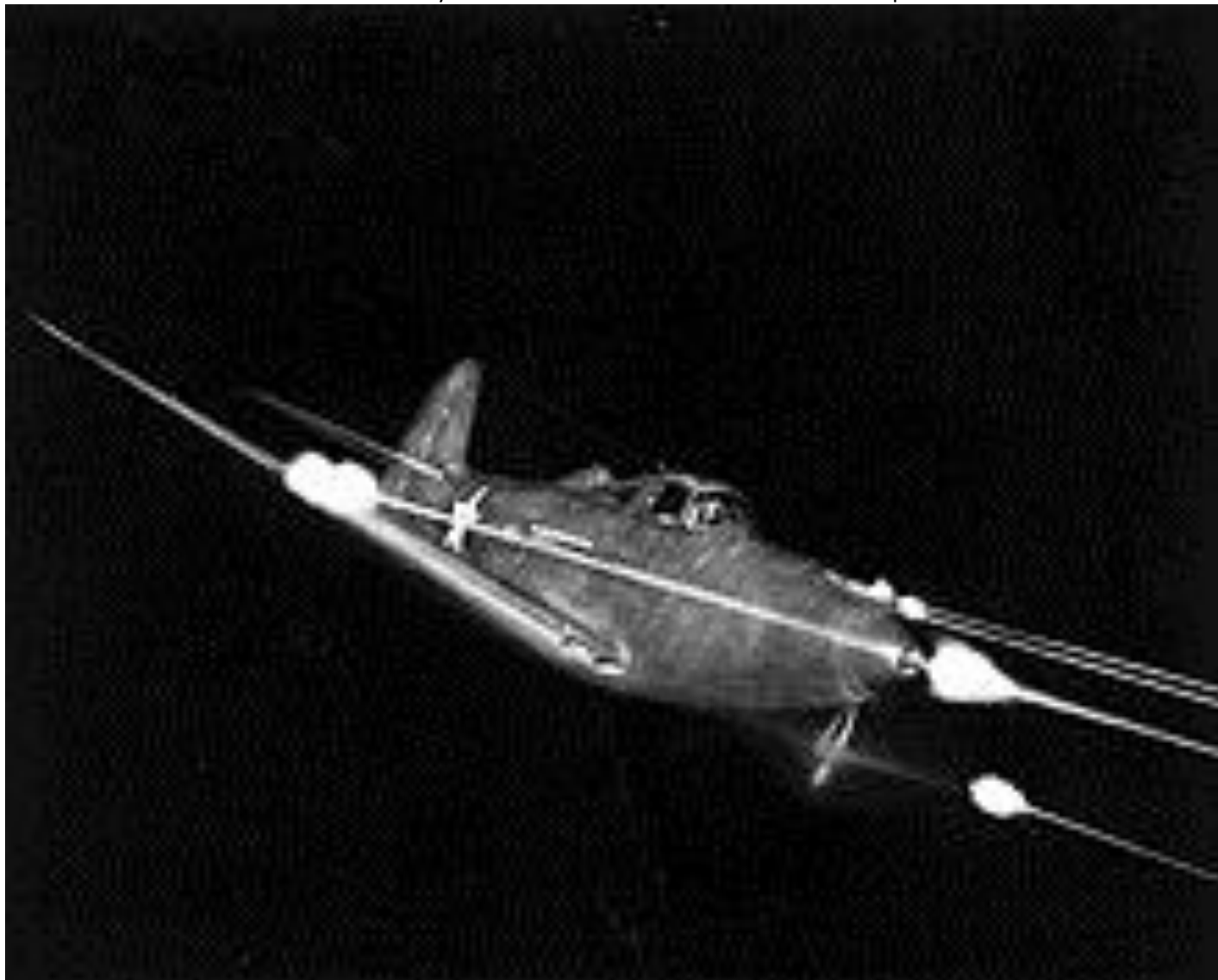
The P-39 was an all-metal, low-wing, single-engine fighter, with a tricycle undercarriage and an [Allison V-1710](#) liquid-cooled V-12 engine mounted in the central fuselage, directly behind the cockpit. The Airacobra was one of the first production fighters to be conceived as a "weapons system"; in this case the aircraft (known originally as the Bell Model 4) was designed to provide a platform for the [37 mm T9 cannon](#).^[29] This weapon, which was designed in 1934 by the American Armament Corporation, a division of [Oldsmobile](#), fired a 1.3 lb (0.59 kg) projectile capable of piercing .8 in (20 mm) of armor at 500 yd (460 m) with [armor-piercing](#) rounds.

The 90-inch-long (2.3 m), 200 lb (90 kg) weapon had to be rigidly mounted and fire parallel to and close to the centerline of the new fighter. It would have been impossible to mount the weapon in the fuselage, firing through the cylinder banks of the [Vee-configured engine](#) and the propeller hub as could be done with smaller 20 mm cannon. Weight, balance and visibility considerations meant that the cockpit could not be placed farther back in the fuselage, behind the engine and cannon.^[29] The solution adopted was to mount the cannon in the forward fuselage and the engine in the center fuselage, directly behind the pilot's seat. The tractor propeller was driven with a 10-foot-long (3.0 m) drive shaft made in two sections, incorporating a self-aligning bearing to accommodate fuselage deflection during violent maneuvers. This shaft ran through a tunnel in the cockpit floor and was connected to a gearbox in the nose of the fuselage which, in turn, drove the three- or (later) four-bladed propeller by way of a short central shaft. The gearbox was provided with its own lubrication system, separate from the engine; in later versions of the Airacobra the gearbox was provided with some armor protection.^[29] The [glycol-cooled radiator](#) was fitted in the wing center section, immediately beneath the engine; this was flanked on either side by a single drum-shaped oil cooler. Air for the radiator and oil coolers was drawn in through intakes in both wing-root leading edges and was directed via four ducts to the radiator faces. The air was then exhausted through three controllable hinged flaps near the trailing edge of the center section. Air for the [carburetor](#) was drawn in through a raised oval intake immediately aft of the rear canopy.^{[30][31]} The fuselage structure was unusual and innovative, being based on a strong central keel that incorporated the armament, cockpit, and engine. Two strong fuselage beams to port and starboard formed the basis of the structure. These angled upwards fore and aft to create mounting points for the T9 cannon and propeller reduction gearbox and for the engine and accessories respectively. A strong arched bulkhead provided the main structural attachment point for the main spar of the wing. This arch incorporated a fireproof panel and an armor plate between the engine and the cockpit. It also incorporated a turnover pylon and a pane of bullet-resistant glass behind the pilot's head. The arch also formed the basis of the cockpit housing; the pilot's seat was attached to the forward face as was the cockpit floor. Forward of the cockpit the fuselage nose was formed from large removable covers. A long nose wheel well was incorporated in the lower nose section. The engine and accessories were attached to the rear of the arch and the main structural beams; these too were covered using large removable panels. A conventional semi-monocoque rear fuselage was attached aft of the main structure.^{[30][N 5]}



The weapons bay of the P-39

Because the pilot was above the extension shaft, he was placed higher in the fuselage than in most contemporary fighters, which, in turn gave the pilot a good field of view.^[29] Access to the cockpit was by way of sideways opening "car doors", one on either side. Both had wind-down windows. As only the right-hand door had a handle both inside and outside this was used as the normal means of access and egress. The left-hand door could be opened only from the outside and was for emergency use, although both doors could be jettisoned. In operational use, as the roof was fixed, the cockpit design made escape difficult in an emergency.^[32] The complete armament fit consisted of the T9 cannon with a pair of [Browning M2 .50 in \(12.7 mm\) machine guns](#) mounted in the nose. This changed to two .50 caliber and two .30 in (7.62 mm) guns in the XP-39B (P-39C, Model 13, the first 20 delivered) and two .50s and four .30s (all four in the wings) in the P-39D (Model 15), which also introduced self-sealing tanks and shackles (and piping) for a 500 lb (230 kg) bomb or drop tank.^[23] Because of the unconventional layout, there was no space in the fuselage to place a fuel tank. Although drop tanks were implemented to extend its range, the standard fuel load was carried in the wings, with the result that the P-39 was limited to short-range tactical strikes.^[33] A heavy structure, and around 256 lb (116 kg) of armor, were characteristic of this aircraft as well. The production P-39's heavier weight combined with the Allison engine with only a single-stage, single-speed supercharger, limited high-altitude performance, which was markedly inferior to contemporary European fighters and, as a result, the first USAAF fighter units in the [European Theater](#) were equipped with the [Spitfire V](#). However, the P-39D's roll rate was 75°/s at 235 mph (378 km/h)—better than the [A6M2](#), [F4F](#), or [P-38](#) up to 265 mph (426 km/h).^[34] Above the supercharger's peak altitude of about 12,000 ft (3,660 m), performance dropped off rapidly, limiting usefulness in traditional fighter missions in Europe as well as in the Pacific, where it was not uncommon for Japanese bombers to attack from above the P-39's ceiling (which in the tropical heat was lower than in cooler climates). The late production N and Q models, which made up 75% of Airacobras built, could maintain a top speed of 375 mph (604 km/h) up to 20,000 ft (6,100 m). Weight distribution could result in it entering a dangerous [flat spin](#), a characteristic Soviet test pilots demonstrated to the skeptical manufacturer, which had been unable to reproduce the effect. It was determined the spin could only be induced if the aircraft was flown with no ammunition in the nose. The flight manual noted a need to ballast the front ammunition compartment to achieve a reasonable [center of gravity](#). High-speed controls were light, consequently high-speed turns and pull-outs were possible. The P-39 had to be held in a dive since it tended to level out and the recommended never-exceed dive speed limit ([Vne](#)) was 475 mph (764 km/h).^[35] Soon after entering service, pilots began to report that "during flights of the P-39 in certain maneuvers, it tumbled end over end." Most of these events happened after the aircraft was stalled in a nose high attitude with considerable power applied. Bell pilots made 86 separate efforts to reproduce the reported tumbling characteristics. In no case were they able to tumble it. In his autobiography veteran test and airshow pilot [R.A. "Bob" Hoover](#) provides an account of tumbling a P-39. He goes on to say that in hindsight, he was actually performing a [Lomcovak](#), a now-common airshow maneuver, which he was also able to do in a [Curtiss P-40](#).^[36] ^[N 6] A study of its spinning characteristics was conducted in the [NASA Langley Research Center](#) 20-foot (6 m) Free-Spinning Tunnel during the 1970s. A study of old reports showed that during earlier tests the aircraft never tumbled. However, it was noted that all testing had been done with a simulated full ammunition load, which moved the center of gravity forward. After finding the original spin test model of the P-39 in storage, the new study first duplicated the earlier tests, with consistent results. Then, the model was re-ballasted to simulate a condition with no ammunition load, which moved the aircraft's center of gravity aft. Under these conditions, the model was found to tumble.^[38] The rear-mounted engine was less likely to be hit when attacking ground targets, but was vulnerable to attacks from above and behind. At its upper altitude limits, the Airacobra was out-performed by many enemy aircraft.^[39]



Bell P-39 Airacobra firing all weapons at night

Service and versions

In September 1940, Britain ordered 386 P-39Ds (Model 14), with a 20 mm [Hispano-Suiza HS.404](#) and six [.303 in \(7.7 mm\)](#) instead of a 37 mm cannon and six .30 caliber guns. The RAF eventually ordered 675 P-39s. However, after the first Airacobras arrived at [601 Squadron RAF](#) in September 1941, they were found to have an inadequate rate of climb and performance at altitude for Western European conditions. Only 80 were operated, all by 601 Squadron. Britain transferred about 200 P-39s to the Soviet Union. Another 200 examples intended for the RAF were taken up by the [USAAF](#) after the [attack on Pearl Harbor](#) as the **P-400**, and were sent to the [Fifth Air Force](#) in Australia, for service in the [South West Pacific Theatre](#).^[40] By the date of the [Pearl Harbor](#) attack, nearly 600 P-39s had been built. When P-39 production ended in August 1944, Bell had built 9,558^{[23][24]} Airacobras, of which 4,773 (mostly -39N and -39Q^[23]) were sent to the Soviet Union through the [Lend-Lease program](#). There were numerous minor variations in engine, propeller, and armament, but no major structural changes in production types, excepting a few two-seat TP-39F and RP-39Q trainers.^{[41][N.7]} In addition, seven went to the [U.S. Navy](#) as radio-controlled [drones](#). Trials of a [laminar flow](#) wing (in the XP-39E) and [Continental](#) IV-1430 engine (the P-76) were unsuccessful.^[23] The mid-engine, gun-through-hub concept was developed further in the [Bell P-63 Kingcobra](#). A naval version with tailwheel landing gear, the [XFL-1 Airabonita](#), was ordered as a competitor to the [Vought F4U Corsair](#) and [Grumman XF5F Skyrocket](#). It first flew 13 May 1940,^[23] but after a troublesome and protracted development and testing period, it was rejected.



Bell P-39Q

Operational history

The Airacobra saw combat throughout the world, particularly in the Southwest Pacific, Mediterranean and Soviet theaters. Because its engine was equipped with only a single-stage, single-speed supercharger, the P-39 performed poorly above 17,000 feet (5,200 m) altitude. In both western Europe and the Pacific, the Airacobra found itself outclassed as an interceptor and the type was gradually relegated to other duties.^[5] It often was used at lower altitudes for such missions as ground strafing.

United Kingdom

In 1940, the [British Direct Purchase Commission](#) in the U.S. was looking for combat aircraft; they ordered 675 of the export version Bell Model 14 as the "**Caribou**" on the strength of the company's representations on 13 April 1940. The British armament was two nose-mounted .50 caliber machine guns and four .303 caliber [Browning machine guns](#) in the wings. The 37 mm gun was replaced by a 20 mm [Hispano-Suiza cannon](#). British expectations had been set by performance figures established by the unarmed and unarmored XP-39 prototype. The British production contract stated that a maximum speed of 394 mph (634 km/h) +/- 4% was required at rated altitude.^[42] In acceptance testing, actual production aircraft were found to be capable of only 371 mph (597 km/h) at 14,090 ft (4,290 m). To enable the aircraft to make the guarantee speed, a variety of drag-reduction modifications were developed by Bell. The areas of the elevator and rudder were reduced by 14.2% and 25.2% respectively. Modified fillets were installed in the tail area. The canopy glass was faired to its frame with putty. The gun access doors on the wing had been seen to bulge in flight, so they were replaced with thicker aluminum sheet. Similarly, the landing gear doors deflected open by as much as two inches at maximum speed, so a stronger linkage was installed to hold them flush. The cooling air exit from the oil and coolant radiators was reduced in area to match the exit velocity to the local flow. New engine exhaust stacks, deflected to match the local flow and with nozzles to increase thrust augmentation, were installed. The machine gun ports were faired over, the antenna mast was removed, a single-piece engine cowling was installed and an exhaust stack fairing was added.



601 Squadron Airacobra I. The long-barrelled [20 mm Hispano-Suiza cannon](#) Hispano is clearly shown, as are the .303 wing guns.

The airframe was painted with 20 coats of primer, with extensive sanding between coats. Standard camouflage was applied and sanded to remove the edges between the colors. Additionally, about 200 lb (91 kg) of weight was removed, making it lighter than normal (7,466 lb (3,387 kg) gross).^[43] After these modifications, the second production aircraft ([serial AH 571](#)) reached a speed of 391 mph (629 km/h) at 14,400 ft (4,400 m) in flight test. As this speed was within 1% of the guarantee, the aircraft was declared to have satisfied contractual obligations.^[42] Despite the success of these modifications, none were applied to other production P-39s. Later testing of a standard production P-400 by the British [Aeroplane and Armament Experimental Establishment](#) (A&AEE) revealed a top speed of only 359 mph (578 km/h).^[44] The British export models were renamed "**Airacobra**" in 1941. A further 150 were specified for delivery under [Lend-Lease](#) in 1941 but these were not supplied. The [Royal Air Force](#) (RAF) took delivery in mid-1941 and found that performance of the non-turbo-supercharged production aircraft differed markedly from what they were expecting.^[45] In some areas, the Airacobra was inferior to existing aircraft such as the [Hawker Hurricane](#) and [Supermarine Spitfire](#) and its performance at altitude suffered drastically. Tests by the [Royal Aircraft Establishment](#) at [Boscombe Down](#) showed the Airacobra reached 355 mph (571 km/h) at 13,000 ft (4,000 m).^[46] The cockpit layout was criticized, and it was noted that the pilot would have difficulty in bailing out in an emergency because the cockpit roof could not be jettisoned.

The lack of a clear vision panel on the windscreen assembly meant that in the event of heavy rain the pilot's forward view would be obliterated; the pilot's notes advised that in this case the door windows would have to be lowered and the speed reduced to 150 mph (240 km/h)^[47] On the other hand, it was considered effective for low level fighter and ground attack work. Problems with gun- and exhaust-flash suppression and the compass could be fixed. [No. 601 Squadron RAF](#) was the only British unit to use the Airacobra operationally, receiving their first two examples on 6 August 1941. On 9 October, four Airacobras attacked enemy barges near Dunkirk, in the type's only operational action with the RAF. The squadron continued to train with the Airacobra during the winter, but a combination of poor serviceability and deep distrust of this unfamiliar fighter resulted in the RAF rejecting the type after one combat mission.^[4] In March 1942, the unit re-equipped with Spitfires. The Airacobras already in the UK, along with the remainder of the first batch being built in the US, were sent to the Soviet Air force, the sole exception being [AH574](#), which was passed to the [Royal Navy](#) and used for experimental work, including the first carrier landing by a tricycle undercarriage aircraft on 4 April 1945 on [HMS Pretoria Castle](#),^[48] until it was scrapped on the recommendation of a visiting Bell test pilot in March 1946.^[49]

U.S. Army Air Forces

Pacific



72nd Tactical Recon Group P-39, c. 1942

The United States requisitioned 200 of the aircraft being manufactured for the UK, adopting them as P-400s (named for the advertised top speed of 400 mph (640 km/h)). After the [attack on Pearl Harbor](#), the P-400 was deployed to training units, but some saw combat in the Southwest Pacific including with the [Cactus Air Force](#) in the [Battle of Guadalcanal](#).^[50] Though outclassed by Japanese fighter aircraft, it performed well in strafing and bombing runs, often proving deadly in ground attacks on Japanese forces trying to retake [Henderson Field](#). Guns salvaged from P-39s were sometimes fitted to Navy [PT boats](#) to increase firepower.

Pacific pilots often complained about problems of performance and unreliable armament, but by the end of 1942, the P-39 units of the Fifth Air Force had claimed about 80 Japanese aircraft, with a similar number of P-39s lost. Fifth and Thirteenth Air Force P-39s did not score more aerial victories in the Solomons due to the aircraft's limited range and poor high altitude performance. Airacobras first fought Japanese Zeros on 30 April 1942 in a low level action near Lae, New Guinea. From May to August 1942 combat between Airacobras and Zeros took place on a regular basis over New Guinea. Compilation of combat reports indicates the Zero was either equal to or close to the P-39 in speed at the altitudes of the various low level encounters. From September to November 1942 pilots of the [57th Fighter Squadron](#) flew P-39s and P-38s from an airfield built on land bulldozed into [Kuluk Bay](#) on the barren island of [Adak](#) in Alaska's [Aleutian Islands](#). They attacked the Japanese forces that had invaded Attu and Kiska islands in the Aleutians in June 1942. The factor that claimed the most lives was not the Japanese but the weather. The low clouds, heavy mist and fog, driving rain, snow, and high winds made flying dangerous and lives miserable. The 57th remained in Alaska until November 1942, then returned to the United States.



USAAF P-40 of 80th Fighter Squadron "Headhunters," 8th Fighter Group

While Lt. Bill Fiedler was the only American pilot to become an ace in a P-39, many later U.S. aces scored one or two of their victories in the type. The Airacobra's low-altitude performance was good and its firepower was impressive; regardless, it soon became a joke in the Pacific Theatre that a P-40 was a P-40 with a Zero on its tail.^[51]

Mediterranean

In North Africa, the [99th Fighter Squadron](#) (also known as the [Tuskegee Airmen](#)) transitioned quickly from the P-40 and were assigned P-39s in February 1944, but only flew the type for a few weeks. The 99th carried out their duties including supporting [Operation Shingle](#) over [Anzio](#) as well as missions over the [Gulf of Naples](#) in the Airacobra but achieved few aerial victories.^[52] The major MTO P-39 operators included the [81st](#) and [350th Fighter Groups](#), both flying the maritime patrol mission from North Africa and on through Italy. The 81st transferred to the [China Burma India Theater](#) by March 1944 and the 350th began transition to the P-47D in August 1944, remaining in Italy with the 12th Air Force.

Soviet Union

Soviet P-39Q formerly 44-2664 on display at the Aviation Museum of Central Finland

The most successful and numerous use of the P-39 was by the [Soviet Air Forces](#). They received the considerably improved N and Q models via the [Alaska-Siberia ferry route](#). The tactical environment of the [Eastern Front](#) did not demand the high-altitude performance the RAF and AAF did. The comparatively low-speed, low-altitude nature of most air combat on the Eastern Front suited the P-39's strengths: sturdy construction, reliable radio gear, and adequate firepower. Soviet pilots appreciated the cannon-armed P-39 primarily for its air-to-air capability. A common Western misconception is that the Bell fighters were used as ground attack aircraft. This is because the Soviet term for the mission of the P-39, *prikrytiye sukhoputnykh voysk* (coverage of ground forces) has been mistaken as meaning [close air support](#). In Soviet usage, it has a broader meaning including protection of the airspace above army operations. Soviet-operated P-39s did make strafing attacks, but it was "never a primary mission or strong suit for this aircraft".^[53] To satisfy the strafing requirement, the Soviets built thousands of heavily armored [Ilyushin Il-2](#) aircraft. For the Bell fighters, the Soviets developed successful group aerial fighting tactics, and scored a surprising number of aerial victories over a variety of German aircraft. Soviet P-39s had no trouble dispatching [Junkers Ju 87 Stukas](#) or German twin-engine bombers and matched, and in some areas surpassed, early and mid-war [Messerschmitt Bf 109s](#). The usual nickname for the Airacobra in the VVS was *Kobrushka* ("little cobra") or *Kobrastochka*, a blend of *Kobra* and *Lastochka* (swallow), "dear little cobra".^[54] "I liked the Cobra, especially the Q-5 version. It was the lightest version of all Cobras and was the best fighter I ever flew. The cockpit was very comfortable, and visibility was outstanding. The instrument panel was very ergonomic, with the entire complement of instruments right up to an artificial horizon and radio compass. It even had a relief tube in the shape of a funnel. The armored glass was very strong, extremely thick. The armor on the back was also thick. The oxygen equipment was reliable, although the mask was quite small, only covering the nose and mouth. We wore that mask only at high altitude. The HF radio set was powerful, reliable and clear."

Soviet pilot Nikolai G. Golodnikov, recalling his experiences of the P-39^[55]. The first Soviet Cobras had a 20 mm Hispano-Suiza cannon and two heavy Browning machine guns, synchronized and mounted in the nose. Later, Cobras arrived with the M4 37 mm cannon and four machine guns, two synchronized and two wing-mounted. "We immediately removed the wing machine guns, leaving one cannon and two machine guns," Golodnikov recalled later.^[55] That modification improved roll rate by reducing [rotational inertia](#). Soviet airmen appreciated the M4 cannon with its powerful rounds and the reliable action but complained about the low rate of fire (three rounds per second) and inadequate ammunition storage (only 30 rounds).^[55] The Soviets used the Airacobra primarily for air-to-air combat^[56] against a variety of German aircraft, including Bf 109s, [Focke-Wulf Fw 190s](#), Ju 87s, and [Ju 88s](#). During the battle of [Kuban](#) River, VVS relied on P-39s much more than Spitfires and P-40s. [Aleksandr Pokryshkin](#), from 16.Gv.IAP ([16th Guards Fighter Aviation Regiment](#)), claimed 20 victories in that campaign in a P-39.^[57]



Former USAAF flown post-war by the [Commemorative Air Force](#) in Soviet markings, c. 1990s

The last plane shot down by the Luftwaffe was a Soviet P-39, on May 8 by *Oblt.* Fritz Stehle of 2./JG 7 flying a [Me 262](#) over the [Ore Mountains](#).^[58] Also, the last Soviet air victory was in a P-39 on May 9 when *Kapitan* Vasily Pshenichikov scored against a [Focke-Wulf Fw 189](#) over [Prague](#).^[59] Five of the 10 highest scoring Soviet aces logged the majority of their kills in P-39s. [Grigoriy Rechkalov](#) scored 44 victories in Airacobras. Pokryshkin scored 47 of his 59 victories in P-39s, making him the highest scoring P-39 fighter pilot of any nation, and the highest scoring Allied fighter pilot using an American fighter.^[60] This does not include his 6 shared victories, at least some of which were achieved with the P-39. The United States did not supply M80 armor-piercing rounds for the [autocannons](#) of Soviet P-39s—instead, the Soviets received 1,232,991 [M54 high-explosive](#) rounds, which they used primarily for air-to-air combat and against soft ground targets. The VVS did not use the P-39 for tank-busting duties.^[61]

A total of 4,719 P-39s were sent to the Soviet Union, accounting for more than one-third of all U.S. and UK-supplied fighter aircraft in the VVS, and nearly half of all P-39 production.^[62] Soviet Airacobra losses totalled 1,030 aircraft (49 in 1942, 305 in 1943, 486 in 1944 and 190 in 1945).^[63] Airacobras served with the Soviet Air Forces as late as 1949, when two regiments were operating as part of the [16th Guards Fighter Aviation Division](#) in the [Belomorsky Military District](#).^[64]

Australia



A RAAF P-39 Airacobra on loan from the U.S. Fifth Airforce and came to Australia in April 1942 to train RAAF pilots. It was damaged on 10 February 1943 and written off on 1 April 1944. Note the US star on the wing.

A total of 23 re-conditioned Airacobras, on loan from the U.S. [Fifth Air Force](#) (5 AF), were used by the [Royal Australian Air Force](#) (RAAF) as a stop-gap interceptor in rear areas. The aircraft were assigned the RAAF serial prefix A53.^[65] In the early months of the Pacific War, the RAAF was able to obtain only enough [Curtiss Kittyhawks](#) to equip three squadrons, destined for front-line duties in [New Guinea](#).^[66] and – in the face of increasing [Japanese air raids on towns in northern Australia](#) – was forced to rely on the P-40, P-39, and P-400 units of 5 AF for the defence of areas such as [Darwin](#). During mid-1942, USAAF P-39 units in Australia and New Guinea began to receive brand new P-39Ds.^[66] Consequently, P-39s that had been repaired in Australian workshops were loaned by 5 AF to the RAAF. In July, seven P-39Fs arrived at [24 Squadron](#), in [RAAF Bankstown](#) in Sydney.^{[65][66]} In August, seven P-39Ds were received by [No. 23 Squadron RAAF](#) at [Lowood Airfield](#), near [Brisbane](#).^{[65][66]} Both squadrons also operated other types, such as the [CAC Wirraway](#) armed [trainer](#). Neither squadron received a full complement of Airacobras or saw combat with them. From early 1943, the air defence role was filled by a wing of Spitfires.

Both 23 and 24 Squadron converted to the [Vultee Vengeance dive bomber](#) in mid-1943, their P-39s transferred to two newly formed fighter squadrons: [No. 82](#) (augmenting P-40s, still in short supply) at Bankstown and [No. 83](#) (as it awaited the Australian-designed [CAC Boomerang](#)) in [Strathpine](#), near Brisbane.^[65] After serving with these squadrons for a few months, the remaining Airacobras were returned to the USAAF and the RAAF ceased to operate the type.^[65]

France

In 1940, France ordered P-39s from Bell, but because of the [armistice with Germany](#) they were not delivered. After [Operation Torch](#), French forces in North Africa sided with the Allies, and were re-equipped with Allied equipment including P-39Ns. From mid-1943 on, three fighter squadrons, the [GC 3/6 Roussillon](#), [GC 1/4 Navarre](#) and [GC 1/5 Champagne](#), flew these P-39s in combat over the Mediterranean, Italy and Southern France. A batch of P-39Qs was delivered later, but Airacobras, which were never popular with French pilots, had been replaced by [P-47s](#) in front line units by late 1944.

Italy



Bell P-39N-1 supplied by the U.S. Army Air Force to the Italian Regia Aeronautica's (Italian Co-Belligerent Air Force) 4th Stormo in the summer of 1944

In June 1944, the [Italian Co-Belligerent Air Force](#) (ICAF) received 170 P-39s, most of them -Qs, and a few -Ns (15th USAAF surplus aircraft stored in Napoli-Capodichino airfield) and also at least one -L and five -Ms. The P-39 N (without the underwing fairings for .50 caliber machine guns) had engines with about 200 hours; a little newer than the P-39Q engines with 30–150 hours. A total of 149 P-39s would be used: the P-39N for training, while newer Qs were used in the front line.

In June–July 1944, *Gruppi* 12°, 9° and 10° of 4° *Stormo*, moved to Campo Vesuvio airstrip to re-equip with the P-39s. The site was not suitable and, in three months of training, 11 accidents occurred, due to engine failures and poor maintenance of the base. Three pilots died and two were seriously injured. One of the victims, on 25 August 1944, was the "ace of aces", *Sergente Maggiore* [Teresio Vittorio Martinoli](#).^[67] The three groups of 4° *Stormo* were first sent to Leverano (Lecce) airstrip, then in mid-October, to Galatina airfield. At the end of the training, eight more accidents occurred. Almost 70 aircraft were operational, and on 18 September 1944, 12° Group's P-39s flew their first mission over Albania. Concentrating on ground attack, the Italian P-39s proved to be suitable in this role, losing 10 aircraft between 4 November and 3 December 1944,^[68] to German flak. In February–March 1945, 10° and 9° *Gruppi* moved North of Galatina, in [Canne](#) airbase, near [Campobasso](#), while Allied allowed Italian pilots to use the airstrip of [Lissa](#) island, in the [Adriatic](#) sea, as an intermediate scale during the long sorties on the [Balkans](#). The 4° *Stormo* pilots flew many effective ground attack missions on northern [Yugoslavia](#), losing only one more P-39, for engine failure in [Sarajevo](#) area, on 2 April 1945.^[69] The Italian P-39 flew over 3,000 hours of combat.^[70] By the end of the war, 89 P-39s were still at the Canne airport and 13 at the *Scuola Addestramento Bombardamento e Caccia* ("Training School for Bombers and Fighters") at Frosinone airfield. In 10 months of operational service, the 4° *Stormo* had been awarded three *Medaglia d'Oro al Valore Militare "alla memoria"*.^[71] After the war the P-39s were taken over by the [Aeronautica Militare Italiana](#) (the new Italian air force) and used for several years as training aircraft. In Galatina fighter training unit (*Scuola Caccia*), war veteran [Tenente colonnello](#) Francis Leoncini was killed during a flying accident, on 10 May 1950.^[69]

Portugal

Between December 1942 and February 1943, the *Aeronáutica Militar* (Army Military Aviation) obtained aircraft operated by the 81st and the 350th Fighter Groups originally dispatched to North Africa as part of [Operation Torch](#). Due to several problems en route, some of the aircraft were forced to land in Portugal and Spain. Of the 19 fighter aircraft that landed in Portugal, all were interned and entered service that year with the [Portuguese Army](#) Military Aviation. They formed the Squadron OK, based at [Ota Air Base](#).^[72] Though unnecessary, the Portuguese Government paid the United States US\$20,000 for each of these interned aircraft as well as for one interned [Lockheed P-38 Lightning](#).^[73] The U.S. accepted the payment, and gave as a gift four additional crates of aircraft, two of which were not badly damaged, without supplying spares, flight manuals or service manuals.^[73] Without proper training, incorporation of the aircraft into service was plagued with problems, and the last six Portuguese Airacobras that remained in 1950 were sold for scrap.

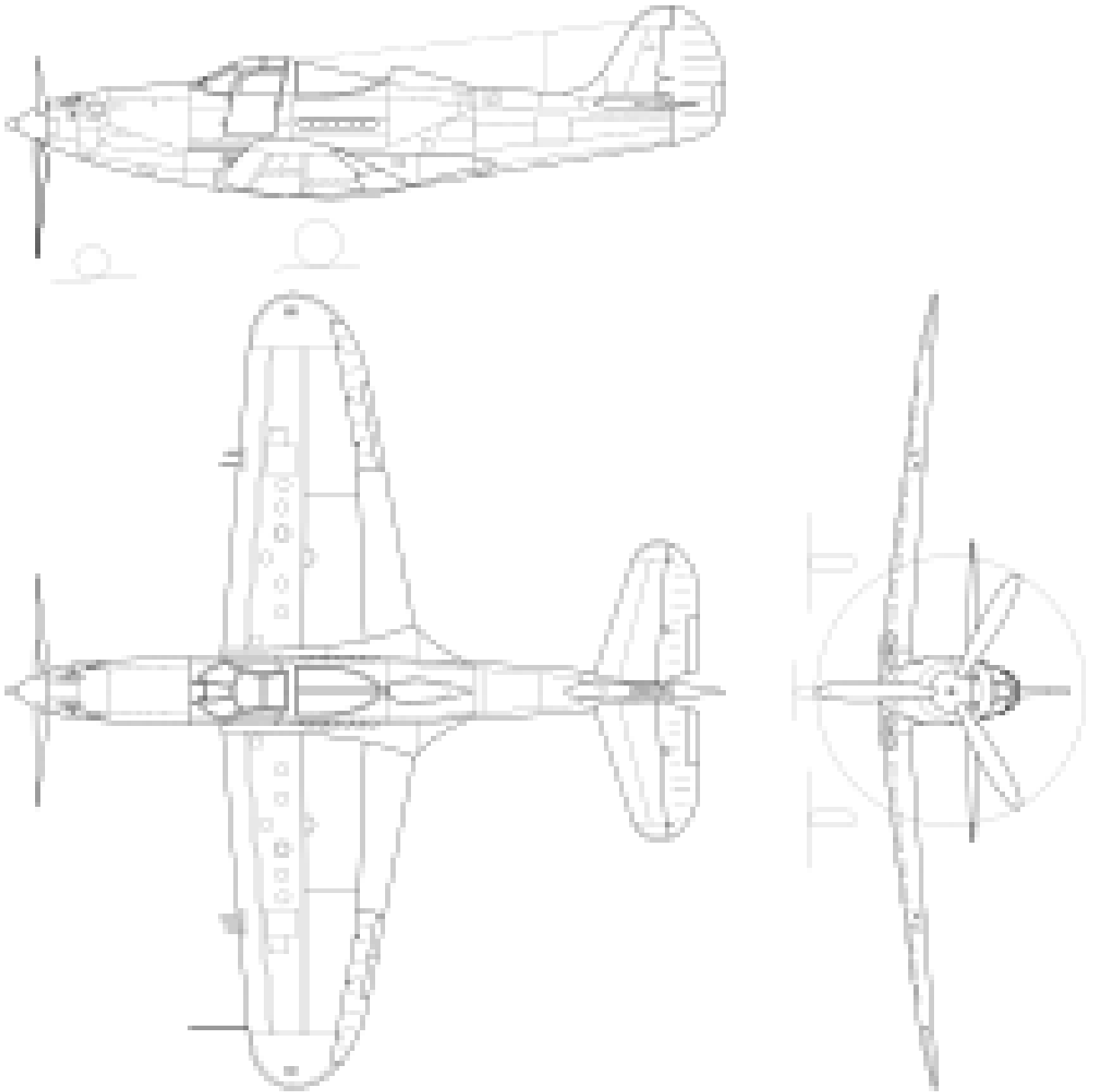
Post-war use

A very small number of late-production P-39Qs survived long enough in the USAAF inventory to be acquired by the United States Air Force upon its separation from the Army. These aircraft served in training and testing roles for approximately a year. They were redesignated as ZF-39Qs ("ZF" for "Obsolete Fighter") in June 1948 as part of the new aircraft designation scheme throughout the USAF. In 1945, Italy purchased the 46 surviving P-39s at 1% of their cost but in summer 1946 many accidents occurred, including fatal ones. By 1947, 4° *Stormo* re-equipped with [P-38s](#), with P-39s sent to training units until the type's retirement in 1951. Only a T9 cannon survives today at Vigna di Valle Museum.^[70]



Mira Slovak's P-39Q "Mr. Mennen"

The Airacobra was raced at the [National Air Races](#) in the United States after World War II. Famous versions used for racing included the twin aircraft known as "Cobra I" and "Cobra II," owned jointly by Bell Aircraft test pilots [Tex Johnston](#) and [Jack Woolams](#). These aircraft were powered by an extensively modified 2000-horsepower engine, and a [P-63](#) four-blade propeller. "Cobra I" with its pilot, Jack Woolams, was lost in 1946 during a test flight over Lake Ontario. The "Cobra II" flown by test pilot "Tex" Johnston, beat racing-modified P-51s, as well as other P-39 racers (which were the favorites), to win the 1946 [Thompson Trophy](#) race.^[74] *Cobra II* competed again in the 1947 Thompson Trophy, finishing 3rd. In the 1948 Thompson trophy, she was unable to finish due to engine difficulties. *Cobra II* did not race again and was destroyed on 10 August 1968 during a test flight prior to an attempt at the world piston-engine air speed record, when owner-pilot Mike Carroll lost control and crashed. Carroll died and the highly modified P-39 was destroyed. [Mira Slovak](#)'s P-39Q "Mr. Mennen" (Race #21) was a fast unlimited racer, but a late arrival in 1972 kept the 2,000 hp (1,500 kW) racer out of the Reno races, and she was never entered again. Her color scheme was all white with "Mennen" green and bronze trim. She is now owned and displayed by the [Kalamazoo Air Zoo](#), in the color scheme of P-400 "Whistlin' Britches."



Three-view drawing



P-39Q at the [National Museum of the U.S. Air Force](#). This winter diorama shows ground crew with a Type F-1A Utility Heater in front of an Airacobra flown by Lt. L. Spoons of the 57th FS based on Adak Island during the Aleutians Campaign in 1942.

General characteristics

- **Crew:** One
- **Length:** 30 ft 2 in (9.19 m)
- **Wingspan:** 34 ft 0 in (10.36 m)
- **Height:** 12 ft 5 in (3.78 m)
- **Wing area:** 213 sq ft (19.8 m²)
- **Empty weight:** 6,516 lb (2,956 kg)
- **Gross weight:** 7,570 lb (3,434 kg)
- **Max takeoff weight:** 8,400 lb (3,810 kg)
- **Powerplant:** 1 × [Allison V-1710-85](#) V-12 liquid-cooled piston engine, 1,200 hp (890 kW) at 9,000 ft (2,743 m) (emergency power)
- **Propellers:** 3-bladed constant-speed propeller

Performance

- **Maximum speed:** 389 mph (626 km/h, 338 kn)
- **Stall speed:** 95 mph (153 km/h, 83 kn) power off, flaps and undercarriage down
- **Never exceed speed:** 525 mph (845 km/h, 456 kn)
- **Range:** 525 mi (845 km, 456 nmi) on internal fuel
- **Service ceiling:** 35,000 ft (11,000 m)
- **Rate of climb:** 3,805 ft/min (19.33 m/s) at 7,400 ft (2,300 m) (using emergency power)
- **Time to altitude:** 15,000 ft (4,600 m) in 4 minutes 30 seconds, at 160 mph (260 km/h)
- **Wing loading:** 34.6 lb/sq ft (169 kg/m²)
- **Power/mass:** 0.16 hp/lb (0.26 kW/kg)

Armament

- **Guns:**
 - 1 × [37 mm M4 cannon](#) firing through the propeller hub
 - 2 × [.50 caliber synchronized Browning M2 machine guns](#), nose-mounted
 - 2 × .50 caliber Browning M2 machine guns one each wing
- **Bombs:** Up to 500 lb (230 kg) of bombs under wings and belly



Source : https://en.wikipedia.org/wiki/Bell_P-39_Airacobra