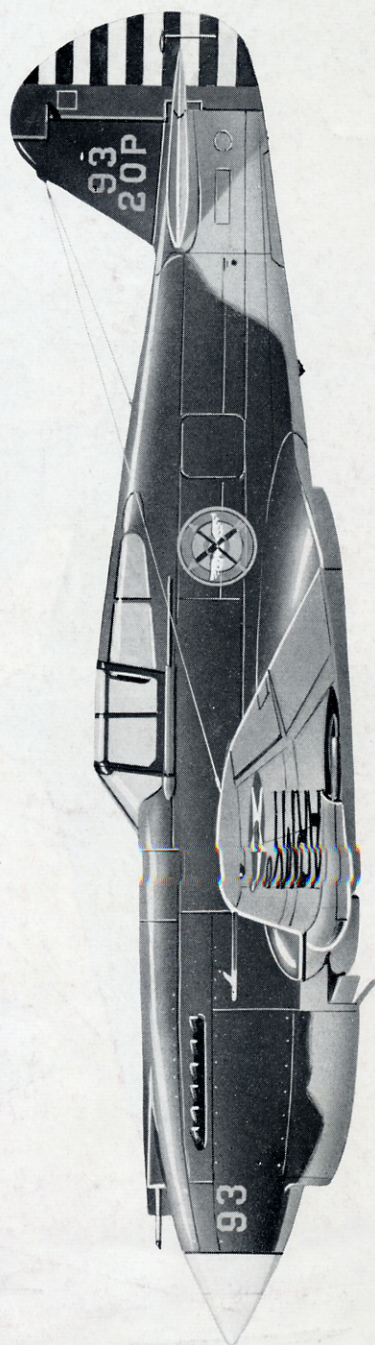


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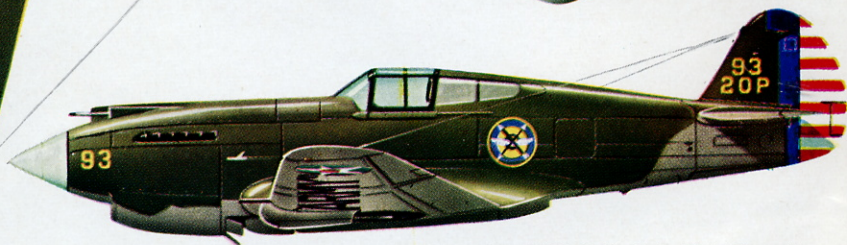
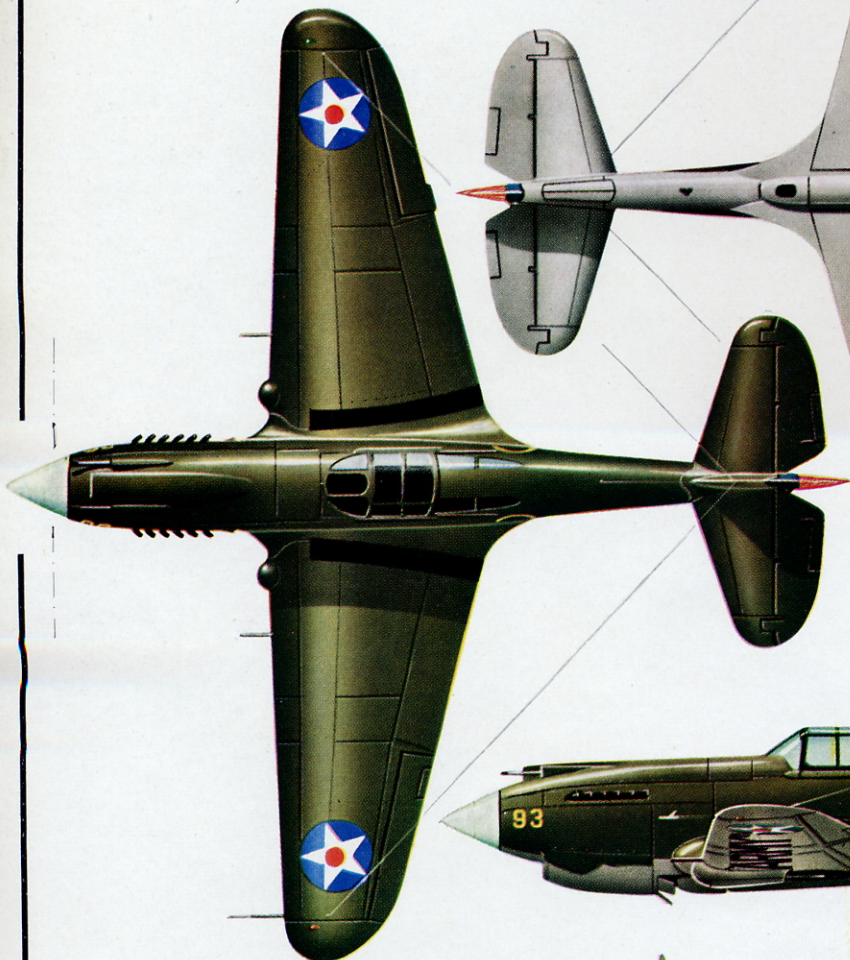
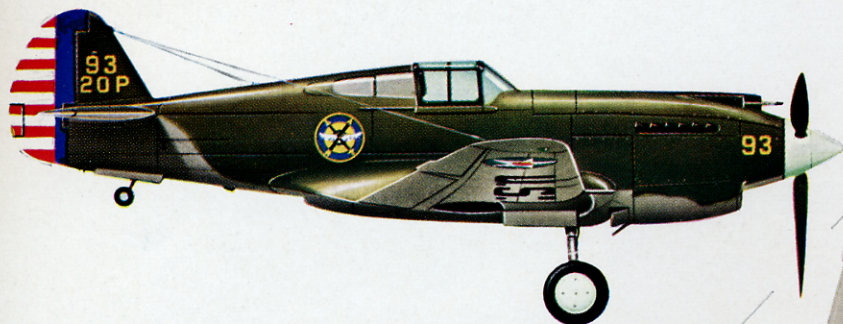
The Curtiss P-40 Tomahawk

NUMBER 35
TWO SHILLINGS

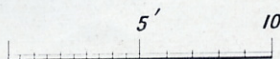
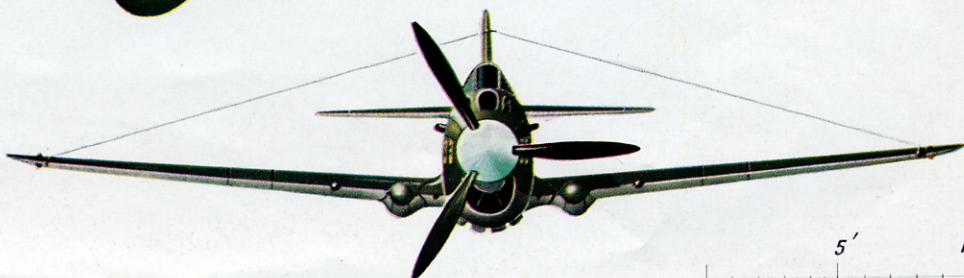




55th Pursuit Squadron Emblem

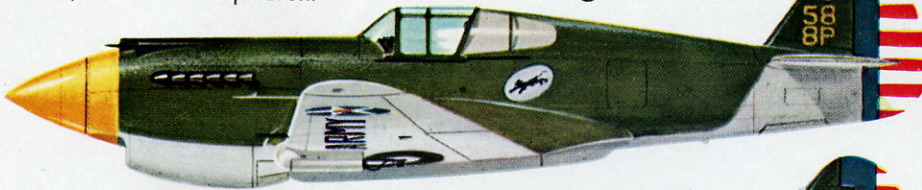


CURTISS P-40 of the 55th Pursuit Squadron, 20th Pursuit Group



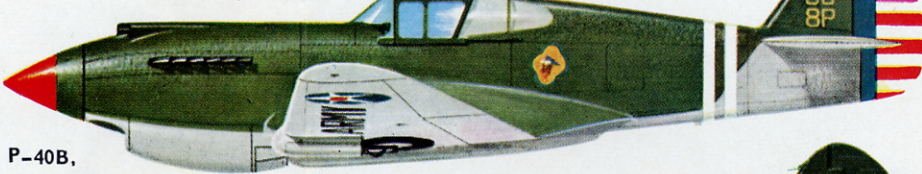
P-40, 35th Pursuit Squadron.

© WARD.



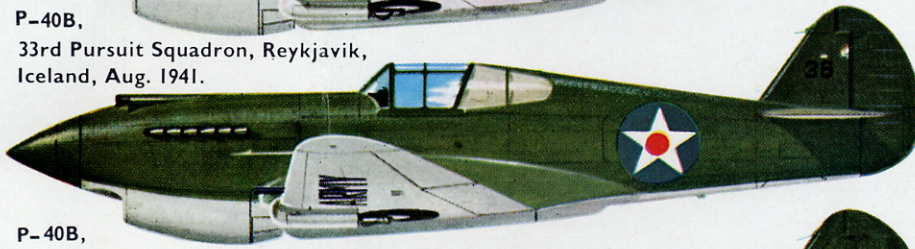
35th Pursuit Sqdn.

P-40, 36th Pursuit Squadron.

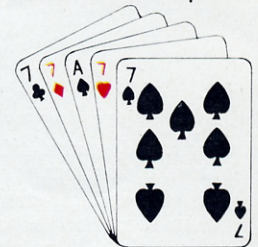
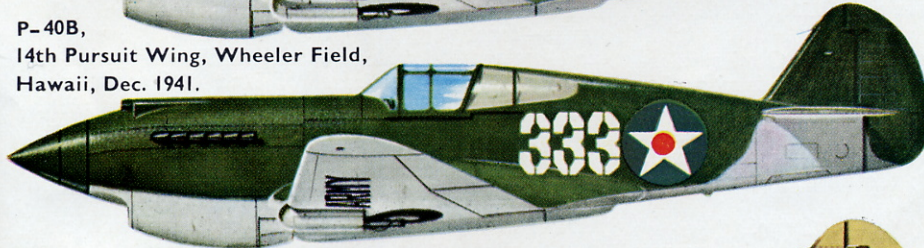


36th Pursuit Sqdn.

P-40B,
33rd Pursuit Squadron, Reykjavik,
Iceland, Aug. 1941.

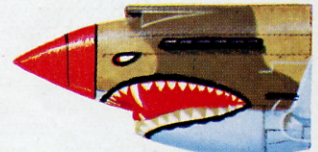


P-40B,
14th Pursuit Wing, Wheeler Field,
Hawaii, Dec. 1941.

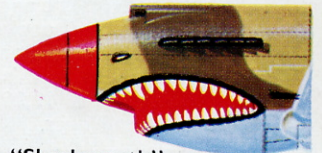


▲ 77th Pursuit Sqdn. 48
20th Pursuit Group 20P

Tomahawk Mk.IIB, No. 112 Squadron, No. 262 Wing, LG 75,
Sidi Haneish, Egypt, Sept. 1941.

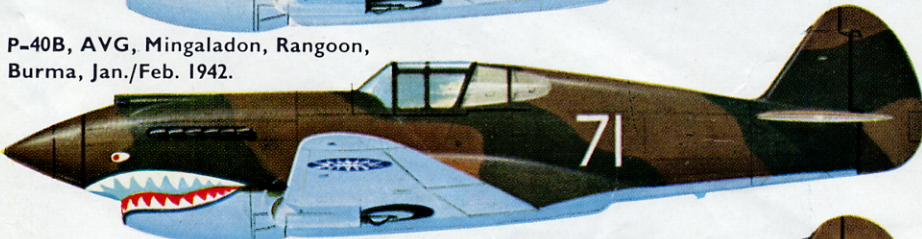


Tomahawk Mk.I, No. 26 Squadron.



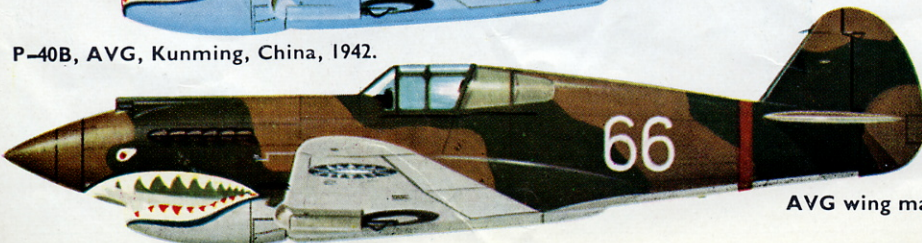
"Sharkmouth"
variations,
No. 112 Sqdn.

P-40B, AVG, Mingaladon, Rangoon,
Burma, Jan./Feb. 1942.



AVG "Angel".

P-40B, AVG, Kunming, China, 1942.



AVG Insignia.

AVG wing marking.



The Curtiss P-40 Tomahawk

by Ray Wagner

Tomahawk IIBs of No. 112 Squadron, R.A.F., at Sidi Heneish in the Western Desert, November 1941.

(Photo: Imperial War Museum)



When the United States entered World War Two, its most important fighter was the Curtiss P-40, for more had been constructed than all other Army fighters put together. In December 1941 the P-40 was fighting the Axis Powers from Egypt and Moscow to China and the Philippines, and it was either praised fervently or damned vigorously for the part it played in the great struggle.

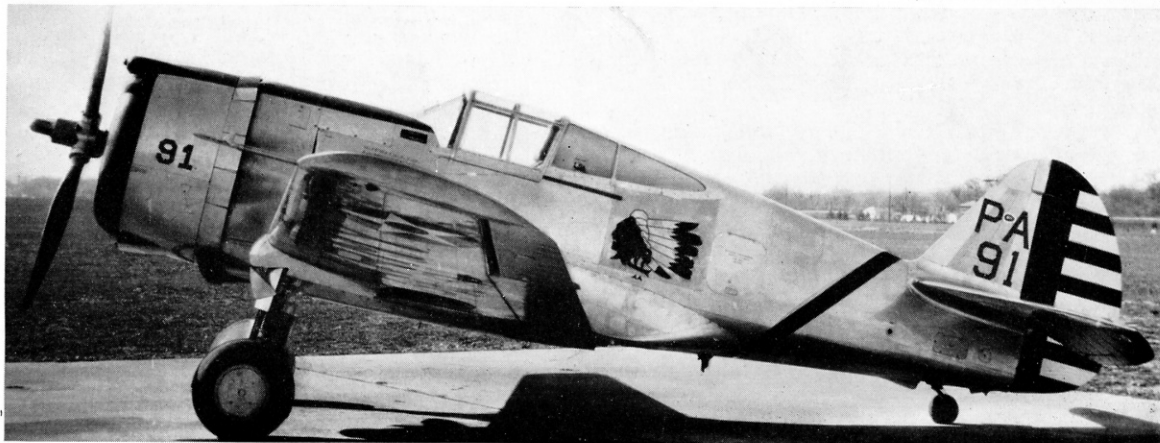
The P-40 went into full-scale production during the summer of 1939 and from then until December 1944, when the P-40N-40 was withdrawn from production, it had been the subject of continuous development; had served with the Allies in practically every war theatre, and had worn the insignia of twenty-eight Allied and friendly nations. On 22nd November 1944 the Curtiss Aviation Division delivered its 15,000th fighter—this was a P-40N Warhawk.

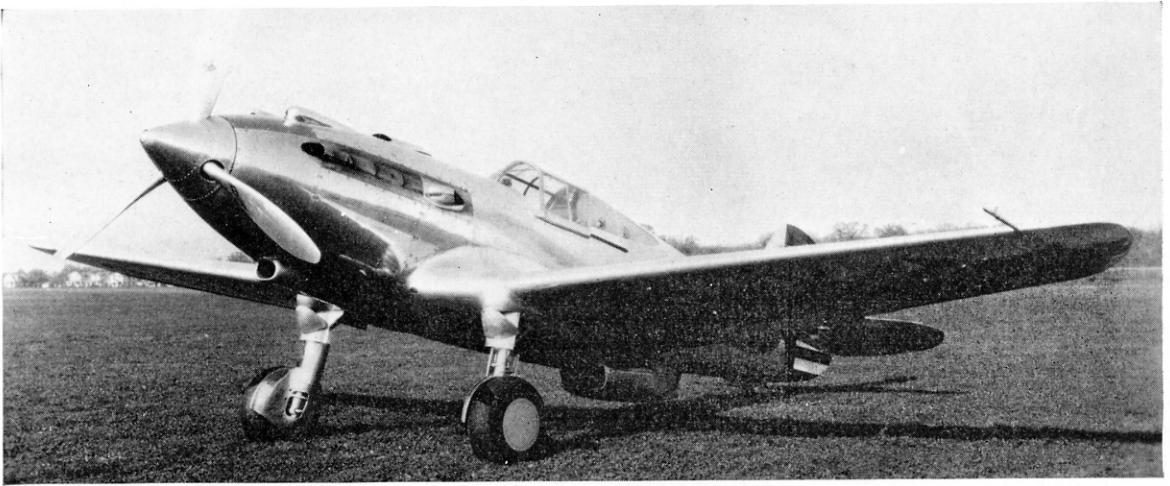
Some indication of the enormous P-40 production programme undertaken by Curtiss can be assessed

by its claim upon floor space and manpower. During 1941 the Curtiss Airplane Division expanded its manufacturing area by approximately 400 per cent and it totalled 4,268,410 square feet. The total work force was 45,000. This expansion included construction of a second factory at Buffalo, known as Plant Two and totalling some 1,200,000 sq. ft. of working area and, a newly-created plant at Columbus, Ohio, with a floor area of 1,156,000 sq. ft. The original St. Louis facility was expanded to 1,210,450 sq. ft. Production at St. Louis was in excess of eight aircraft per working day, and production of the whole Airplane Division eventually reached sixty aircraft. P-40s produced at St. Louis (No. 1 Plant) carried the suffix CS, while those built at Buffalo and Columbus were designated CU.

How did this fighter which was recognised as being inferior in performance and firepower to contemporary types, ever reach such large scale production?

The Curtiss P-40 was an immediate development of the Curtiss P-36. Aircraft illustrated served with the 95th Pursuit Squadron, U.S.A.A.F.





Above: *The original XP-40 prototype with belly radiator scoop. Below: The XP-40 as modified with chin radiator, modified exhaust stacks and revised undercarriage.*



To discover the answer to this question we must examine the history of the P-40, beginning with the Curtiss 75 Hawk, an all-metal, low-wing monoplane designed for the Army Air Corps in November 1934. After several revisions, and overcoming the Seversky P-35S competition, the Curtiss single-seater won a contract for 210 aircraft on 30th July 1937. Most of them were delivered as the P-36A and powered by a single Pratt & Whitney R-1830-13 radial, air-cooled engine.

Operationally the P-36A had a short career, and was considered to be obsolete when Japan attacked America at Pearl Harbour in December 1941. Apart from a brief brush with Japanese fighters it was soon relegated to the advanced training rôle. Export P-36s, or Hawk 75As, saw action with the French on the Western Front, claiming several victories over the much vaunted Messerschmitt Bf 109. After the French collapse a number of Hawks served with the Vichy Air Force. It is a little-known fact that a number of Hawks, captured by the Germans, were refurbished and sold to Finland.

During 1937 the in-line, liquid-cooled Allison engine became available, and Curtiss decided to install one in

a P-36 airframe. In March 1937 design work was started and the tenth P-36A aircraft—serial number 38-010—was selected to mount the new powerplant in. With the new engine the aircraft was designated XP-40.

THE XP-40 IS ORDERED

The XP-40 was ordered by the Air Force in July 1937 and when first flown in October 1938 was similar to the P-36A with the exception of the Allison V-1710-19 (C-13) engine, developing 1,160 h.p. at take-off, and 1,000 h.p. at 10,000 feet. The carburettor air intake was on top of the engine cowling between a .50 calibre and a .30 calibre machine gun, standard armament of United States fighters between the wars. A small oil cooler was located beneath the pencil-point nose, with the ventral radiator in a scoop behind the wing.

Maximum speed of the XP-40 was 342 m.p.h. at 12,200 feet, at a gross weight of 6,260 lb. This exceeded that of the Hawker Hurricane, but was inferior to the Supermarine Spitfire and Messerschmitt Bf 109E. Range with 100 gallons of fuel was 460 miles at 299 m.p.h., and with 159 gallons at 200 m.p.h. 1,180 miles was claimed.

Conventional in appearance the XP-40 had a wing span of 37 ft. 4 in. and an area of 236 sq. ft., dimensions that remained the same throughout its history. Fuselage length was 31 ft. 1 in., height 12 ft. 4 in. The XP-40 tipped the scales at 5,417 lb. when empty and 6,870 lb. fully loaded.

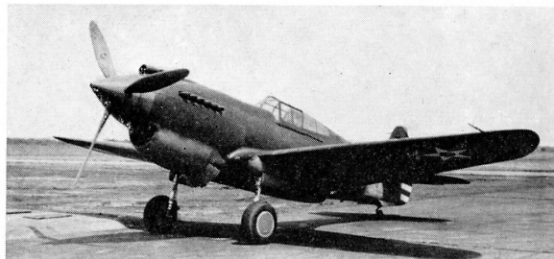
The Army Air Corps was planning to expand in the late 1930s and aircraft manufacturers were invited to submit bids for pursuit aircraft on 25th January 1930. The minimum and maximum performance requirements specified indicated that the Army still thought in terms of low-altitude, short-range fighters. Minimum top speed was 310 m.p.h. at 15,000 feet and climb to that altitude in 4-5 to 6 minutes, plus an endurance of two hours at 280 to 335 m.p.h. Maximum speed demanded was 370 m.p.h. at 15,000 feet. Actual wartime air battles, however, were to be fought at altitudes and ranges far greater than those of the specification, and the fighters following the P-40, such as the Mustang and Thunderbolt, were to fight at altitudes of between 30,000 and 35,000 feet, whilst range was in the region of 2,200 miles with auxiliary fuel tanks.

Among the many designs submitted to the specification was the sophisticated Lockheed XP-38 (Lightning) with two turbo-supercharged engines; the Bell XP-39 with its unique arrangement of engine located behind the cockpit; the Seversky XP-41 and AP-4 and Curtiss' own H-75R, P-37 and XP-42.

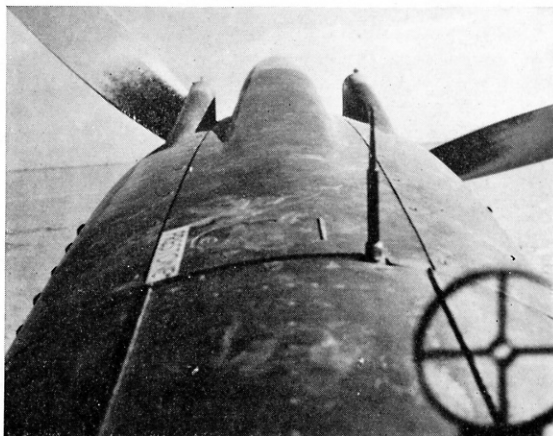
While not matching the performance, especially at altitudes, of the turbo-supercharged types, the P-40 was less expensive and could reach quantity production a year ahead of the other machines. It was based on an airframe already proven in U.S. service and was in large scale production in the Curtiss plant which had been expanded to fill French orders for the H-75A, the export P-36.

Neither Bell nor Lockheed could go into quantity production for two years, and although the Republic P-43 was based on the P-35 airframe, production facilities were restricted and a large-scale programme could not be attempted until the factory was expanded. Also, the Lockheed fighter was a very advanced concept and it was four years before it was able to take a decisive part in the war in the air.

This, then, was the situation facing the Army and one that had to be resolved quickly if the Air Corps was to get a modern fighter. On 27th April 1939 the



An early P-40 showing production pattern landing gear and radiator scoop.



Pilot's view of the P-40 (Tomahawk IIB) cowling. Ring and bead sight can be clearly seen. (Photo: R. Ward Collection)

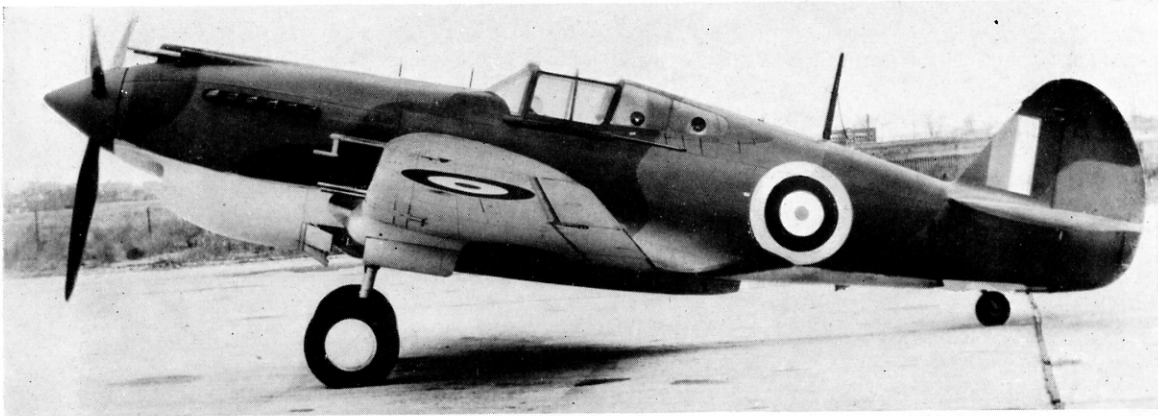
War Department announced a contract, approved the day before, for 524 P-40 pursuit aircraft at \$12,872,898. This was the largest warplane contract ever placed since 1918 and it dwarfed the service test orders placed for the more radical YP-38 and YP-39 designs. The contracts for the Lockheed and Bell fighters were placed on the same day and 13 of each type were ordered. Two weeks later the Army authorised a contract for 13 Republic YP-43s.

PRODUCTION COMMENCES

Work was put in hand immediately the contract was signed and the Curtiss engineers carried out an extensive modification programme on the prototype

Head-on view of R.A.F. Tomahawk IIB reveals radiator air intake, cooling gills and two-tone under-surface colour scheme of blue and black. (Photo: Imperial War Museum)





Tomahawk IIA, AH973, of the R.A.F. Wing guns are installed.

(Photo: Curtiss Aircraft Corp.)

to improve performance. First the coolant radiator was moved from its original position aft of the wing trailing edge to under the nose, and the exhaust manifolds altered. Later, the aircraft was brought nearer to production standard by adding above the engine cowling the long intake for the single-speed supercharger that became characteristic of early models, as well as individual exhaust stacks, and a modified landing gear. The wheel still rotated through 90 degrees as it folded back to fit flat into the wing, but the fairing plates inherited from the P-36 were deleted and two small doors closed over the wheel strut. The radiator intake was redesigned to include an oil cooler and two coolers for the ethylene/glycol engine coolant.

In May 1940 delivery began on the first production P-40s, which had the Allison V-1710-33 (C15) engine rated at 1,040 h.p. at 15,000 feet, and use of flush riveting to reduce drag. Armament included two .50 calibre machine guns mounted above the engine cowling and firing through the airscrew disc, and provision for a single .30 calibre machine gun in each wing. Flight tests of the first machine, 39-156, demonstrated a top speed of 357 m.p.h. at 15,000 feet, a service ceiling of 32,750 feet and a climb rate of 3,080 feet in the first minute and 15,000 feet in 5.3 minutes. Cruising speed was 277 m.p.h. and landing speed 80 m.p.h. The first three P-40s off the production line were utilised for service trials, for the Air Force contract made no provision for the standard practice of supplying YP models.

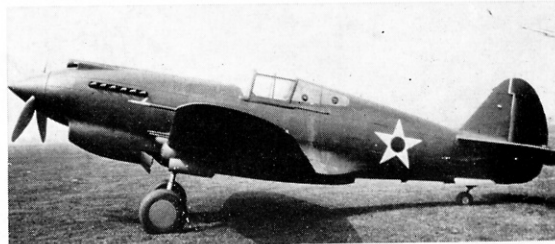
The production P-40's length of 31 feet 8 $\frac{3}{4}$ inches became standard for all early models, but the weight, 5,376 lb. empty, 6,787 lb. gross and 7,215 lb. maximum loaded, was to increase sharply. Two hundred P-40s were delivered to the Army by September 1940 and they had only two synchronised guns. The remaining 324 of the first contract had delivery deferred to enable Curtiss to expedite the 140 H-81A (export P-40s) ordered by France. These aircraft never reached the French Air Force for France collapsed and surrendered to Germany in September 1940. The contract was taken over by the Royal Air Force, and such was the urgency of delivery that many of the 140 machines reached the United Kingdom with French instruments and cockpit lettering. On reaching Britain the P-40s had four .303 Browning machine guns installed in the wings. They lacked armour plate for the pilot's protection, a bullet-proof windscreen and self-sealing fuel tanks. However, they were re-

placed much later by ships incorporating these refinements, plus more firepower. When the final 324 aircraft for the U.S. Army Air Corps were delivered in September 1940, they, too, were to this standard.

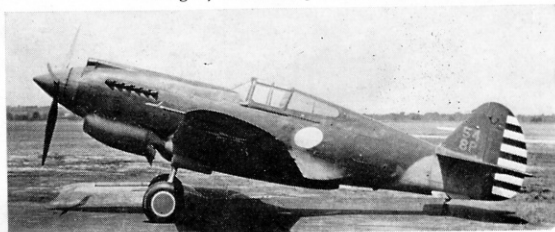
The first H81-A-1 export models reached England in September 1940 and were designated the Tomahawk Mark I, but because of their lack of defence and fire power were relegated to the training rôle. The first Tomahawk bore the serial number AH741 and the following 139 aircraft had serials running from this through to AH880. As more aircraft became available they were issued to Nos. 2, 13, 16, 26, 94, 112, 168, 171, 208, 231, 239, 241, 250, 260, 268, 349, 400, 403, 414, 430 and 613 Squadrons as the Tomahawk Marks I, IA and IB. No. 2 Squadron was the first to operate the Tomahawk. Overseas, the first Desert Air Force squadron to be fully equipped with Tomahawks was No. 112, which exchanged its Gloster Gladiators for the Curtiss fighter. No. 112 became famous for its "Shark's Tooth" insignia on the engine cowling, and this scheme was later adopted by the American Volunteer Group in China.

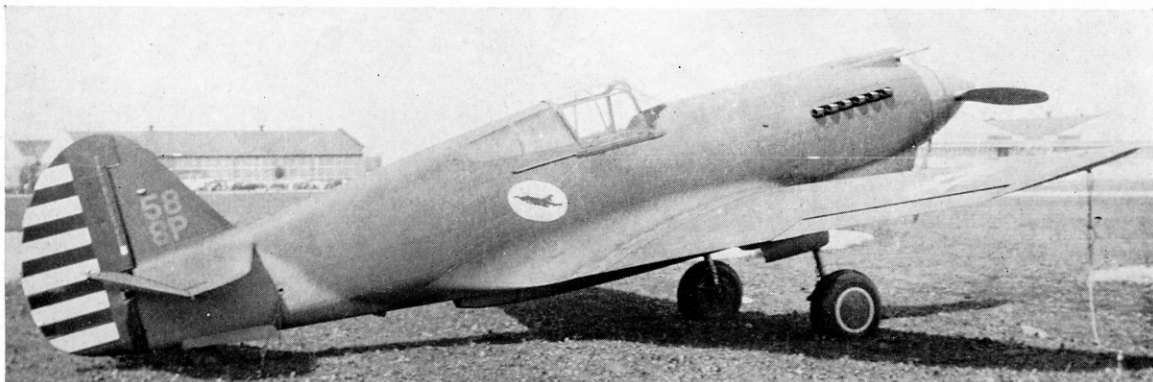
THE P-40B VARIANT

More warlike was the H81-A-2, or Tomahawk IIA, which carried two .303 in. machine guns in the wings

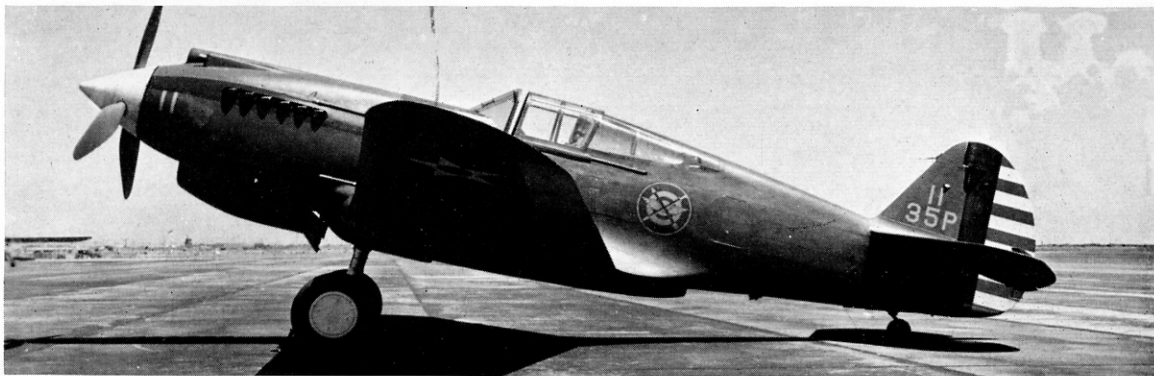


Above: Early production P-40 with pre-war U.S.A.A.F. insignia and wing guns. Below: P-40 of the 35th Pursuit Squadron, 8th Pursuit Group. It lacks wing guns; squadron insignia (black cougar) has been painted out.

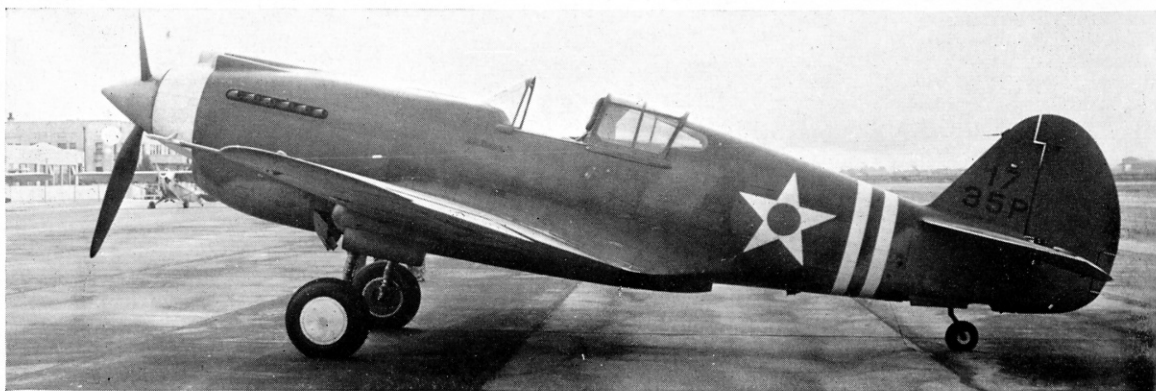


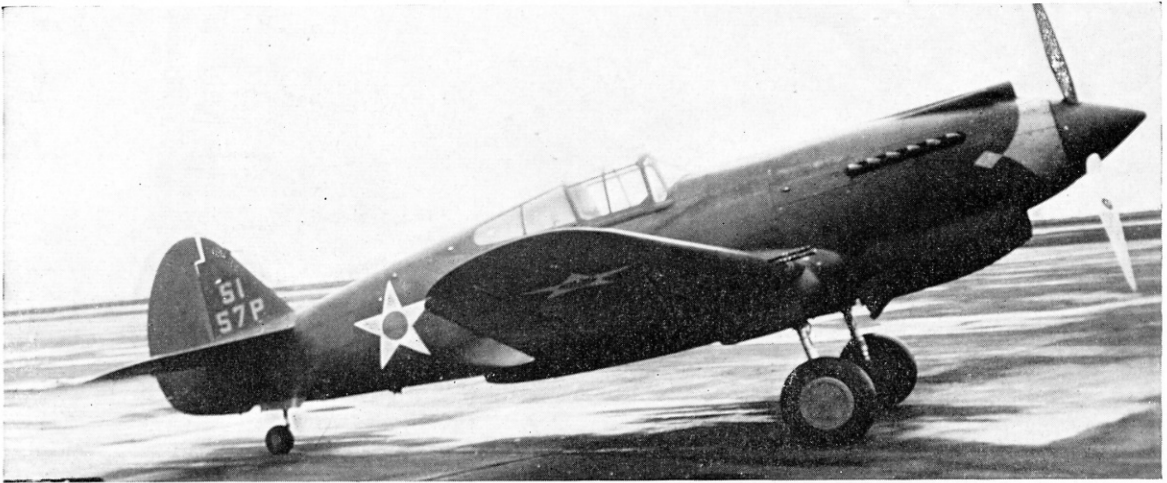


Above: P-40 of the 35th Fighter Squadron. (Photo: F. C. Dickey, Jr.). Below: P-40 of the 55th Pursuit Squadron, 20th Pursuit Group.

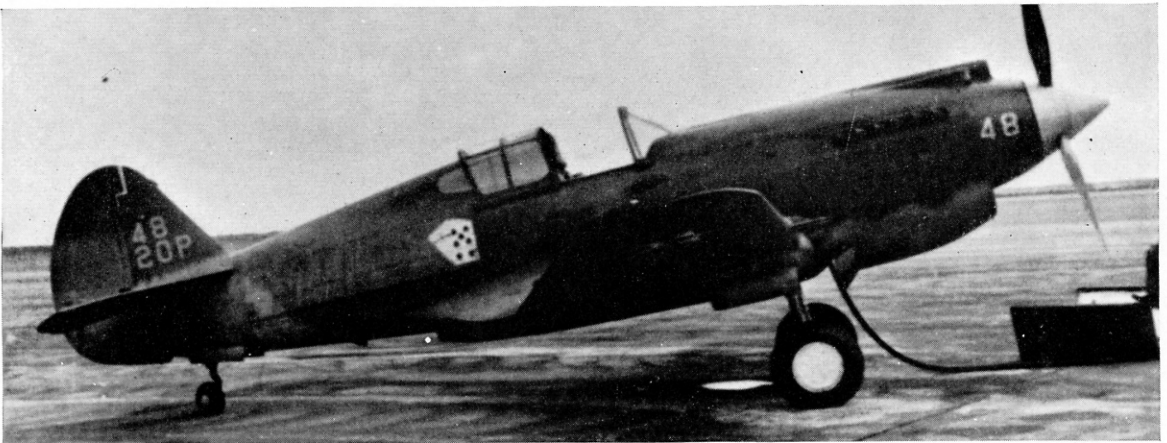


Above: P-40 of the 79th Pursuit Squadron, 20th Pursuit Group. Below: Squadron Leader's aircraft, 33rd Pursuit Squadron.





Above: P-40C of the 77th Pursuit Squadron, 20th Pursuit Group. Below: P-40C, 77th Pursuit Squadron.



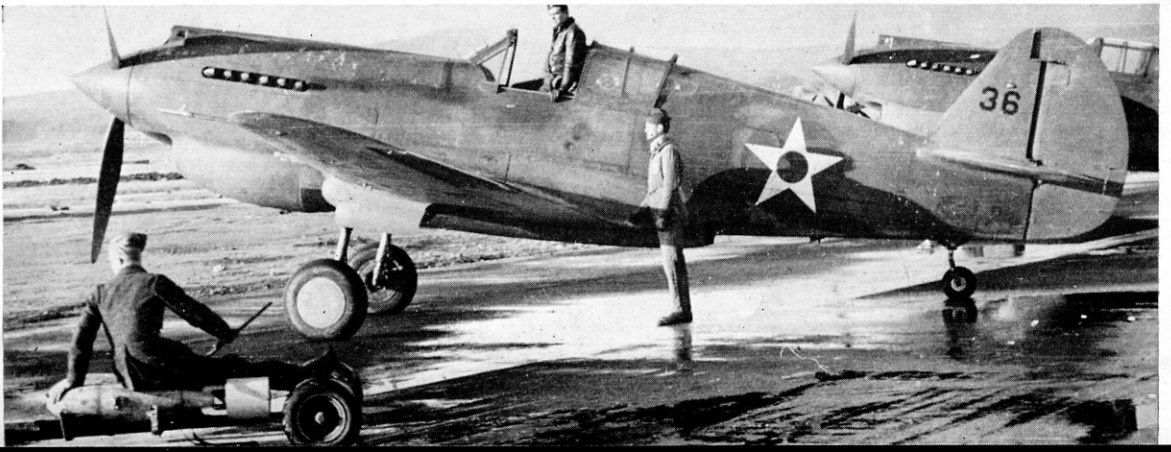
in addition to other refinements, and 110 were delivered to the Royal Air Force. Serials of this batch started at *AH881* and ran through to *AH990*. In September 1940 the U.S. Army adopted this model as the P-40B, the P-40A designation having been dropped, and 131 were procured to replace the deferred P-40s. They began reaching U.S. squadrons in February 1941 and most were eventually deployed to Hawaii and the Philippines. The colourful rudder stripes of the P-40 and earlier Army pursuit aircraft were abandoned for the drab olive camouflage finish. The Hawaii-based

aircraft, sixty-two 'B's and eleven 'C's were caught on the ground when the Japanese attacked Pearl Harbour on 7th December 1941 and the majority destroyed.

The P-40B retained the same dimensions of earlier models, but weight was increased to 5,590 empty, 7,326 lb. gross and 7,600 maximum loaded. The 'B' had an inferior performance to that of the original P-40, for top speed was depressed to 352 m.p.h., service ceiling to 32,400 feet and climb rate to 2,860 feet per minute. The fuel capacity of between 120 to

P-40s of the 33rd Pursuit Squadron at Reykjavik, Iceland, 1941.

(Photo: Imperial War Museum)





Tomahawk Mk.I and two Mk.IIAs of No. 26 Squadron, England, 1941.

(Photo: Imperial War Museum)

160 gallons provided a normal range of 730 miles, and a maximum range of 1,230 miles at the minimum cruise setting.

THE P-40C, TOMAHAWK IIB.

A new fuel system, with 134 gallons in new tanks with improved self-sealing, plus fittings for a 52-gallon drop tank below the fuselage, was employed on the H81A-3, which also incorporated two additional wing mounted .30 calibre machine guns, bringing the total to six and including the two nose mounted .50s.

Curtiss built 930 similar aircraft for the R.A.F., in whose service they were known as the Tomahawk IIB, and 193 for the U.S. Army as the P-40C (commencing with 41-13328). The P-40C, in addition to its extra guns and other internal equipment, had a SCR-247N radio instead of the SCR-283, and it weighed 5,812 lb. empty, 7,459 lb. gross and 8,058 lb. maximum loaded. Maximum speed was 345 m.p.h. at 15,000 feet, service ceiling 29,500 feet and climb rate 2,650 feet per minute. The R.A.F. aircraft had .303 Browning machine guns instead of the American armament.

P-40B of the A.V.G., Rangoon, 1942.

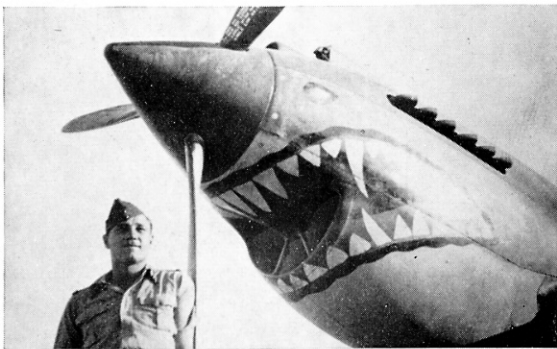


(Photo: Imperial War Museum)

Serial batches of R.A.F. Tomahawk IIBs ran as follows: *AH991* to *AH999*, nine aircraft with four wing guns and sundry changes. *AK100* to *AK570*, 471 aircraft. Thirty-six of this batch were shipped to China and were selected at random with no particular sequence. *AM370* to *AM519*, 150 aircraft. Sixty-four shipped to China, selected at random. *AN218* to *AN517*, 300 aircraft. One hundred and ninety-five were shipped to Russia, some from America, the remainder from the United Kingdom. Tomahawk IIBs were issued to Nos 73, 136, 231 and 414 Squadrons.

INTO BATTLE

The exported Tomahawks became the first of the P-40s to see action. Several hundred were kept in England as a reserve force against the expected German invasion of the summer of 1941, and they were issued to army co-operation squadrons for low-level tactical support. In August 1941 they replaced the Westland Lysander two-seaters in Nos. 2, 13 and 26 Squadrons. Sixteen home-based British and Canadian



Study in shark's teeth. Left: No. 112 Squadron. Right: Unit unknown, possibly training unit. (Photo: Imperial War Museum)

squadrons practised with the type. One unauthorised strafing sortie took place on 28th August by a Tomahawk I from No. 410 Squadron R.C.A.F., and it was the only British-based machine to see action.

Many other Tomahawks were shipped to Takoradi, West Africa, and then ferried to Egypt and the Middle East, where they first went into action in June 1941. Ironically, some of their first victims were the Martin Maryland twin-engined bombers, flown by Syrian-based Vichy French forces. In this area five R.A.F. squadrons as well as Nos. 2 and 4 Squadrons of the South African Air Force, and No. 3 Squadron of the R.A.A.F. used the Tomahawk, strafing Rommel's troops and supply lines. A total of 1,080 Tomahawks of three types were ordered by the R.A.F. Other Tomahawks included two stragglers, namely *AX900* and *BK852*.

After the German invasion of Soviet Russia 146 Tomahawk IIBs were re-shipped there, selected from the reserve force based in the United Kingdom. The last 49 aircraft were sent directly from the U.S.A. They went into action on the Moscow and Leningrad fronts in October 1941, and were the first U.S. planes to be used in the new battle areas.

Another batch of Tomahawks went to bolster Turkish neutrality in November 1941, but the most famous of all Tomahawks were the 100 diverted from the British contracts for shipment to the American Volunteer Group (the A.V.G.) of the Chinese Air Force.

Painted with the shark's teeth inspired by the markings of the Desert Air Force's No. 112 Squadron, the "Flying Tigers" came into existence in August 1941 under the command of Major Claire Lee Chenault. Newly promoted to Brigadier General in the Chinese Army fighting the Japanese, Chenault went to the States in November 1940 to recruit pilots. Of the 100 aircraft sent to China only 90 reached Kyedaw, and these, together with eighty American pilots began operating out of Kumming and Mingaladon in December 1941. They first fought and defeated the Japanese when shooting down six out of a force of ten bombers attacking the town of Kumming on 20th December 1941. The Mingaladon-based squadron did not do so well for they began their operational life with the loss of two pilots when intercepting Japanese bombers three days later.

The A.V.G. was credited with 286 victories over Burma and Southern China before it became the 23rd Fighter Group of the U.S.A.F. The "Flying Tigers" developed tactics whereby the superior climb and manoeuvrability of the Japanese fighters could be balanced by the P-40's superior speed and rugged construction. They worked their aircraft hard and

without replacement losses rose rapidly. Some were destroyed on the ground by strafing Japanese fighters, and cannibalisation provided spares for those that could be kept airworthy. By March 1942 only twenty P-40Bs were available, but the U.S. Government furnished a small number of the improved P-40E, thirty being ferried to the A.V.G.

P-40 VARIANTS

A small number of P-40s were converted to RP-40 reconnaissance fighters in 1941, and one aircraft was modified to accept installation of the 1,200-h.p. Pratt & Whitney R-1830 Twin Wasp, radial, air-cooled engine. This was housed in a close fitting cowling and, ironically, was found to give the P-40 a better performance than the standard Allison-powered model. The circle of radial-engine, in-line, radial had been completed.

THE TOMAHAWK DESCRIBED

Low-wing cantilever monoplane with N.A.C.A. aerofoil 2215 at root and 2209 at tip. Structurally it consisted of two wing panels joined at the fuselage centre-line, with longitudinal stringers, shear beams and bulkhead of aluminium alloy covered with a flush-riveted smooth Alclad skin. Ailerons were of aluminium alloy frames covered with fabric. Hydraulically-operated split trailing-edge flaps extended between the ailerons and fuselage. The fuselage was an aluminium alloy semi-monocoque structure built up of Alclad bulkheads, aluminium alloy stringers and a flush-riveted, stressed Alclad skin.

Tail unit was a cantilever monoplane with all-metal framework, the fixed surfaces having a smooth metal covering, whilst moving surfaces were covered with

Tomahawk IIB of No. 26 Squadron, R.A.F.
(Photo: Imperial War Museum)





Interesting and unusual colour scheme is carried by this P-40 in the Western Desert. Thought to be early camouflage pattern.

fabric. Adjustable trim tabs were fitted to the elevators and rudder.

Undercarriage consisted of two Curtiss oleo-pneumatic, shock absorber legs with wheels retracting backwards and rotating through 90 degrees to lie flush within the wing. Struts were enclosed in hinged fairings beneath the wing. Tail wheel was retractable and steerable, and when in the up position was enclosed by two doors.

Powerplant was a single Allison V-1710-33, twelve cylinder, liquid-cooled Vee engine developing 1,150 h.p. at take-off. It had a single speed, internal blower (supercharger) and integral reduction gears driving a three-blade, fully-feathering variable-pitch Curtiss electric propeller. Twin radiators were installed in a scoop under the engine cowl, and they cooled the ethylene/glycol coolant, 3.7 gallons of which was stored in a tank on the engine bulkhead. The oil cooler was also installed in this scoop. The Allison operated most efficiently at 12,000 feet, but power fell off at 15,000 feet and over.

Fuel, 148 gallons, was contained in three main tanks—front wing 35 gallons; main wing 50.5 gallons and fuselage 62.5 gallons. Normal fuel consumption of 50 to 60 gallons per hour provided 2½ hours flying. A belly tank, varying between 52 and 150 gallons could be installed.

Armament consisted of two to four free-firing .30 calibre (.303 Brownings in the British P-40s) in the wings, and two .50 calibre on the engine cowl. Each gun was charged manually on the ground and carried 235 rounds of ammunition, enough for approximately 10 seconds continuous firing.

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U.S.A.F. PRODUCTION				
Quantity	Model	Contract	Date approved	Serial Nos.
1	XP-40	AC-10136	30 July 1937 (ord.)	38-010
65	P-40	AC-12414	26 April 1939	38-156 to 220
68	P-40	AC-12414	26 April 1939	39-222 to 289
(390 P-40s to this contract cancelled)				
66	P-40	AC-12414	26 April 1939	39-290 to 679
100	P-40B	AC-15802	13 Sept. 1940	40-292 to 357
31	P-40B	AC-15802	13 Sept. 1940	41-5205 to 5304
193	P-40C	AC-15802	13 Sept. 1940	41-13297 to 13327
				41-13328 to 13520

SPECIFICATION

	P-40 Tomahawk I, IA, IB	P-40B Tomahawk IIA	P-40C Tomahawk IIB	
Dimensions				
Wing Span	37 ft. 4 in.	37 ft. 4 in.	37 ft. 4 in.	
Wing Area—Sq. ft.	236	236	236	
Length	31 ft. 8½ in.	31 ft. 8½ in.	31 ft. 8½ in.	
Height	10 ft. 7 in.	10 ft. 7 in.	10 ft. 7 in.	
Weight—lbs.				
Empty	5,376	5,590	5,812	
Normal loaded	6,787	7,326	7,459	
Maximum loaded	7,215	7,600	8,058	
Performance				
Max. Speed at 15,000 ft.	357	352	345	
Cruising—m.p.h.	277	273	270	
Landing	80	80	85	
Normal Range—miles	650	730	730	
Maximum Range	1,400*	1,230	1,230	
Service Ceiling—ft.	32,750	32,400	29,500	
Climb Rate—f.p.m.	3,080	2,860	2,650	
Armament				
.30 M/gns.	2	4**	4	
.50 M/gns.	2	2	2	
Fuel—Gallons	100-168	120-160	134-186	* 160 U.S. Gallons of fuel.
Engine	Allison V-1710-33	Allison V-1710-33	Allison V-1710-33	** British .303 M/gns
H.P.	1,040	1,040	1,040	