

**PROFILE**  
**PUBLICATIONS**

The  
American  
D.H.4

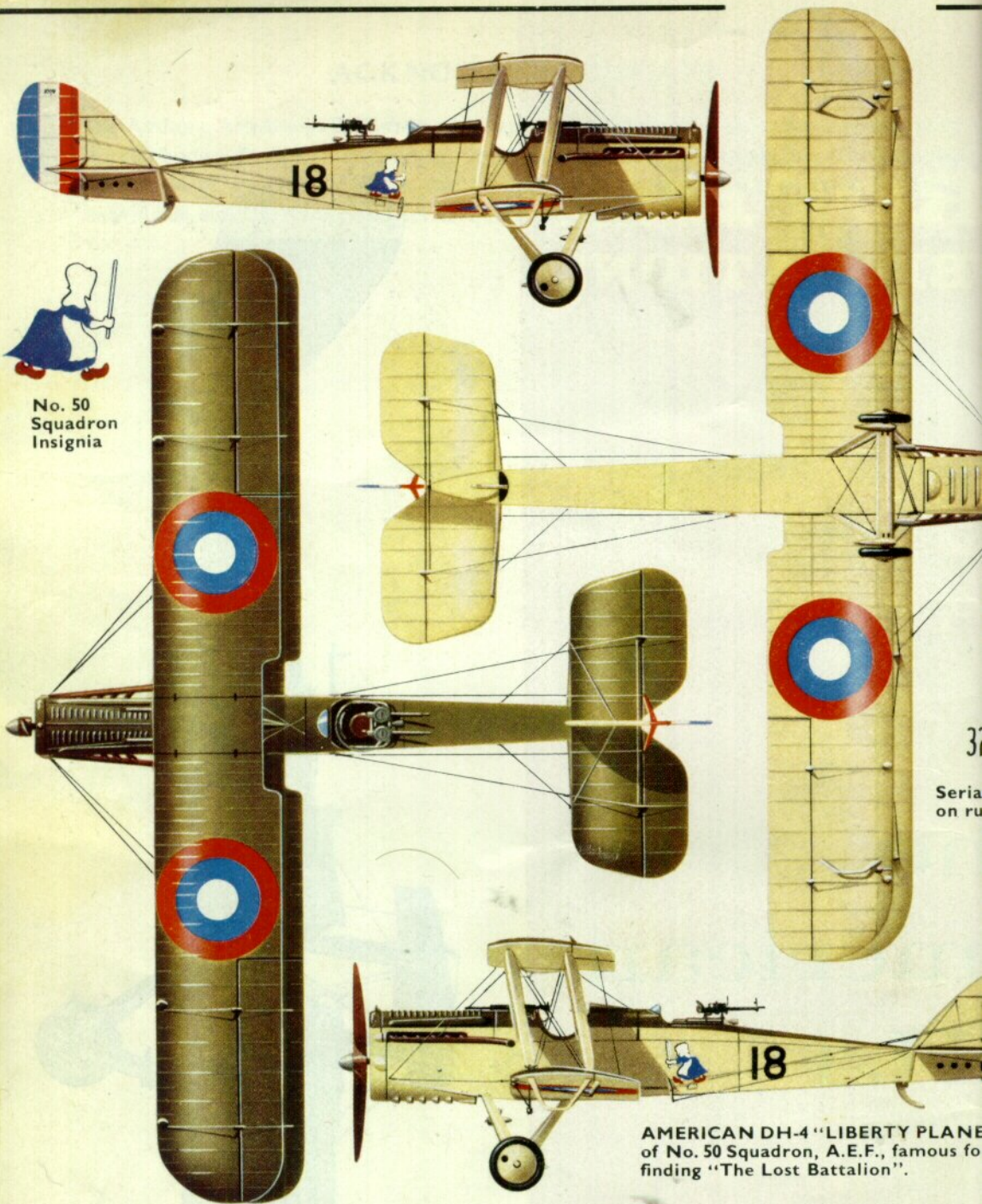
**NUMBER 97**  
**TWO SHILLINGS**





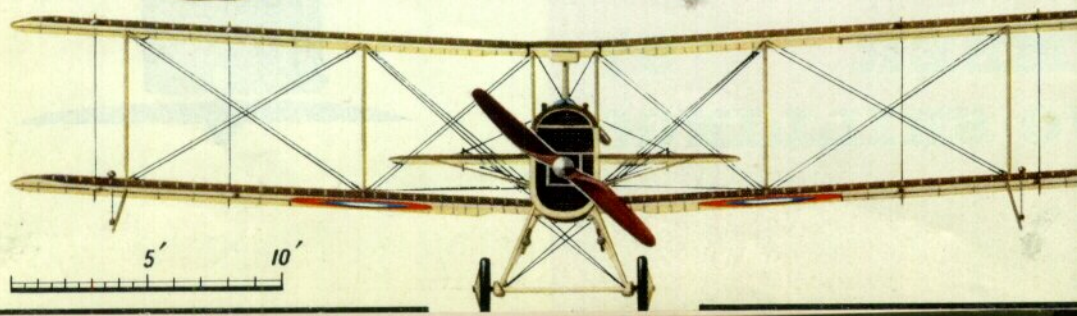


No. 50 Squadron Insignia



Serial on ru

AMERICAN DH-4 "LIBERTY PLANE" of No. 50 Squadron, A.E.F., famous for finding "The Lost Battalion".





# The American D.H.4



by Peter M. Bowers

*Boeing 02B-1's of the U.S. Marine Corps, duplicates of the DH-4M's with steel tube fuselages built for the Army Air Service by the Boeing Airplane Company in 1923-24.* (U.S. Navy Photo)

When the United States entered World War I on 6th April 1917, the Aviation Section of the Signal Corps did not possess a single combat-worthy aeroplane. The country had gone to war in a woeful state of unpreparedness, but in aviation it was least prepared of all. With typical American optimism however the nation mobilised its industries and embarked upon truly prodigious feats of production in a remarkably short time. Apart from its vast manpower reserves, one of its major contributions to the war in Europe was to be in combat aircraft. After conferences that extolled American manufacturing capacity, the French asked for 8,000 machines to be at the front by 1st May 1918, with reserves and trainers in support, totalling 20,000.

A number of contingencies frustrated the rosy promises of "thousands of battleplanes darkening the Western Front". To begin with, the automobile industry practically took over America's fledgling aircraft industry soon after the declaration of war, so that aviation people had little to say in subsequent proceedings, and it took a painfully long time for the auto tycoons to realize that aeroplanes simply could not be mass-produced in the manner applied to automobiles. Thus in spite of the promises and the expenditure of some \$617,000,000 on the American aviation programme, barely 200 U.S.-built aircraft saw action over the front before the Armistice.

Since there were no suitable combat aircraft on hand or even on the drawing boards in the country, a technical commission—the Bolling Commission, named after its commander, Colonel R. C. Bolling—was despatched to Europe to study the best designs available and arrange for their manufacture in the States.

The initial designs chosen were the British de Havilland D.H.4, Bristol Fighter and S.E.5, and the French Spad XIII.\* Samples of each were promptly shipped to the States for further study, and the drawings were revised to American standards. Of the four originally chosen, only the D.H.4 ever reached

the front. This machine, renamed "Liberty Plane" in the spirit of times that renamed German sauerkraut Liberty Cabbage, banned Beethoven's music and dubbed the war bonds "Liberty Bonds", was destined to become one of the most controversial and widely investigated aircraft of all time. There was much but ineffective protest over its adoption in the first place, as well as scandal and subsequent investigation in its manufacture, sharp criticism of its effectiveness at the front, and further scandals concerning the disposal of surplus aircraft after the War. In spite of its obvious inadequacies, the 1916 design remained in U.S. service until 1932—by any standards a remarkably long service life.

## AMERICAN ADAPTATION OF THE D.H.4

The first sample British D.H.4 arrived in the United States on 27th July 1917 and was promptly rushed to McCook Field at Dayton, Ohio, Headquarters of the Technical Staff of the Aviation Section. This machine, a late model with provision for the 250 h.p. Rolls-Royce Eagle engine—but delivered without one—was readily adaptable to the new American Liberty engine, which was also a V-12 type. A test model of the Liberty was installed in the British machine and the first flight of the combination took place on 29th October.

While the airframe and engine were compatible, putting them into production was no simple matter. The engine, ultimately to become one of the most reliable in the world, had many teething troubles, but these were nothing compared to the problems that American industry encountered in building plants and tooling them for production of the D.H.4. Thousands of engineering changes were made to the design before the machines began to roll from the factories. These were mostly in the nature of pro-

\* D.H.4 described in PROFILE No. 26, Bristol Fighter in PROFILE No. 21, S.E.5A in PROFILE No. 1, and SPAD S.XIII in PROFILE No. 17.





Early production version of the Liberty Plane in original colouring. Compare wheel size and location with later versions. (Photo: Bowers Collection)



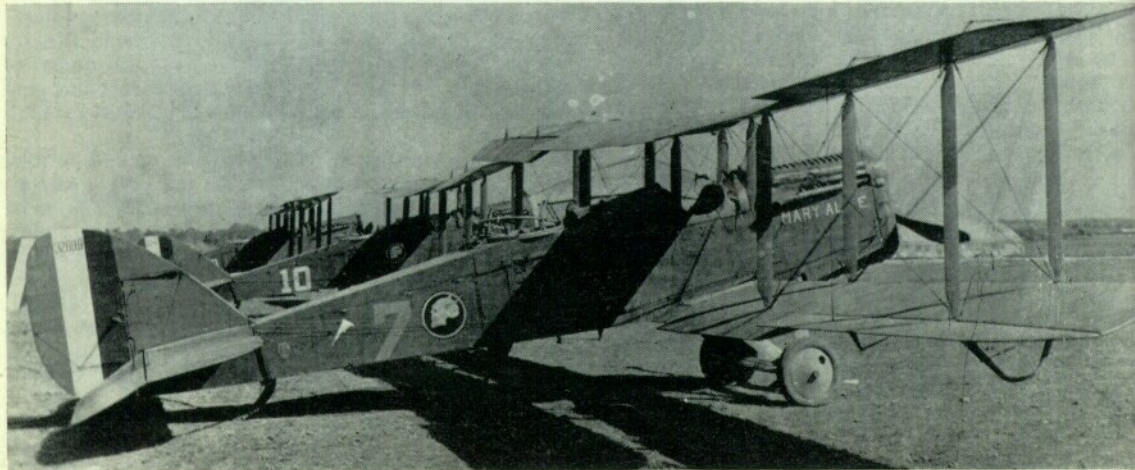
Cockpit details of the Liberty Plane. Normal armament was two Marlin machine guns for the pilot and two Lewis guns for the observer. (Photo: courtesy Gordon S. Williams)



The framework of a Fisher-built Liberty Plane partially uncovered for exhibition purposes. (North American Aviation Photo)

Liberty Planes of the 168th Observation Squadron, A.E.F., in the over-all khaki-brown colouring of the late 1918 period.

(Photo: Bowers Collection)



duction details and had little effect on the outward appearance of the design which, at a glance, was difficult to distinguish from the late versions of the British model with the high undercarriage. All metric dimensions had to be changed to the American standards of feet and inches, and even the screw threads had to be altered to the standards established by the Society of Automotive Engineers.

The Liberty Plane was built by three different manufacturers under contract to the U.S. Army which controlled the American proprietary rights to the design. In fact, many official publications referred to it as the Engineering Division DH-4. The three manufacturers were the Dayton-Wright Company Dayton, Ohio, which built 3,106 aircraft; the Fisher Body Division of General Motors at Cleveland, Ohio, which built 1,600, and the Standard Aircraft Corporation of Patterson, New Jersey, which built 140. An additional 7,502, on order from these and other firms, were cancelled following the Armistice. The established price of the 1918 Liberty Plane was \$5,500.

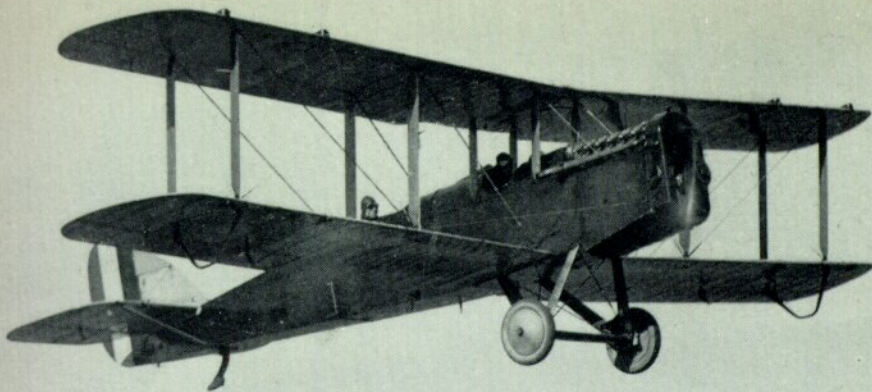
All Liberty Plane production was for the Army but of the 4,346 built some 283 were transferred to the Navy and Marines during and after the War. The Marines actually used some in combat, four squadrons having reached the Day Wing of the Northern Bombing Group by October 1918.

**Structure.** The basic construction was not changed from the British original. The fuselage was built in three separate sections. The cockpit-engine area used wood longerons covered with a plywood skin that eliminated the need for wire bracing. The portion between the cockpits and the tail was a fabric-covered wooden frame with wire bracing, and the tail section was again plywood-covered.

The wings used the standard routed-wood spars of the time with thin R.A.F. 15-section wing ribs sawn from sheets of wood and fitted with grooved strips screwed and glued in place. Wing bracing in the initial production versions was round strand wire, but this was soon replaced by streamlined R.A.F.-wires.

The undercarriage was built-up with two laminated wood Vee's joined by straight-across spreader bars and a floating axle secured with shock-absorbing rubber cord.





*Above and Below: The "Liberty Plane", the American-built version of the British De Havilland 4. This was the only American-built plane to see action over the Western Front in World War I. (Photo: Bowers Collection)*

### EARLY PROBLEMS

There had been considerable criticism of the British de Havilland as a choice for American production from certain knowledgeable sources, but they were steamrollered into ineffectiveness by the automotive juggernaut that was "running the show". In fact the 1916 D.H.4 was obsolete when the test model came to America, and its British-designed successor was already under way. The later European designs would not be available for American manufacture until they had been built and tested, and the Army's production programme was so tied up in red tape that knowledgeable American designers were not permitted to develop new designs of their own. When they were finally permitted to do so, in the Spring of 1918, the Liberty Plane was in heavy production and the new Air Service was committed to its use for the balance of the year.

One of the major drawbacks of the design was the seating. The pilot and his observer/gunner were separated by the 67-gallon main fuel tank which not only made communication between the cockpits difficult, but meant that the pilot was certain to be a casualty in almost any crash—as the tank was of heavy construction incorporating an early form of self-sealing in case of bullet damage. This feature

had been criticised from the first, but had nevertheless been retained.

Another original feature that gave trouble was the undercarriage. The wheels were located too far aft, rendering the machine nose-heavy on the ground. If the landing area was at all muddy, a nose-over was possible: in heavy mud it was almost a certainty. On un-modified aircraft this tendency was countered in a thoroughly intrepid fashion; the rear seat occupant would leave his cockpit during the landing approach and sit on the aft fuselage to weight the tail and prevent a nose-over! This was widely practised during the Air Service Reliability Race of late 1919, involving a round trip from coast to coast. The official report of the event however took note of this practice and condemned it.

There were plenty of other bugs built into the aircraft and in spite of a generally good performance from the Liberty engine, forced landings were frequent. It was not uncommon for combat machines to catch fire in the air without any assistance from the enemy.

Because of these various troubles the Liberty Plane soon acquired an unsavoury reputation, and the cry went up from the public that American boys were sent over the front in "Flaming Coffins". Actually







*Liberty Plane modified to a two-litter ambulance under the designation of DH-4Amb-2. Second litter is stowed in top fuselage superstructure with access from starboard side.* (U.S. Air Force Photo)

the Liberty Plane was little worse than other combat aircraft of the time, but all its troubles were seized on and amplified by the critics of the overall American programme. Corrections were worked out as rapidly as possible, and an entirely new model, the DH-4B, was ready for production by October 1918. This never however managed to replace the original models at the front.

#### COMBAT USE

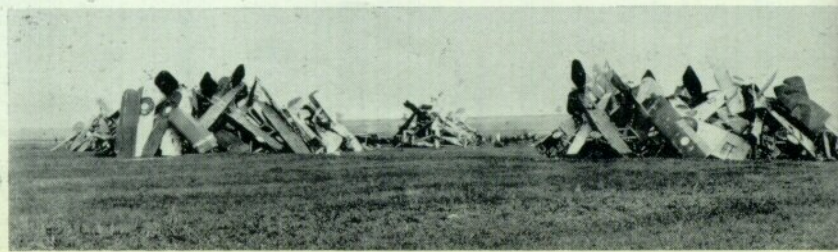
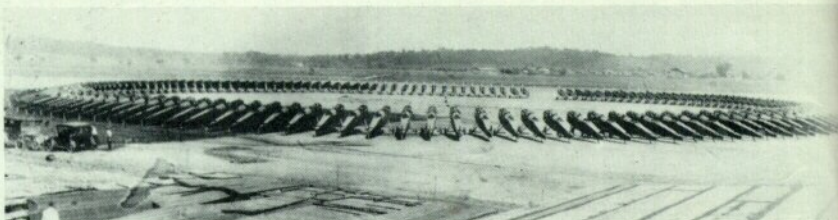
The first American-built DH-4 to reach France arrived on 11th May 1918 and was rushed to the American depot at Romorantin where it was set up and flown on 17th May. However, this and the following machines were in no condition for combat and had to be extensively re-worked at Romorantin. Because of this, and also of the need to accumulate the machines in sufficient quantities, the first combat mission was not flown until 2nd August, by which date 12 had been brought up to a suitable military standard. By the time of the Armistice a total of 13 Army squadrons in France—five of them bomber squadrons—were equipped with the Liberty Plane. In addition, the combined Navy-Marine Northern Bombing Group had four squadrons of DH-4's along the Belgian coast. Of the Army models only 196 were actually at the front, while the total in the Zone of Advance was only 696 out of a total of 1,213 delivered to France.

*Above Right: One week's production of Liberty Planes at the Dayton-Wright plant.* One wonders how much the war effort was slowed up by the time required to set up such propaganda pictures.

(Manufacturer's Photo)

*Below Right: Surplus Liberty Planes in France stacked for the "Billion Dollar Bonfire" that followed the Armistice.*

(U.S. Air Force Photo)

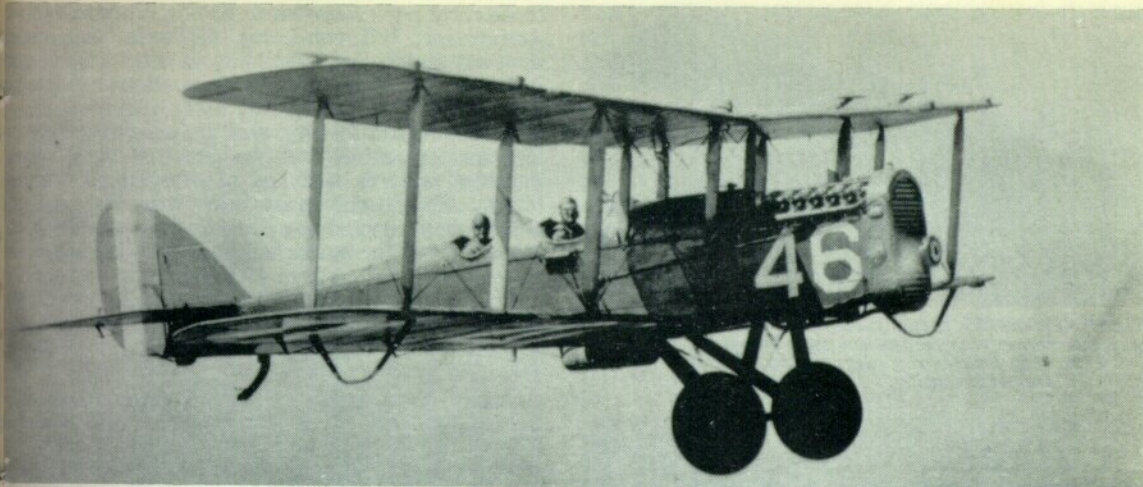


With the improved DH-4B in production at home there was little point in bringing the inadequate early models all the way home after the Armistice. The majority was stripped of salvageable equipment and burned—thereby sparking off still another hue and cry and congressional investigation into the reasons for the "Billion Dollar Bonfire". The truth of the matter was quite simple: the War was over, and with it the demand for combat aircraft. Newer models were on hand at home, and the cost of crating and shipping the early aircraft would have been more than their value to the post-War Air Service.

#### ARMAMENT

The Liberty Plane possessed greater forward fire power than the standard British version, being equipped first with two 0-303-calibre Marlin machine guns—later replaced by Brownings. The observer gunner was provided with a pair of 0-303-calibre Lewis guns on the standard British Scarff ring mounting. This remained standard for as long as D.H.4's carried armament in U.S. service. Racks were installed on each lower wing panel ju





DH-4B "Airways" conversion featuring deep sheltered cockpits for the crew, improved navigation and night-flying equipment, and usually carrying a spare wheel beneath the fuselage. (U.S. Air Force Photo)

outboard of the fuselage for a maximum of 12 bombs or any combination not exceeding 322 pounds. Miscellaneous military equipment consisted of cameras in the rear cockpit, wireless, and flares for night observation.

**ENTER THE DH-4B**

Some of the technical problems of the original Liberty Plane, principally in the fuel system, were taken care of in mid-1918 by a modified version known as the DH-4A. This was outwardly indistinguishable from the original Liberty Plane and was in no way similar to the post-War British DH-4A cabin transport. The first major changes in the U.S. models took place in the DH-4B.

The major improvement undertaken was the

re-arrangement of the crew seating and the main fuel tank, in the manner of the British D.H.9\*. The pilot and the tank changed positions, thereby improving the pilot's safety factor in a crash, his visibility because of his furtheraft location, and his communication with his observer. A less noticeable but greatly appreciated change was a revision of the undercarriage which moved the landing wheels a few inches forward. Furthermore, the entire length of the fuselage was covered with plywood, and the fuel capacity was increased to a total of 96 gallons.

While some DH-4Bs were built as such on the late-1918 contracts for the type, most were converted to "B" configuration from the original Liberty Plane models. In the early post-War years the American Congress displayed great reluctance to spend money



Left: Liberty Plane fitted with hydrovane and flotation gear developed at the Grain Naval Air Station in Britain. The top engine cowling was soon removed from all American DH-4's in service. (U.S. Air Force Photo).



Right: The DH-4B was a great improvement over the Liberty Plane, but was developed too late in the war to be of use in France. This photographic version was used by the U.S. Navy. (U.S. Navy Photo)

Left: DH-4B stationed at McCook Field for use as an engine test bed. This one carries a twin-row British Armstrong-Siddeley "Jaguar" radial. (U.S. Air Force Photo). Right: The DH-4B-5 with two-seat rear cockpit fitted as a cabin. In its civil version this was called "The Honeymoon Express". (U.S. Air Force Photo).







The single DH-4BS, specially adapted for high-altitude flights with a turbo supercharger, special geared-down Liberty engine, and extra long undercarriage legs to accommodate the large-diameter low-speed propeller. (U.S. Air Force Photo)



Standard DH-4B conversion as accomplished by the Gallaudet Aircraft Corp. but fitted with the improved wings of the Loening COA-1 amphibian. (U.S. Air Force Photo)



DH-4B of 91st Observation Squadron rigged for racing. Double flying wires have been taped over, the wing dihedral reduced, the front cockpit covered over. (courtesy James A. Morrow)



The second XDM-4H built by the Boeing Airplane Company, fitted with the original wooden DH-4B undercarriage. (Photo: The Boeing Company)

on the military, and the Air Service suffered proportionately greater than other branches in this respect. Although new models had been developed, there were no funds with which to purchase them. "Maintenance" funds were however available, and these were used in an extensive programme of DH-4 improvement. In fact, this was all that kept a number of American aircraft manufacturers in business in

those early post-War years. Boeing, Thomas-Moermer, Aeromarine, Wittman-Lewis, Gallaudet and others survived simply by rebuilding Liberty Planes into DH-B's. This conversion work continued as late as 1926.

The standard DH-4B was an observation-reconnaissance machine, but on account of its great numbers and the shortage of other suitable types it was adopted for many other missions, some of which were reflected in additional letters to the basic designation. The Army had adopted a letter-number system for its aircraft in 1920, but this was applied only to new models. Old ones, such as the DH-4B, retained their original designations. The following is a partial table of designations applied to modified DH-4B's:

DH-4B-1	110-gallon main fuel tank; 8-gallon reserve
DH-4B-2	76-gallon leakproof main tank; 8-gallon reserve
DH-4B-3	135-gallon main fuel tank; 8-gallon reserve
DH-4B-4	Airways version; 110-gallon main tank; 8-gallon reserve
DH-4B-5	2-seat cabin behind pilot similar to Brewster D.H.4A
DH-4BD	Crop duster for Dept. of Agriculture experiments
DH-4BG	Gas barrage conversion with chemical storage tanks
DH-4BK	Special night flying equipment
DH-4BM	Messenger version; rear passenger seat and baggage compartment
DH-4BM-1	Dual control DH-4BM; 135-gallon main fuel tank
DH-4BM-2	Transport version of DH-4BM-1
XDH-4BP	Photo plane with automatic cameras in front cockpit
DH-4BP-1	Standard post-War photographic version
XDH-4BP-2	Experimental with 135-gallon tank and double wings
DH-4BP-3	Similar to DH-4BP-1 with 100-gallon main tank
XDH-4BS	Supercharged DH-4B; 88-gallon main tank
DH-4BT	Dual-control trainer; instruments and controls in both cockpits
DH-4BW	Forty DH-4B's with 300-h.p. Wright-Hispano H engine
DH-4C	Test bed for 350 h.p. Packard 1A-1237 engine
XDH-4L	Cross country racer with 9-hour fuel supply

In addition to the above established designations there were hundreds of individual alterations undertaken at the various bases equipped with the plane. It was customary for the Air Service to participate in designated events in the post-War National Air Races and a squadron entering one of its aircraft in a DH-4 race would be apt to make many minor alterations with a view to cleaning up the design and improving its top speed. Among the favourite modifications was the fitting of strips of wood between the double flying wires, taping the wires and wood together to form a large single streamlined wire. Speed was increased fractionally by rigging out most of the trailing edge degree wing dihedral, and rigging the upper wing far aft as it would go to reduce the stagger.

Because of their availability, relatively large numbers of DH-4's were used as test vehicles at the Air Service Test Centre at McCook Field, Dayton, Ohio. Here many features were tested on DH-4B's not so much to improve the aeroplane itself but to evaluate new devices, powerplants, radiators and other accessories. In most cases no revision of aircraft designation was made for these purely experimental features.

\* For D.H.9, see PROFILE No. 62.



## THE DH-4M's

In the early post-War years the Air Service was greatly impressed by the structural simplicity and easy maintenance of the welded steel tube fuselage of the German Fokker D-VII, many of which were brought to the United States as war booty. Some of these machines were distributed among various manufacturers for study. The Boeing Airplane Company of Seattle, Washington, was also greatly impressed since it was being somewhat critical of the traditional wood-and-wire fuselages of 200 Thomas-



Boeing DH-4M-1 modified after delivery with steel-tube undercarriage and larger wheels mounted farther forward.

(Photo: U.S.A.F.)



The DH-4M-2's were built by Fokker in his new American plant, known as the Atlantic Aircraft Corp. This is DH-4M-2S with turbo-supercharger.

(U.S. Air Force Photo)



Atlantic-Fokker DH-4M-2K target with post-1927 Army tail stripes. Reel for tow cable is carried below the fuselage.

(Photo by Jack Goodwin)

Standard Mailplane conversion of the Liberty Plane. Entire length of the fuselage is covered with birch plywood. This ski-equipped version has the original long exhaust stacks.

(Photo: Bowers Collection)



Morse MB-3A's that it was building for the Air Service. When it set out to develop a new fighter design of its own, it adapted the Fokker fuselage construction. However, where Fokker had used gas welding, Boeing developed an arc-welding technique. The success of this principle impressed the Air Service and, in 1923, Boeing was awarded a contract to produce new fuselages for 180 DH-4's under the designation DH-4M (M for Modernized). The first three were designated XDH-4M.

When Fokker established an American plant of his own in 1924, his first order was for 100 gas-welded fuselages for DH-4's, so that the Boeings became known as DH-4M-1, and the Fokkers (properly Atlantic, for the Atlantic Aircraft Corp.) became DH-4M-2. The Fokker-Atlantic total was brought to 135 by an additional order for 35 dual-control trainer versions. The official designations of the DH-4M's were:

DH-4M-1	Boeing-built DH-4M; 76-gallon main tank
DH-4M-1K	DH-4M-1 equipped as target tug
DH-4M-1T	Dual control trainer converted by Air Service
DH-4M-2	Fokker-built DH-4M; 110-gallon main tank
DH-4M-2A	Airways version with deep cockpits
DH-4M-2K	Target tug
DH-4M-2P	Photographic version
DH-4M-2S	Turbo-supercharged engine; 10 built
DH-4M-2T	Dual control trainer

Thirty of the Boeing DH-4M-1's were transferred from the Air Service contract to the Navy and were used by the Marine Corps under the new naval designation of O2B-1. Four that were converted to the comfortable "Airways" configuration became O2B-2. Other DH-4's in Navy and Marine service retained the original D.H. designations as used before the Navy adopted its new system of designation in 1921.

As originally built the Boeing DH-4M-1's used the wooden undercarriage of the DH-4B version. After these entered service however, many were re-equipped with new steel tube undercarriages with larger wheels which were again moved forward a few inches. The later Fokker-Atlantic DH-4M-2's moved the axle  $7\frac{1}{2}$  inches forward of the DH-4B position and used  $36 \times 8$ " wheels. Other than the undercarriage differences, the Fokker and Boeing DH-4M's could only be distinguished apart by close scrutiny of the centre-section struts: those on the Fokker were more widely spaced at the bottom in the fore-and-aft direction and so were noticeably out of parallel when compared with the original and Boeing-built versions.

Late in 1924 Boeing sought to improve the DH-4M by fitting entirely new tapered wings of its own design. The Air Service bought three for evaluation under the designation XCO-7 for Experimental Corps Observation, Model 7. The first two used the standard upright Liberty engine but the third was powered by a newly developed inverted version of the Liberty. The Army, meanwhile, tried an improvement of its own and fitted Loening COA-1 wings on an Atlantic DH-4M-2 and re-designated it XCO-8. None of these alterations justified the cost of converting additional aircraft.

## AIR MAIL MODELS

On the 15th May 1918 the U.S. Government began scheduled Air Mail services with a few converted Curtiss JN-4H models and some older Curtiss R-4's





Another experimental mailplane conversion with high-lift wings developed by the Bellanca Aircraft Corp. The wide "Lifting" wings were a well-known feature of the Bellanca monoplanes for nearly two decades. (U.S. Air Force Photo)

obtained from the Air Service; these were not however suited to the job. The cost of developing entirely new models could not be met out of post-War appropriations, so the plentiful DH-4 was adapted. Converted to a single-seater, with the pilot slightly aft of the normal observer's position and a 500 lb. capacity mail compartment in the former front cockpit location, the mailplane version of the Liberty Plane was to remain standard equipment of the postal services until the last routes were turned over to private operators on 1st July 1927. Most of the Air Mail models were converted by the L.W.F. Company of College Point, New York.

When the mail began to be flown at night, large streamlined landing lights were installed on the wing tips. Post-War tests by the Air Service, using high-speed photography techniques on wingless DH-4's crashed into concrete barriers, showed that the long exhaust stacks featured by the Air Mail models were a great fire hazard in a crash. As a result the long stacks were deleted, but had to be re-adopted on the night-flying versions as the flame from the short stacks blinded the pilots.

Several manufacturers submitted extensively modified versions of the mailplanes, but though they represented some improvement the costs involved did not justify their adoption and so the L.W.F. version remained standard. One extreme variant was a twin-engine conversion with two 200 h.p. Hall-Scott L-6 six-cylinder in-line engines. L.W.F. produced 10 of these for the Army and 20 for the Post Office, but they were not used. A few standard Air Mail models followed the Air Service lead and were fitted with the improved wings of the Loening COA-1 amphibian.

When the Post Office department stopped flying the mail in 1927 its remaining DH-4's were returned to the Army. As they were useless for any military rôle, some were converted back to two-seaters and were used on the forest fire patrols which the Army was conducting for the Forest Service in the Western States. Some of the old Post Office aircraft were retained on these duties until 1931.

### MARKINGS AND COLOURING

The first Liberty Planes were a creamy-white colour with top surfaces of both wings, fuselage and horizontal tail surfaces painted khaki-brown. This colour extended a short way down the sides of fuselage from the top, but later in 1918 the khaki-brown was applied to the entire aircraft. This remained standard in the Army until the end of 1918 when the wings and tail surfaces were painted orange-yellow for increased visibility as a safety measure during the peacetime years.

The original Liberty Planes supplied to the Navy had the basic cream colouring, but those in use during post-War years adopted the standard Navy colour scheme of all-silver with orange-yellow on the upper surfaces of wings and tail. A few of the plywood fuselage DH-4B's followed the practice used on wooden-hull flying boats in having their fuselages painted battleship grey.

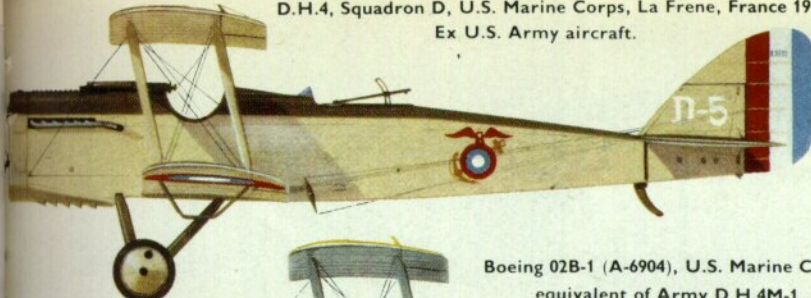
At the time the first American-built DH-4's began to leave the factories in 1918, the standard military marking was the former Imperial Russian roundel, consisting of red outer ring, then blue, a white centre. In spite of this, some of the DH-4's built by Dayton-Wright carried the white marking adopted in 1917. The 1918 tail stripes of red, white and blue had the red on the leading edge of the rudder. The circles and stripes survived for several years during the transition period, but at the end of 1926 the Army changed its rudder stripes.

*An attempt to improve the range and capacity of the mailplane by deepening the belly to carry more mail and fuel. Note straight upper wing and increased dihedral angle of lower wing.* (Photo: Bowers Collection)





D.H.4, Squadron D, U.S. Marine Corps, La Frene, France 1918.  
Ex U.S. Army aircraft.



U.S. Marine Corps insignia, used till December 1st, 1922.

Boeing 02B-1 (A-6904), U.S. Marine Corps equivalent of Army D.H.4M-1.

U.S. Marine Corps insignia, used from December 1st, 1922.

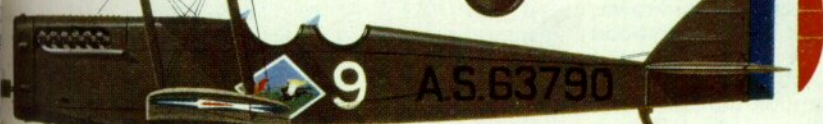


U.S. MARINES

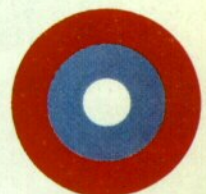


11th Bombardment Squadron, A.E.F.

D.H.4, 11th Bombardment Squadron, A.E.F., France 1918.



D.H.4B, 91st Observation Squadron showing revised Army tail stripes for the period 1919-1926.



A.E.F. wing roundel.



91st Observation Squadron.



D.H.4AMB-2, special two-stretcher ambulance conversion.



Atlantic D.H.4M-2 trainer in scheme and markings 1927-1932.



Mexican Air Force insignia.



D.H.4, Balbuena Air Force Base, Mexico City, 1924. Mexican Air Force.





Short-lived twin-engine version of the DH-4 mailplane, this one powered with two Hall-Scott L-6 200 h.p. engines.

(Photo: courtesy Jesse Davis)

arrangement to a single vertical blue stripe with 13 alternating red and white stripes based on the American flag, while the Navy and Marines retained the three vertical stripe arrangement.

The original application of the wing roundels in 1918 was inboard of the ailerons, but was shortly afterwards changed on Army planes to the mid point of the ailerons. Soon after the War the wing marking was moved to the extreme wing-tip for Army planes but remained inboard of the aileron on Navy aircraft until well in the 1920s. By 1926 both Services had reduced the size of the wing star to fit between the aileron and the wing leading edge.

The early mailplanes, being direct transfers from Air Service stocks, carried the overall khaki-brown; the L.W.F. conversions had their birch plywood fuselages clear varnished and the fabric wings and tail were silver-doped. These did not carry either military markings or civil registration numbers, only "U.S. MAIL" and the Post Office serial number on each side of the fuselage. The few DH-4's operated by civilian owners after the adoption of civil registration requirements in January 1927, carried the standard numbers under the lower left wing, on top of the upper right wing, and on each side of the rudder. **Serial Numbers.** It is impossible to identify the American DH-4 variants by serial number. The original orders were placed for small batches in a range between 22800 and 39500. Many of those converted to DH-4B were given new serials in the 62000 to 68000 range at the time of their rebuilding

in the early post-War years, while others retained their original numbers through several subsequent conversions. Random re-assignment of serials continued right up to 1926, with the highest number assigned, 26-29 and 26-30 going to DH-4BK's for 1926 conversion. The Boeing and Fokker DH-4 conversions all retained their WW-1 serials until the last few were scrapped in 1932.

Army models transferred to the Navy were assigned Navy serial numbers in their proper sequence in a series that began with No. 1 in 1911. The Army series reached 68000 in 1921 when a new system, based on the number of aircraft procured during the fiscal year, was adopted in fiscal year 1922 which began 1st July 1921. A few experimental aircraft were assigned numbers in a special 94000 series before a new system was adopted.

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#### AMERICAN DH-4 "LIBERTY PLANE" SPECIFICATION

**Dimensions:** Wing span, 42 ft. 5½ in. Length, 29 ft. 11 in. Height, 9 ft. 8 in. Wing area, 440 sq. ft.

**Weights:** Weight empty, 2,732 lb. Gross weight, 4,297 lb.

**Powerplant:** One Liberty V-1650, rated at 400 b.h.p. at 1,625 r.p.m.

**Performance:** Max. speed at sea level, 124.7 m.p.h. Max. speed at 15,000 feet, 113 m.p.h. Climb to 10,000 feet, 14 minutes. Service ceiling, 15,800 feet. Absolute ceiling, 19,500 feet. Endurance at full throttle, 2 hrs. 13 min. Endurance at half throttle, 3 hrs. 3 min.

The last flyable De Havilland 4, a former U.S. Army DH-4M-1 owned by Tallmantz Aviation of Santa Ana, California, and used in numerous post-war-II aviation movies.

(Photo by Harry Gann)

