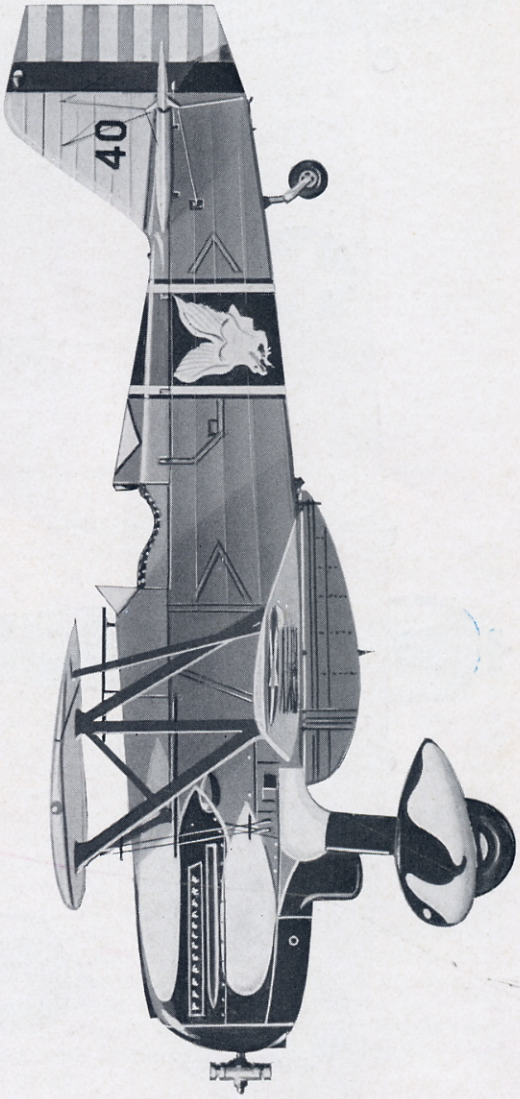
PROFILE
PUBLICATIONS

The Curtiss Army Hawks



NUMBER 45
TWO SHILLINGS

CURTISS P-6E HAWK (600-h.p. V-1570-23 Conqueror) of the 17th Pursuit Squadron, 1st Pursuit Group, Selfridge Field, Michigan, U.S.A.

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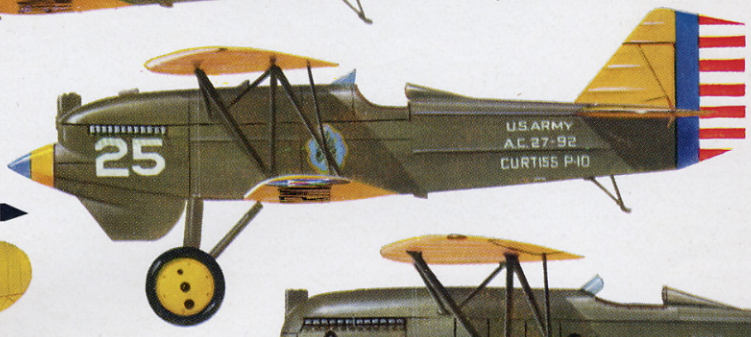
P-1D Hawk, 43rd School Squadron, Kelly Field, Texas. Command aircraft.

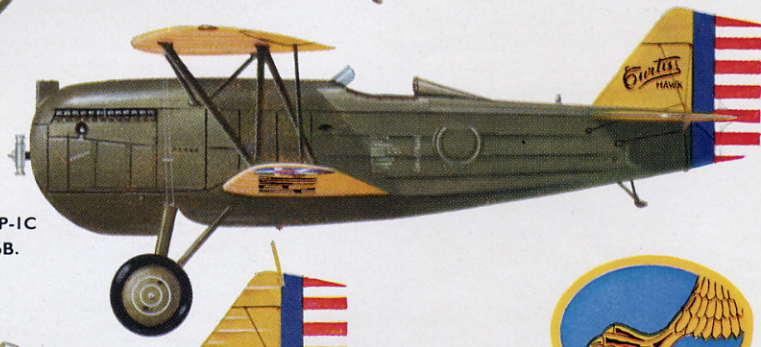
Upper wing detail

43rd School Squadron.



P-1D Hawk, 43rd School Squadron, Kelly Field, Texas.

A/C 58 Command stripes, 17th Pursuit Squadron. (see five view)



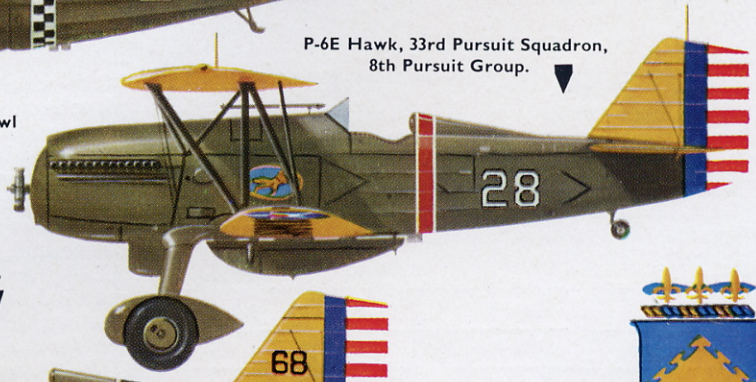
P-1C Hawk, the last P-1C completed as XP-6B.

A/C 38

33rd Pursuit Squadron

P-6D Hawk fitted with turbo-supercharger.

P-6E Hawk, 33rd Pursuit Squadron, 8th Pursuit Group.

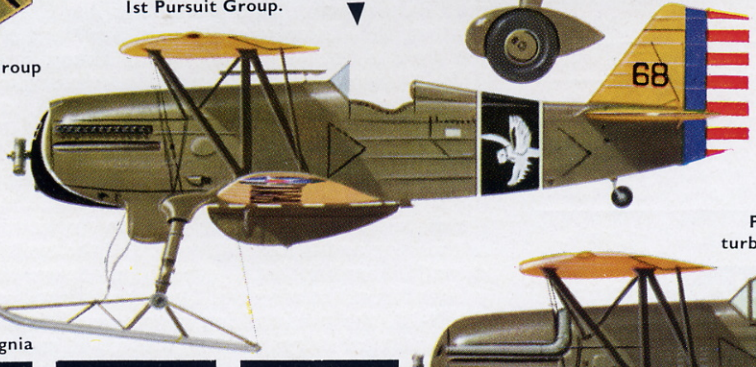


Coolant notice on cowl

PRESTONE

1st Pursuit Group

P-6E Hawk, 17th Pursuit Squadron, 1st Pursuit Group.



8th Pursuit Group

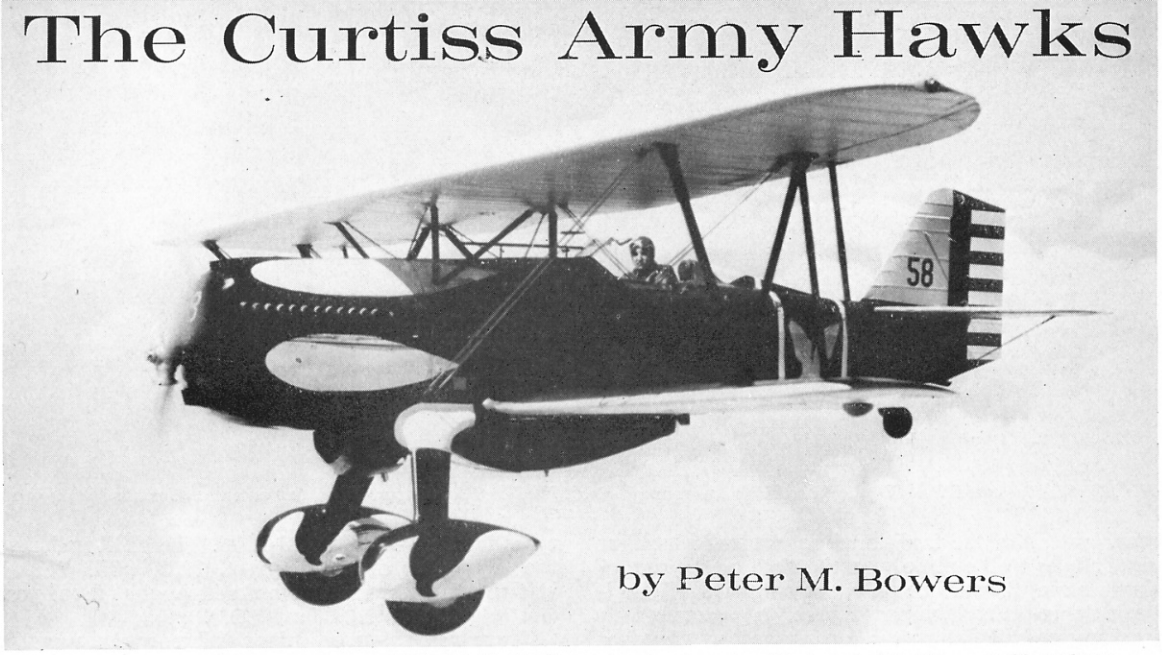
Variations of 17th Pursuit Squadron insignia

P-6F Hawk, fitted with turbo-supercharger and cabin.

Air Material Command, Wright Field

WRIGHT

The Curtiss Army Hawks



by Peter M. Bowers

P-6E of the 17th Pursuit Squadron, Selfridge Field, Michigan, showing the unique black and white "Snow Owl" markings.

The Curtiss "Hawk", built by the Curtiss Aeroplane & Motor Company of Buffalo and Garden City, New York, is one of the most famous biplane fighter designs of the years between the two world wars. This graceful machine was in production for over a decade —a remarkably long life for a fighter of that period, and in its major production versions, P-1 and P-6, the "Hawk" was first-line equipment in the U.S. Army Air Service and the later Army Air Corps. Similar models served the U.S. Navy as F6C-1 to F6C-4 and considerably revised later models appeared in the fleet as F11C-2/BFC-2 and BF2C-1. Export models of all versions, some of which survived to the end of W.W.II, were sold abroad under a variety of factory-assigned "Hawk" designations. However, only the U.S. Army models are described in this *Profile*.

Because of the Army procurement policy of the time, under which the principal service aircraft types were procured from two different manufacturers, the "Hawks" did not enjoy a monopoly of the fighter rôle (this was called "Pursuit" from W.W.I until 1948, as shown in the "P-for-Pursuit" designation of the airplanes). They shared the limelight with their contemporaries, the Boeing PW-9s and P-12s, which outnumbered them slightly. However, due largely to their tapered wings and the refined fuselage and undercarriage details of the later models, the "Hawk" is the more memorable design and by far the favourite of the model builders.

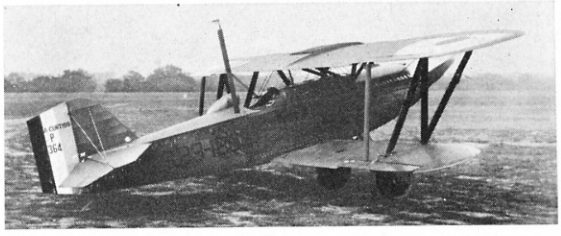
ORIGIN OF THE DESIGN

The Curtiss "Hawk" fighter was developed directly from the line of specialised racing planes that Curtiss built for the Army and Navy between 1921 and 1925, which included two winners of the Schneider Trophy Cup. The common feature of all the Curtiss racers was the powerplant. This was a compact, water-cooled, direct-drive V-12 design that had been introduced in 1918 as the Curtiss-Kirkham K-12. In its post-war production version it had a displacement of 1,150 cubic inches and developed 435 h.p. The racing versions were of course operated at much higher power, but contributed much to the standard service versions. Later versions were the short-lived V-1400 model and the famous V-1570 "Conqueror", a 600-h.p. model that served the "Hawks" and other U.S. Army aircraft from 1927 to the beginning of W.W.II. At the time the "Hawk" was introduced, engines were known only by their manufacturer's given designation. Both U.S. military services adopted a type and size designation in the middle 1920's. The D-12 became the V-1150 because of its basic Vee design and its 1,150 cubic inch displacement. The letter "R" identified the air-cooled radial design.

Another feature of the Curtiss racers that was adopted for the new fighter model that led to the "Hawk" was the unique low-drag wing surface radi-

**Unless indicated, all the photographs appearing in this Profile are part of the Peter M. Bowers collection.*

Left: *The fourth production PW-8, 24-204. This is the machine used by Lt. Russell Maughan in his famous "Dawn-to-Dusk" flight from coast to coast on 23 June 1924.* Right: *The XPW-8A with its original centre section radiator.* (Photo: U.S.A.F.)

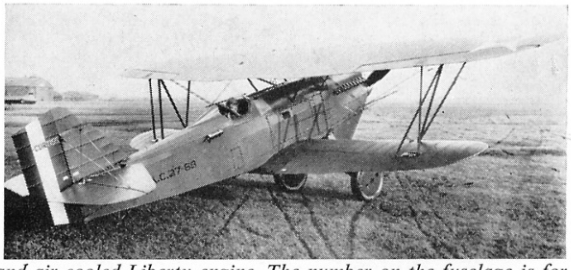


The XPW-8A became XPW-8B when fitted with new tapered wings. The long boom is part of the test equipment installed during tests at McCook Field.

ator. Instead of the traditional honeycomb placed at right angles to the airflow on the nose or the side of the fuselage, the surface radiators consisted of longitudinal thin-wall tubes approximately one-quarter inch in diameter laid flat on the top surface of the upper wing. One feature of the Curtiss racers that was not passed on to the fighters was the heavy laminated wood veneer fuselage.

Following the trend of the times, Curtiss broke away from traditional wire-braced wood truss fuselage construction when it developed its new biplane fighter for the Army in 1923. Three prototypes, with welded steel tube fuselages and one of the first divided-axle undercarriages, were ordered on 27th April 1923. These were designated PW-8, for Pursuit, Watercooled, Model 8, under a designation series that had originated in 1920. The supplemental prefix letter "X" was applied retroactively to the PW-8 prototypes after the desirability of distinguishing between prototype and production versions of the same design became apparent in 1924. Air Service serial numbers for the prototypes were *23-1201* to *23-1203*. The "23" indicated the fiscal year of the contract, 1923, while "1201" was the 1,201st airplane ordered in that fiscal year (1st July 1922 to 30th June 1923).

There were relatively minor differences between the first two XPW-8s, and the 25 production versions (*24–201* to *24–225*) were generally similar to the second prototype. The third prototype was held back at the factory for completion with entirely new wings and a new cooling system. It had been recognised, even before the production models were built, that the surface-type radiators were a liability on a combat machine. Their large area made them highly vulnerable to damage by gunfire, and the terrific total length of tubing created a serious leakage problem. The PW-8s were an interesting mixture of the old and the new, as might be expected in the first new fighter design produced in quantity since the end of W.W.1. While the fuselage and undercarriage were entirely new and of steel construction, the wings were not only all wood but were of thin section that required



Left: *The first P-1 after being fitted with an experimental inverted and air-cooled Liberty engine. The number on the fuselage is for racing.* Right: *The sixth P-1B, A.C. 27-68, photographed at the factory.*

Left: *P-1B 27-84 of the 43rd School Squadron.* Right: *P-10, 27-92, 43rd Squadron, Kelly Field, Texas. Group insignia appears on the fin.*

The first P-2, fitted with a turbo-supercharger and redesignated XP-2.

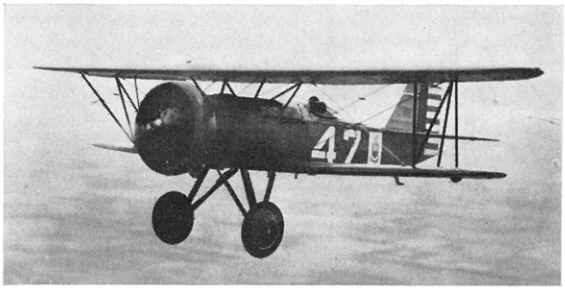
a second bay of interplane struts for stiffening. The PW-8s were the only post-war U.S. fighters to use double-bay wings.

THE "HAWK" APPEARS

The configuration of the "Hawk" began to take shape with the appearance of the third XPW-8, which was designated XPW-8A. The wings were straight, as on the PW-8s, but the skin radiators were replaced by a core type built into the upper wing centre section somewhat in the manner of W.W.I German Albatros' and similar types. Heavier spars produced stiffer structure, so only a single bay of struts was required. By the time the XPW-8A was undergoing test at McCook Field, Dayton, Ohio, where the Army Engineering Division was located, a competitive design had made its appearance. This was the Boeing XPW-9, which incorporated some interesting new features, notably tapered wings and a "tunnel" radiator installation located beneath the engine. Neither of these features was new, even on an American design, both having been seen on the Army's own XPW-1 design of 1920. Boeing, however, brought them to a degree of perfection that made them very attractive. Since the XPW-8A showed relatively little improvement over the Basic PW-8 with the same straight wing, the Army asked Curtiss to try the new features on it—first the tunnel radiator and then the tapered wing. The final configuration, designated XPW-8B and delivered in March 1925, was highly successful and became the prototype of the entire "Hawk" line, which started with an order for 15 P-1 "Hawks" placed by the Army in 1925. The "PW" designation was dropped when a new "P-for-Pursuit" designation was adopted in 1924. However, since Boeing PW-9s were in production at the time, the designation was retained for that one model until production ended in 1928.

THE "HAWK" DEVELOPS

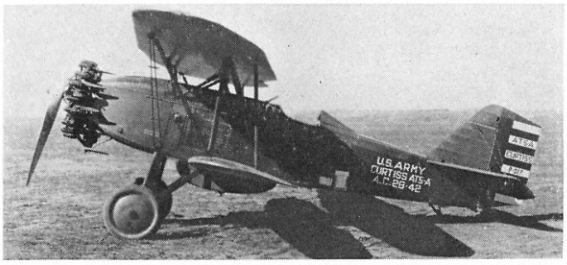
The following descriptions of U.S. Army "Hawk" air-



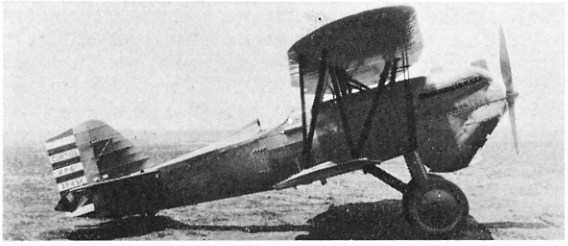
Left: *The first XP-3A with the fuselage contours filled out to meet the lines of the experimental NACA engine cowling.* Right: *XP-3A No. 2, a standard P-3A also fitted with experimental cowling.* (Photo: U.S.A.F.)

Left: *P-3A fitted with Townend anti-drag ring. Insignia is of Technical Training Command, Chanute Field, Rantoul, Illinois.* Right: *P-5, essentially a P-1A with turbo-supercharger.*

The XAT-4, a P-1A fitted with a 180-h.p. Wright-Hispano engine and tested as an advanced trainer. (Photo: Curtiss)



AT-5A, structurally similar to the P-1B but fitted with a 220-h.p. Wright J-5 radial engine for use as an advanced trainer. Later converted to P-1E. (Photo: U.S.A.F.)



The XP-6 was a P-2 fitted with the new 600-h.p. Curtiss V-1570 "Conqueror" engine. (Photo: U.S.A.F.)

planes are presented in number and letter sequence of model designation, with "X" models being listed before "Production" models. Some modifications of early airplanes received late designations while the production versions of high-number prototypes sometimes used much lower numbers.

P-1—The only noticeable external difference between the XPW-8B and the P-1 was the addition of aerodynamic balance area to the rudder of the P-1. Armament was the U.S. standard of the time, a pair of ·30 calibre Browning machine guns synchronised to fire through the propeller with alternate provision for a single ·30 and one ·50 calibre gun. Provision was made for interchangeable engine mounts that would permit use of the standard D-12 engine or an enlarged version, the Curtiss V-1400. As originally planned, the last five of fifteen P-1s ordered were to be delivered with the V-1400. The first P-1 was delivered in August 1925, and was used mainly as a test machine. After proving out the standard model, it was fitted with an inverted air-cooled "Liberty" engine modified by Allison and was entered in the 1926 National Air Races. Later, it was fitted with an experimental Curtiss V-1460 engine and redesignated XP-17. Only ten of the P-1s originally ordered were completed as such, with Air Service Serial numbers *25–410* to *25–419*.

XP-1A—Not a prototype. Production P-1A *26–280* assigned experimental status for test work.

P-1A—Twenty-five improved P-1As were ordered in September 1925, with deliveries beginning in April 1926. Principal changes from the P-1 were use of the later D-12C engine, fuselage structure lengthened three inches, revised fuel system, and improved bomb release system. Serial numbers *26–276* to *26–300*, inclusive. Only 23 P-1As were delivered as such, *26–296* being completed as XAT-4 and *26–300* as XP-3A, but three additional P-3As were created by installing D-12 engines in P-2 airplanes *25–421*, *422* and *424*.

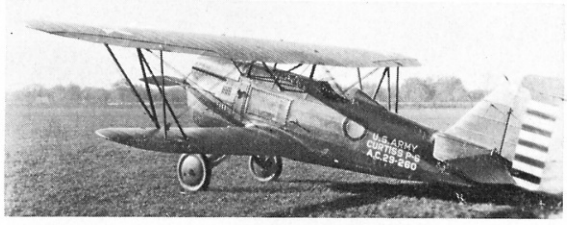
XP-1B—Not a prototype. Production P-1B *27–71* used for test work.

P-1B—An additional 25 improved P-1s, structurally similar to P-1As but equipped with larger wheels, redesigned radiator and cowling, flares for night landings, and improved controls. By the time the P-1Bs were ordered in August 1926, the Army Air Service had become the Army Air Corps, so the P-1B serial numbers were written as A.C. *27–63* to *27–87* instead of using the former A.S. prefix.

XP-1C—Not a prototype. Production P-1C *29–238* temporarily assigned to test work.

P-1C—The last production P-1s were 33 P-1Cs, essentially P-1Bs fitted with 30-inch by 5-inch wheels with brakes. Ordered in October 1928, and delivery completed in April 1929. The last two were delivered with hydraulic shock absorbers instead of the rubber blocks used on earlier models. One was converted to XP-6B by engine change. P-1C serials *29–227* to *29–259*.

P-1D—The 40 P-1Ds were not originally ordered as such. The Army reached the conclusion that standard fighter airframes fitted with lower-powered engines would make good advanced trainers. Industry was encouraged to develop the idea, so Boeing installed a surplus W.W.I Wright-Hispano "E" of 180 h.p. in a PW-9A to create the XAT-3 while Curtiss fitted the same engine to P-1A *26–296* to produce the XAT-4. The Curtiss design won the large production order. However, the disadvantages of the scheme soon became apparent. The weight of the P-1A airframe and its load factors were not reduced to be compatible with the lower power, so the performance of the airplane was disappointing. As a result, the Army ordered the first 35 AT-4s to undergo an engine change



P-6 (actually P-6A) 29-260 with fuselage contours filled out to match larger size of Curtiss "Conqueror" engine.
(Photo: U.S.A.F.)

The first XP-6A was a P-1A fitted with XPW-8A wings and a "Conqueror" engine for the 1927 National Air Races.
(Photo: Curtiss)

to the D-12 and redesignated them P-1D. The last five had the water-cooled "Hisso" engines replaced with air-cooled Wright J-5 radials and continued in the trainer rôle. P-1D serial numbers *27–88* to *27–97*, *27–213* to *27–237*.

P-1E—The last five AT-4s were completed as AT-5 with the new air-cooled Wright J-5 (R-790) radial engine of 220 h.p. that was considerably lighter than the Wright-Hispano. However, the disadvantages of low power in a highly-stressed fighter airframe were still the same, and the AT-5s were fitted with D-12 engines and redesignated P-1E. AT-5 serial numbers *27–238* to *27–232*.

P-1F—An additional 31 fighter-trainers with the J-5 engine were ordered as AT-5A. Their structural relationship to the AT-5 was the same as that of the P-1B to the P-1A, hence the difference in designation. Again, performance was disappointing, with a top speed of only 121·9 m.p.h. compared to 157·5 for the P-1B, which had a gross weight of 2,932 lb. compared to the 2,478 of the AT-5A. AT-5A serial numbers *28–42* to *28–72*. An additional P-1F resulted from installation of a D-12 engine in the second XP-21, *28–189*.

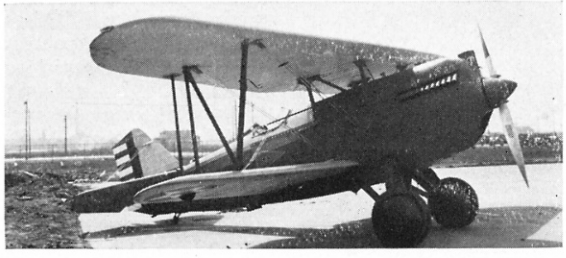
XP-2—Not a prototype. The first P-2, *25–420*, given an experimental designation after being fitted with a side-mounted turbo-supercharger.

P-2—The last five P-1s were completed with 600-h.p. Curtiss V-1400 engines and were redesignated P-2. The new engine did not prove to be a desirable article, so three of the P-2s (*25–421*, *422* and *424*) were converted to P-1As with D-12 engines and *25–423* became the XP-6 with the new Curtiss V-1570 "Conqueror" engine. Only the first one, *25–420*, remained a P-2.

XP-3—The last P-1A, *25–300*, was to have been completed at the factory with the new 390-h.p. Curtiss R-1454 air-cooled radial engine, but since this had already been tested in other aircraft and found unsatisfactory, a new Pratt & Whitney "Wasp" engine was ordered, installed before the XP-3 was completed.

XP-3A—The XP-3 completed with the new 410-h.p. Pratt & Whitney R-1340 "Wasp" engine in place of the Curtiss R-1454. Originally delivered with an uncowled engine, this airplane was used to test the early N.A.C.A. cowlings for radial engines, at which time the fuselage lines were filled out to fair to the cowling contours by adding formers and stringers to the fuselage. Later, when used to test the smaller Pratt & Whitney "Wasp Jr." engine, the XP-3A was redesignated XP-21.

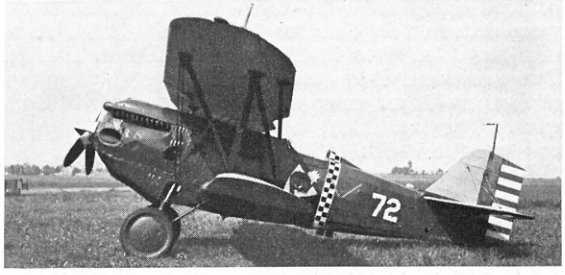
P-6A with three-blade propeller and standard nose shape.



P-6A with modified nose and two-blade propeller.
(Photo: E. N. Sommerich)

The last P-1C completed as XP-6B with "Conqueror" engine.
(Photo: Curtiss)

Chequered band is black and white. Above and Below: *P6Ds were P-6s and P-6As fitted with turbo-super-chargers.*
(Photos: E. M. Sommerich and A. U. Schmidt)



XP-3A No. 2—Not a prototype. The first production P-3A, *28–189*, used for test work in connection with the N.A.C.A. cowling development. When fitted with a tight cowling and a large spinner, this airplane was entered in the 1929 National Air Races, the last time that the Army competed with civil aircraft in the races. Later, the second XP-3A joined the first in testing the "Wasp Jr." engine as XP-21.

P-3A—Five "Hawks" generally similar to the AT-5A used to service test the 410-h.p. "Wasp" radial engine in a fighter airframe. The Air Corps decided against the use of the radial in the "Hawk" although preferring it in the contemporary Boeing P-12 model. However, the liquid-cooled D-12s and "Conquerors" were at a decided disadvantage at altitude, and the Army conducted experiments with practically every different liquid-cooled "Hawk" model by installing turbo-superchargers to improve high-altitude performance. The Navy, however, switched from the D-12 in its equivalent F6C-1 to F6C-3 models to the "Wasp" in the F6C-4. The P-3As were originally delivered without engine cowlings, but narrow Townend rings were soon added. They did little, however, to increase the speed of the P-3As over the 154 m.p.h. maximum of the original uncowled XP-3A. P-3A serial numbers *28–189* to *28–193*.

XP-5—Not a prototype. The first P-5 assigned to test work.

P-5—Five "Hawks" similar to the P-1A but fitted with turbo-supercharged D-12F engines to service test the new engine. Gross weight increased to 3,421 lb. compared to 2,932 for the P-1B. Sea-level speed was only 142 m.p.h., but this increased to 166 at 25,000 feet. Service ceiling for the P-5 was 30,475 feet compared to the absolute ceiling of 21,350 feet for the P-1A. By the time the P-5s were delivered in 1928, the later "Conqueror" engine was in service and no further developments were undertaken with the D-12. P-5 serial numbers *27–327* to *27–331*.

XP-6—The fourth P-2 (*25–423*) was fitted with the new 600-h.p. Curtiss V-1570 "Conqueror" engine and redesignated XP-6. Used primarily as a test bed for the new engine, it was entered in the 1927 National Air Races and placed second to the XP-6A in the unlimited event with a top speed for the closed course of 189 m.p.h.

P-6—Originally 18 service test P-6s, sometimes referred to as YP-6s, were ordered with the "Conqueror" engine. These were to use Prestone (Ethylene Glycol) for cooling instead of water, but in order to get some machines into service as quickly as possible, nine were ordered completed with water-cooled engines. These were delivered in October 1929 as P-6, with serial numbers *29–269* to *29–273* and *29–236* to *29–366*. Two additional P-6s were created by completing two of three P-11s on order with the water-cooled "Conqueror" engine. Most of the P-6s were eventually converted to P-6D.

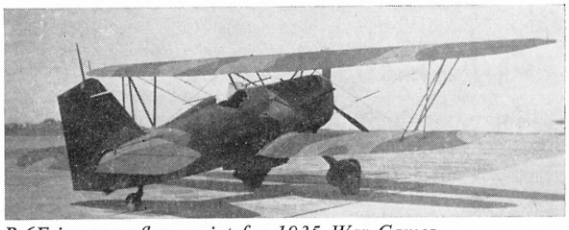
XP-6A No. 1—For its principal entry in the 1927 National Air Races, the Army ordered extensive modification of P-1A *26–295*. The old XPW-8A wings were installed after having been rebuilt to take the older PW-8 type surface radiator, the new V-1570 "Conqueror" engine was installed in a PW-8 nose cowling, and various minor refinements were undertaken. This machine won the unlimited race at a speed of 201 m.p.h. Useful only as a racer, the first XP-6A was destroyed shortly before the 1928 National Air Race.

XP-6A No. 2—Not a prototype. The fourth P-6A, *29–263*, temporarily assigned an experimental designation while being used for test work.

P-6A—The first nine machines of the original P-6 order completed with Prestone cooling systems. During the service test period, various minor changes in radiator shape were made and some of the machines were fitted with three-blade airscrews in place of the original two-bladers. One or more of the P-6As were converted to P-6D. P-1A serial numbers *29–260* to *29–268*.

P-6E of 33rd Pursuit Squadron. Compare late style open wheel fairings (called "Pants") with closed style shown on page 3. (Photo: A. U. Schmidt)

P-6E of 3rd Base H.Q. and Air Base Squadron, showing revised shape of elevators and inboard location of wing stars.



P-6E in camouflage paint for 1935 War Games. (Photo: R. H. Lober)

XP-6B—The last P-1C, *29–259*, was completed with a "Conqueror" engine in place of the D-12 and was redesignated XP-6B. It was intended for a long-distance flight from New York to Alaska, to be accomplished by Captain Hoyt of the Army Air Corps. Because of this, the airplane was known at the factory as the "Hoyt Special". It crashed short of its goal and was shipped back to the United States for repair and subsequent test work.

P-6C—Designation not used. Originally intended to replace the Y1P-22 designation but cancelled when the new P-6E designation was assigned to the same airplanes.

XP-6D—The first P-6A, *29–260*, fitted experimentally with a turbo-supercharged V-1570C "Conqueror" engine in April 1931. Sea-level speed decreased slightly to 172 m.p.h. from the 178·6 of the P-6A, but top speed at 15,000 feet increased to 197 m.p.h.

P-6D—Following the successful test of the XP-6D,

The former YP-20 and XP-6E became XP-6F when fitted with a turbo-supercharger and enclosed cockpit.

XP-6F showing turbo-supercharger.
(Photo: Gordon S. Williams)

XP-6G was a standard P-6E fitted temporarily with a later model V-1570 "Conqueror" engine.

The XP-6H was the first production P-6E fitted with four wing-mounted ·30 calibre machine guns in addition to the normal pair of synchronised nose guns. (Photo: D. C. Cooke)

nine of the P-6s and an undetermined number of the P-6As were converted to P-6D between February and April 1932, by installing turbo-superchargers. The only outward difference from the XP-6D was the use of three-blade propellers instead of the two-bladers of the prototype.

XP-6E—This was a much-redesignated airplane, having been ordered originally as the third P-11, serial number *29–374*. It was completed as the YP-20 and was then fitted with the engine and landing gear of the XP-22 and redesignated XP-6E. Later, it became the XP-6F.

P-6E—Forty-six greatly improved "Hawks" were ordered under the service test designation of Y1P-22, since they were derived from the experimental XP-22 model. The designation was changed to P-6C to simplify book-keeping and the spare parts problem, since most of the major components were similar to those used on the existing P-6 models. However, this was changed to P-6E before delivery in late 1931 and early 1932. The most noticeable change was the use of a single-strut undercarriage and a completely revised nose with the radiator moved back to a position just ahead of the undercarriage, as developed on the XP-22.

The balance area of the rudder was decreased by raising the top rib of the fin while the elevators were enlarged by straightening out the previously tapered trailing edges. The armament installation was revised by mounting the machine guns at the sides of the fuselage instead of on top of it. Structural refinements brought the gross weight down to 2,760 lb. while the 700-h.p. V-1570C "Conqueror" engine permitted a top speed of 197·8 m.p.h. at sea-level. The last airplane on the P-6E contract was kept at the factory and converted to the XP-23. P-6E serials *32–233* to *278*.

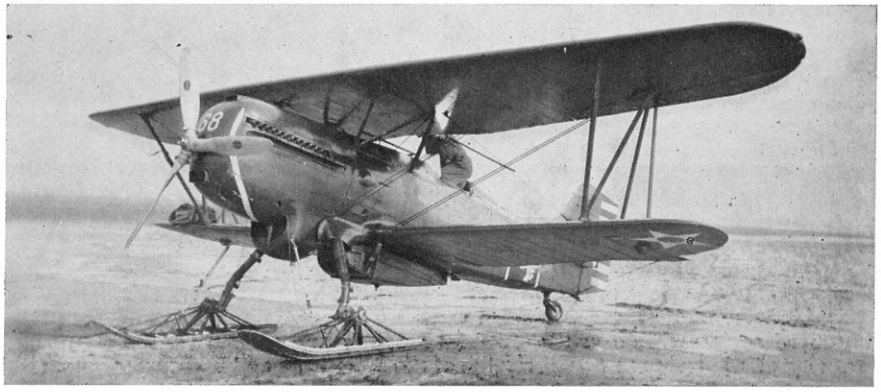
XP-6F—In March 1932, the XP-6E was returned to the factory for conversion to XP-6F with a turbo-supercharged V-1570F "Conqueror" engine. Redelivery was made March 1933. Gross weight increased to 3,149 lb., 389 lb. over that of the P-6E. High speed at sea-level decreased to 194 m.p.h. but was a blazing 225 m.p.h. at 15,000 feet. Cooling difficulties precluded careful testing above that altitude. Other than the turbo-supercharger, the only distinguishing feature of the XP-6F was the use of a sliding canopy over the pilot's cockpit. The XP-6F had proved that as speeds exceeded 200 m.p.h., the traditional open cockpit was no longer satisfactory.

XP-6G—One P-6E, *32–254*, was used to test an unsupercharged V-1570F "Conqueror" engine. Later, the experimental prefix was dropped, the airplane becoming P-6G. Eventually, the standard V-1570C engine was reinstalled and the airplane reverted to P-6E.

XP-6H—The first production P-6E, *32–233*, returned to the factory and fitted with new wing panels containing ·30 calibre machine guns. Two were installed in the one-piece upper wing just outboard of the centre section struts and one was installed in each lower wing panel. All four fired outside of the propeller arc.

P-11—At the same time that the "Conqueror"-powered P-6s were ordered, three similar airframes were ordered with new 600-h.p. Curtiss H-1640 12-cylinder two-bank air-cooled engines under the designation of P-11. Before the machines were finished tests of the engine in other aircraft proved it unsatisfactory, so the first two P-11s were completed as P-6 while the third, fitted with a Wright "Cyclone" radial engine, became the YP-20. P-11 serial numbers *29–367*, *368* and *374*.

XP-17—The first P-1, *25–410*, was used throughout its life as a test machine. While no designation change was made when the inverted air-cooled "Liberty" engine was installed, it became XP-17 when fitted with the experimental Curtiss V-1470, a 480-h.p. inverted



P-6E of 17th Pursuit Squadron on skis.

The YP-20 was originally to have been P-11; later became XP-6E, XP-6F.

The first P-1 became XP-17 when fitted with Curtiss V-1460 engine. (Photo: U.S.A.F.)

air-cooled V-12 model. By the time the Curtiss engine was installed in 1930, the airplane was thoroughly obsolete. The experimental designation was to indicate the test status of the airframe and not a new experimental fighter prototype.

YP-20—The third P-11, *29–374*, was completed in October 1930, with a 575-h.p. Wright R-1820 "Cyclone" radial engine in place of the Curtiss H-1640 and was given the designation of YP-20. After test of the "Cyclone", the YP-20 was fitted with the nose-landing gear, and tail surfaces of the XP-22 and was redesignated XP-6E. After proving out the P-6E configuration, it was fitted with a turbo-supercharger and became the XP-6F.

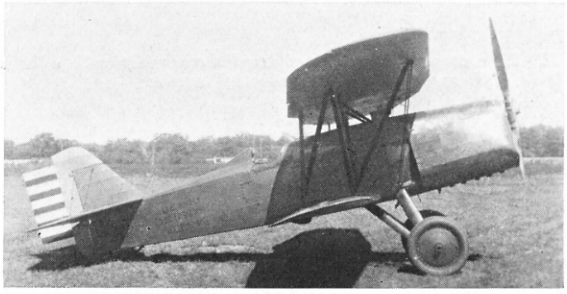
XP-21—The first and second XP-3As, *26–300* and *28–189*, were fitted with the new Pratt & Whitney R-985 "Wasp Jr." engines in December 1930. As in the case of the XP-17, the new designation was assigned to identify a particular test configuration and not a new prototype. The new Pratt & Whitney engine delivered only 300 h.p. and service fighters of the time used nearly double that power. The first XP-21 became XP-21A with minor changes while the second was fitted with a D-12 engine and became a P-1F.

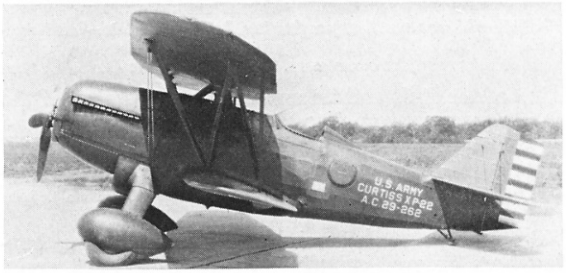
XP-22—The third P-6A, *29–262*, was extensively modified by installation of an entirely new nose and engine cooling system, gun installation, a single-strut undercarriage, a three-blade propeller, and revised tail surfaces. These items were removed and used on the YP-20, and the XP-22 reverted to a P-6A with its original equipment.

Y1P-22—Forty-six "Service Test" versions of the XP-22 were to be ordered under the designation of Y1P-22. This was unusual, since the normal service test order seldom exceeded 13 units. The airplanes were to have been redesignated P-6C before they were built, but were finally delivered as P-6Es.

XP-23—The last P-6E, *32–278*, was held at the factory and completed as the XP-23 with an entirely new monocoque aluminium fuselage, new tail surfaces, a new nose and landing gear, and a turbo-supercharged and geared G1V-1570-C engine. At a gross weight of 4,242 lb. the XP-23 had a top sea-level speed of 178 m.p.h. but reached 220 m.p.h. at 15,000 feet. The turbo-supercharger was later removed.

YP-23—The XP-23 redesignated when switched from "Experimental" to "Service Test" status. As YP-23 it flew with a two-blade propeller instead of the original three-blade model of the XP-23. In spite of the improved performance over the standard P-6E, there was no point in trying to extend the life of the biplane fighter any further—the monoplanes were already beginning to take over, at least in the Army. The Navy, with its requirement for slow landing speed on aircraft carriers, kept the biplane in production for a few more years. The Curtiss P-6Es of 1931–32 and the Boeing P-12Fs of 1933 marked the end of biplane fighter procurement for the U.S. Army Air Corps.





The XP-22 was a P-6A fitted with new nose and landing gear and served as the prototype for the P-6E. (Photo: U.S.A.F.)

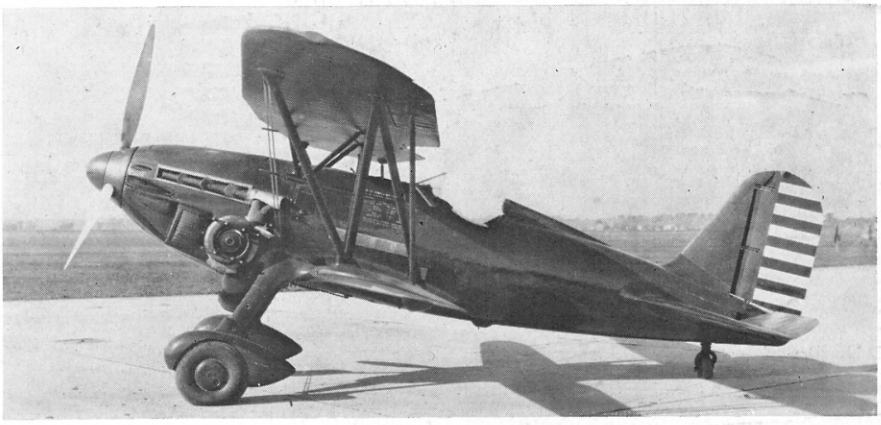
The XP-22 fitted with an experimental nose radiator during its test programme. (Photo: Curtiss)

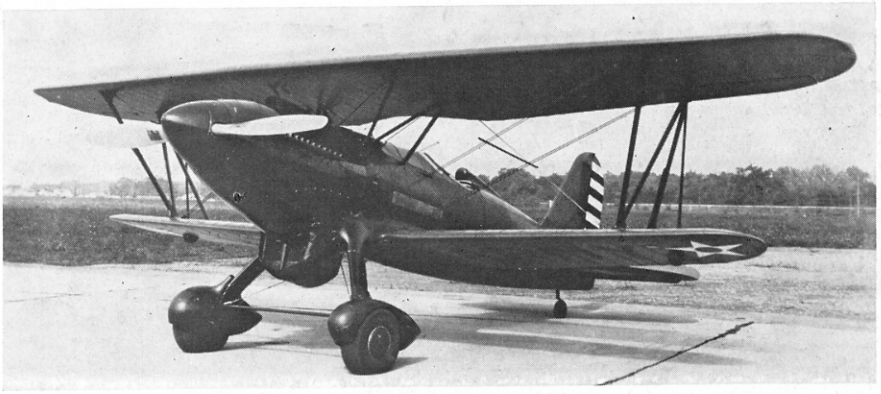
ARMY "HAWK" COLOURING

From the original PW-8s up to the P-1Bs, the Army "Hawks" were painted in overall khaki brown, a colour which became increasingly dark over the years and eventually came to be called olive drab. In 1927,

The XP-23 was the last P-6E completed with entirely new fuselage, nose, and tail surfaces.

After removal of the turbo-supercharger, the XP-23 was redesignated YP-23.
(Photo: U.S.A.F.)





the Army Air Corps abandoned the solid camouflage shade that had been in use since W.W.I and adopted high-visibility colouring in the interest of safety. All wings and horizontal and vertical tail surfaces were repainted in orange-yellow, also called chrome yellow, while fuselage, struts, and undercarriage remained olive drab. In 1935–36, the olive drab was replaced by a medium shade of greyish blue for fighters and other first-line combat types after some observation and training models had used it for several years. The Curtiss P-6Es retained this colouring until they were retired from service in 1939.

ARMY "HAWK" MARKINGS

When the PW-8s were introduced, the Air Service serial number was painted in large black figures on each side of the fuselage, as A.S. *23–1201* for the first XPW-8. The model designation and the name of the manufacturer were painted in three-inch black figures across the top of the rudder, as PW-8 CURTISS.

	P-1B	P-6A	P-6E
Wing Span	31 ft. 7 in.	31 ft. 6 in.	31 ft. 6 in.
Length	22 ft. 10 in.	23 ft. 7 in.	23 ft. 2 in.
Powerplant	Curtiss D-12D 435 h.p. at 2,300 r.p.m.	Curtiss V-1570A 600 h.p. at 2,400 r.p.m.	Curtiss V-1570C 700 h.p. at 2,400 r.p.m.
Empty Weight	2,104 lb.	2,389 lb.	2,068 lb.
Gross Weight	2,932 lb.	3,172 lb.	2,760 lb.
Speed (Sea level)	157·4 m.p.h.	178·6 m.p.h.	197·8 m.p.h.
Climb (Sea level)	1,638 ft./min.	2,320 ft./min.	2,400 ft./min.
Service Ceiling	20,000 ft.	27,200 ft.	24,700 ft.
Absolute Ceiling	21,900 ft.	28,400 ft.	25,800 ft.

Machines under test at McCook Field had the airplane Project number painted on the rudder below the designation, as P 364 for the PW-8A. By late 1926, the size of the serial number on the fuselage was reduced, and the words U.S. ARMY were added above them, with the designation still appearing on the rudder. In 1928, all of the information was combined in a three-line legend on the aft portion of the fuselage, U.S. ARMY on the top line, then the manufacturer and model designation, and finally the Air Corps serial number. This lettering could be either black or white, but for the Curtiss "Hawks" was almost invariably white. In some cases, the last two lines were transposed.

The form and application of the U.S. national markings varied during the life of the "Hawks". Until the end of 1926, the star-in-circle marking was carried at the extreme wing tips and as large as possible. At the time the yellow colouring was adopted, the size of the circle was reduced to fit between the leading edge of the wing and the aileron spar, and the marking was moved inboard so that its outer edge was one diameter inboard from the wing tip. Throughout production of the P-1B, the tail marking consisted of three equal-width vertical stripes of blue, white, and red, with the red at the trailing edge in the manner of contemporary British and French designs. In November 1926, this was changed, retaining the vertical blue stripe but changing the red and white to thirteen alternating horizontal stripes in the style of the American flag. The change-over was not instantaneous, and some Army airplanes carried the old vertical stripes into 1928.