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AMERICAN DEVELOPMENTS OF THE BRISTOL FIGHTER

On September 9, 1916, Frank Barnwell turned out the first Bristol F2A, a handsome two-seat fighter of orthodox construction and unorthodox design. Using the results of combat experience, the designer altered the top fuselage line and lower center-section, installed progressively larger models of the Rolls-Royce Falcon, and so developed the F2B. This aircraft, while undergoing minor modifications and carrying increasingly heavy loads, saw service with the RAF until 1932. It was only natural that such a successful aircraft should be in great demand during the war, and that every effort should be made to produce it in great numbers. On August 1, 1917, General Pershing personally recommended that the F2B with the 200 H. P. Hispano-Suiza engine be produced in the United States. This suggestion set in motion a series of developments which were to cause great loss of time, money, and confidence in the American war effort.

Two weeks after the General's recommendation, a sample F2B was shipped from England, and arrived at the Smithsonian in Washington on September 5. Colonel V. E. Clark, a member of the Bolling Commission, started work to round out the incomplete set of drawings which came with it. At the same time he redesigned it for the big 400 H. P. Liberty 12. On the arrival day the Aircraft Production Board recommended to the Signal Corps a contract with the Fisher Body Corporation for 1000 Bristol Fighters; this accorded with their feeling that aircraft mass production could best be handled by the automobile industry. But at the end of October, 1917, this contract was rescinded and placed with the Curtiss Aeroplane and Motor Company. On December 7 the contract was doubled. On November 7, the sample fighter reached Curtiss in Buffalo, and this was the last Colonel Clark ever saw of it. The Colonel felt that the later difficulties with the design resulted from his absence from the project. Within two weeks, the last of some 880 blueprints had been sent from Clark to Curtiss, and construction of a pilot model was started at once. It was completed on January 25, 1918, under the watchful eyes of two British F2B experts who had come from England especially to work on it. On the same day the Curtiss contract was further amended to include an order for spare parts for 500 more aircraft than the 2000 already on order.

The first model flew at last on March 5, and was officially released as a pattern for 25 more, with some slight changes—in particular, the landing gear was to be reinforced. On March 28 the Signal Corps authorized the building of the next 375. It had been arranged to build them in lots of 400, each successive group to incorporate the improvements found necessary in the preceding number. It was thus hoped to save time by avoiding a process of continual modification and redesign. But by the end of March, Signal Corps Major E. J. Hall had made enough changes in the original aircraft to make obsolete some 1400 Curtiss production drawings, and the 25-odd aircraft nearing completion had to be modified to conform. Efficiency and morale fell off at the Buffalo plant and there were some accusations of sabotage.

Meanwhile, the Air Board requested another sample Fighter from England, to be shipped without engine, for testing with the new 300 H. P. Hispano-Suiza then going into production in this country. The Curtiss Company was requested to make a sand test on the existing aircraft, referred to officially as the U. S. A. O-1, and on April 4, 1918, the Air Board further requested that a committee study the situation at Curtiss. The committee consisted of H. M. Crane, G. C. Loening, and C. M. Vought, and Vought went to Buffalo immediately to supervise the sand-test.

At this point events happened rapidly--all except production. The first U. S. A. O-1 was sent to Wilbur Wright Field for further testing and permission was given Curtiss by the Air Board to start planning for the second 400, although the first 400 were far from finished. Curtiss completed the first four production aircraft, and Vought finished the sand-test, and passed the airframe. On the same day, May 7, the second experimental model (not one of the first four), built in six days from available parts, flew and was wrecked, the fabric peeling back off the upper wing. A warning note came from the Army Adjutant General, Paul Giddings, authorizing the Signal Corps to equip with DH-4's if the American Bristols did not materialize.

Now openly doubtful of the program, the U. S. Government expressed interest in building the Rolls-Royce Falcon on an American assembly line, and suggested that Frank Barnwell be invited to design a new two-seat fighter around the Liberty engine, using as many components of the Bristol Fighter as possible. Nothing came of either of these ideas. The impatience of the Air Board at the delays in Buffalo grew rapidly, and they recommended the DH-9 as an alternate. On June 4 Curtiss organized a mock battle between a Spad and the original Curtiss model of the Bristol. The Bristol Fighter apparently matched the lighter plane maneuver for maneuver, and impressed the observers.

But in this story, the good is more than balanced by the bad. Reports had come to Pershing that the American Bristol with its heavier engine might not be able to carry bombs, as the British version did, and he was understandably annoyed. On June 10 a second Bristol crashed, this one a production model, again because of faulty fabric. Both of the crew were killed, and the machine burned. Late in June, 1918, the Chief Engineer, Lt. Col. Vincent, turned over to Wilbur Wright Field the original British-built Fighter (McCook Field #P-30) now equipped with the only 300 H. P. American Hispano engine in existence. The Board grabbed at the chance of putting an engine of tested design into a tested airframe, and suggested to Curtiss that they drop their experimental work with the Liberty and concentrate on the Hisso combination. The firm objected strenuously, saying that the necessary redesign would stop production entirely, and that the firm would be completely disorganized.

On July 15 there was a third accident, this time due to pilot error. The Air Service sent a Col. W. Sempill to fly a sample machine. He found many objections, and recommended the substitution of the Liberty 8 for the 12, to cut down the excessive vibration. Apparently realizing that opinion had turned against the project, Glenn Curtiss himself stated that he thought the design could even then be adequately improved, although he recognized that it was basically out of date.

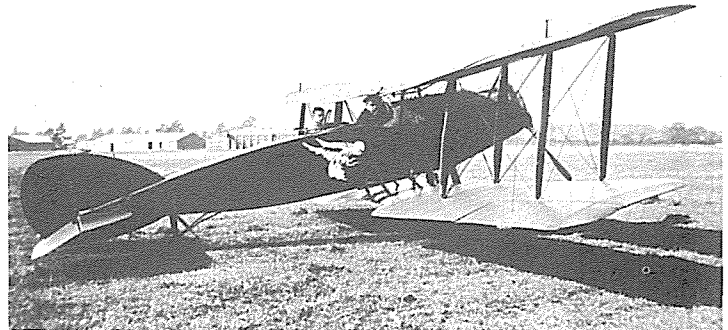
In spite of this thread of hope, the Curtiss contracts were cancelled on July 20, 1918, effective on September 30. The company announced immediately that it would put the SE5 and the triplane Caproni bomber into production to replace the Bristol on the assembly line. By this Curtiss hoped to encourage the 2000 workers who would otherwise be laid off. The total cost of this cancellation, including subsidiary contracts for parts and spares with the Hayes Ionia Company and the Lewis Spring and Axle Company came to \$6,482,000. The total number of American O-1's built is recorded as both 25 and 27, with many spare parts. What seems to have happened is that Curtiss built the prototype and 25 more, of which two were damaged, one permanently; and the second Bristol to fly and the first to crash, not a production model, was added in to make 27. The British-built sample, first fitted with the Liberty 12 and then the 300 H. P. Hisso, known as P-30, was surveyed Feb. 19, 1919. I have been able to find no record of the second engineless Bristol, shipped to be fitted with the 300 H. P. Hisso, and which arrived from England on June 25, 1918-- after the first one had been tested with the same engine. Could it have been tested with a Liberty 8, and numbered P-37.

A story like this, as expensive as this, and as apparently fruitless as this, ought to lead to something eventually, and so it did. It produced two strong recommendations: one from Henry Lockhart in Paris, suggesting that the American LePere fighter be tested at once with an eye to production; the other, from W. C. Potter of the Bureau of Aircraft Production, suggesting that the original British Bristol Fighter be reproduced exactly, using either the 300 H. P. Hisso or the Liberty 8.

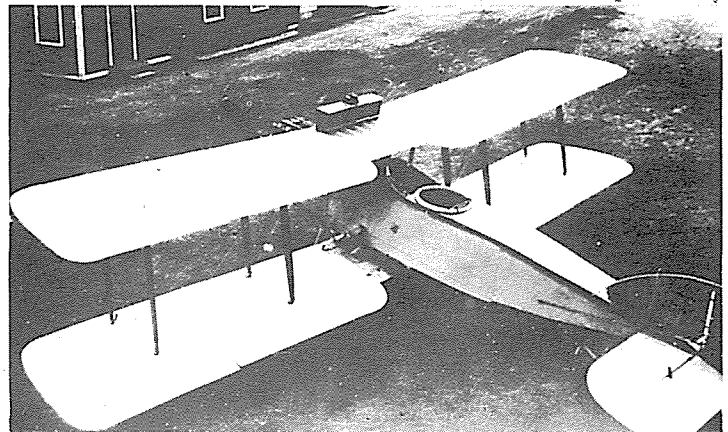
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By the time the contracts with the Curtiss Aeroplane and Motor Company for a redesigned Bristol Fighter powered with the Liberty 12 were cancelled, the ground for the next stage had been prepared. Back in April, 1918, the Chief Engineer, Lt. Col. Vincent, had installed in the original sample Fighter at McCook Field the only 300 H. P. Hispano-Suiza engine existing in this country. The combination was known by McCook Field as #P-30. Although flight tests gave about the same results as those obtained in England with a standard F2B with the 275 H. P. Falcon, the difference between this performance and the expected performance was attributed to poor choice of propeller and an awkward cowl. The Air Board became interested in this version, and in another version to be powered with the Liberty 8. Its feeling was that the big Hisso had been tested in Europe, and that the Liberty 8 was lighter than the 12, so that both engines had advantages over the 12 which was proving unsatisfactory in the American O-1.

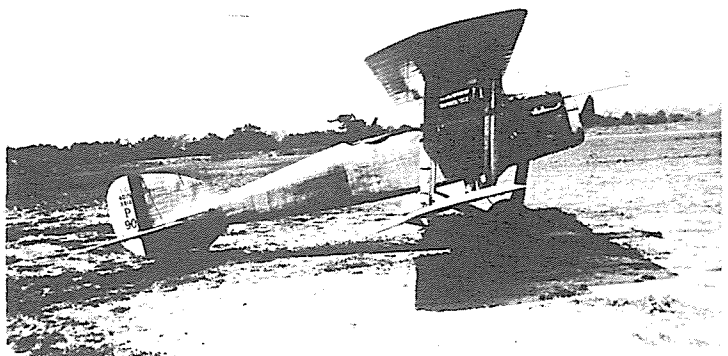
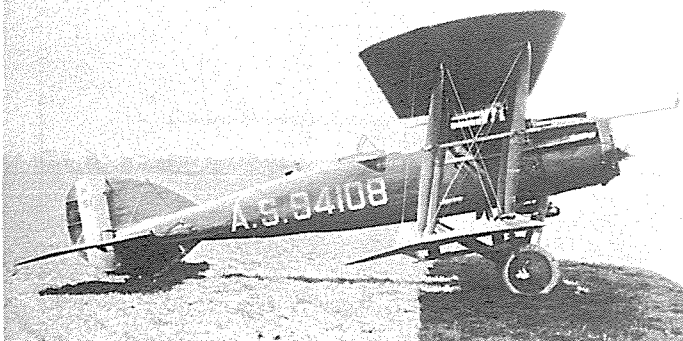
Four different versions were then begun at McCook Field to experiment with the two engines and to take advantage of the supply of U. S. A. O-1 fuselages stocked at Curtiss. Four Curtiss fuselages, of regular F2B construction except that ply veneer had been tacked to the sides, were to be equipped with the Hisso and would be called U. S. B-1. Four other identical fuselages were to take the small Liberty, and would be called U. S. B-2. The McCook engineers had been studying the formed plywood fuselages of the American LWF and a captured German Albatros (McCook numbers P-8 and P-13, respectively), and had built up an experimental plywood and bulkhead fuselage for the U. S. A. C-2. Further experimenting produced another fuselage made without dies, the covering being wrapped, nailed, and glued around a rigid frame. Having few metal fittings this fuselage was cheap and easy to produce. The McCook



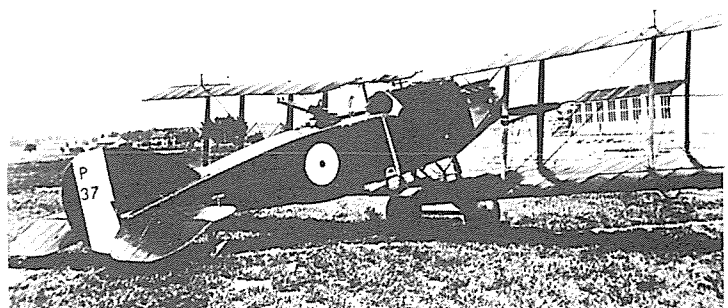
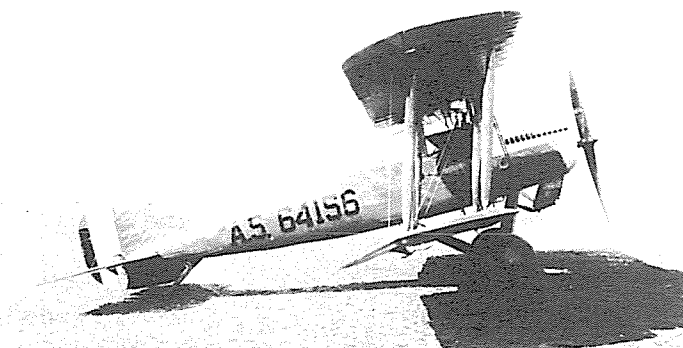
(L) Bristol F.2B w/ 300 HP Hispano and (r) w/ 275 HP Rolls-Royce "Falcon" (Bristol photos)



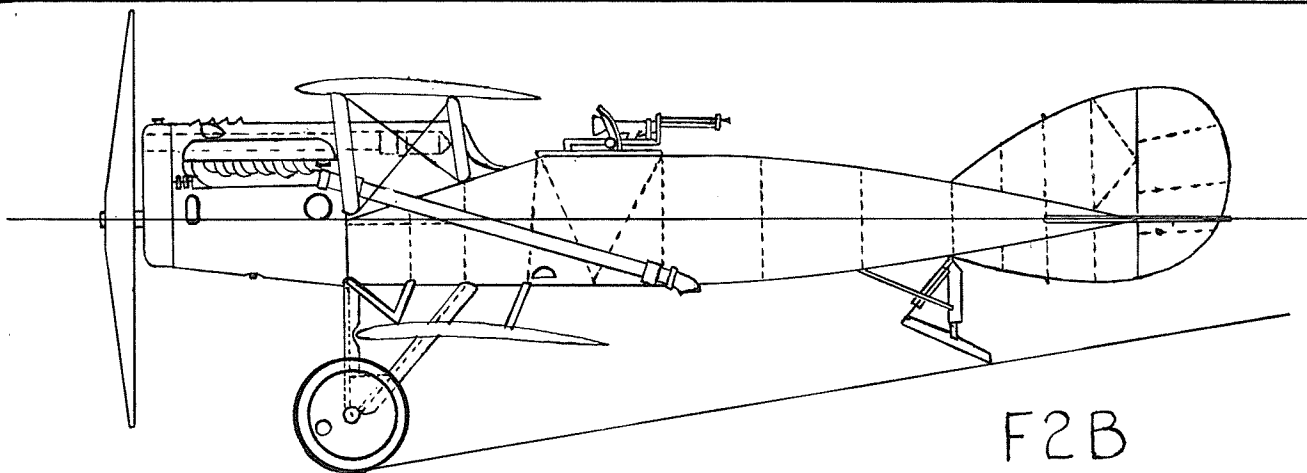
(L) Curtiss U.S.A. O-1 w/ 400 HP Liberty 12 and (r) same w/modif. radiator (Wright Fd.)



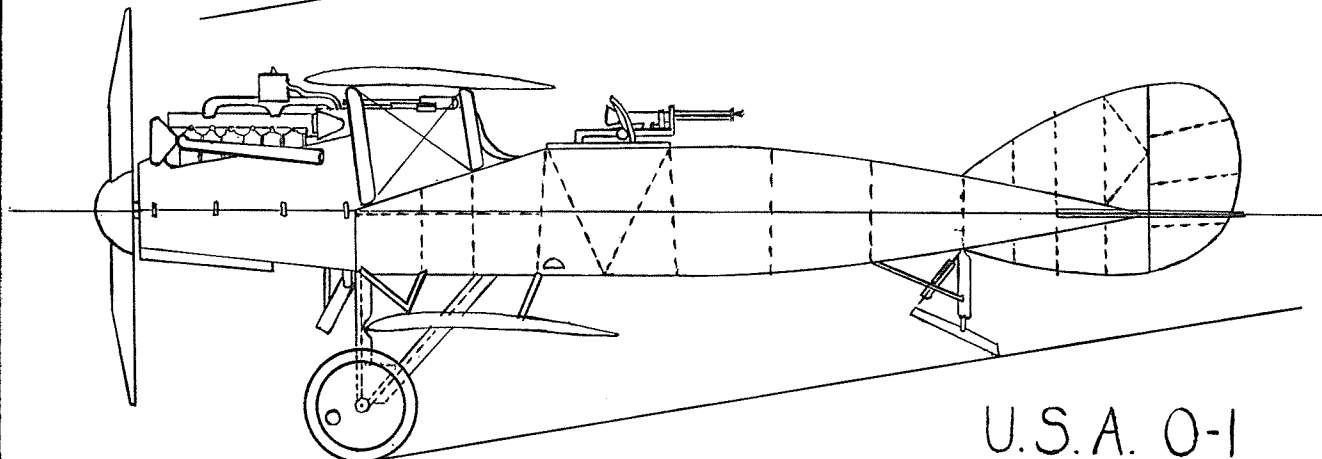
U.S. XB-1A w/300 HP Wright-Hispano, s/n S.C. 40125 (P-151) and (r) A.S. 94108 (P-90) (Wr. Fd.)



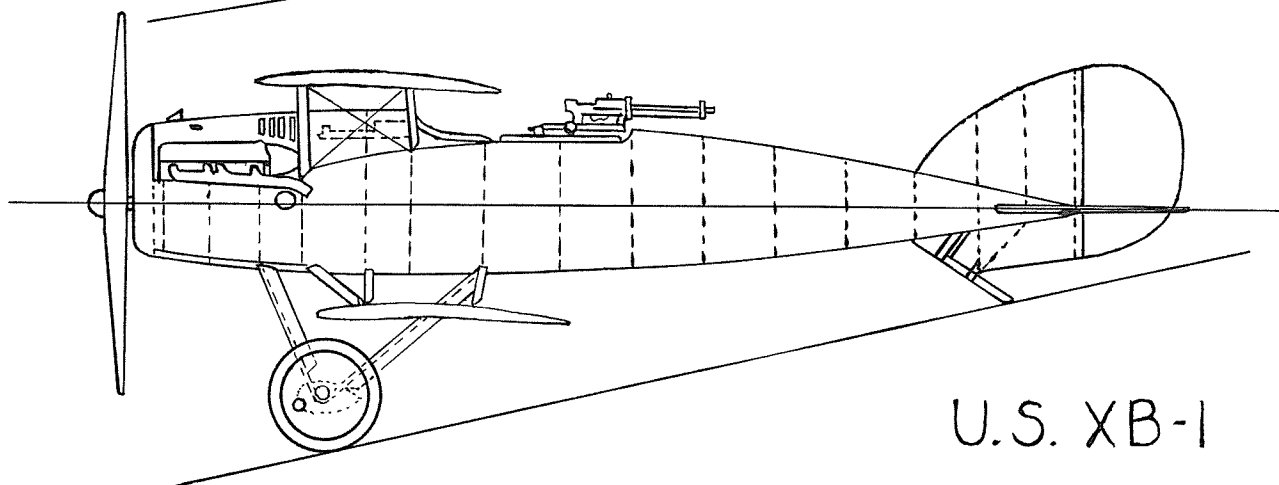
U.S. XB-1A w/Curtiss D-12, A.S. 64156 (Bowers) U.S. XB-2 w/ Liberty 8 (P-37) (Bristol)



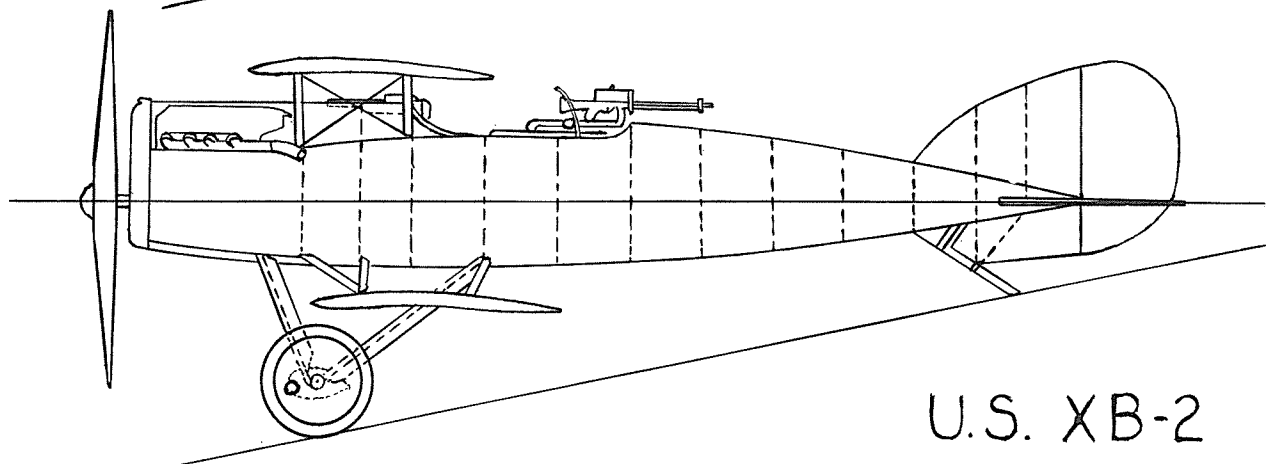
F2B



U.S.A. O-1



U.S. XB-1



U.S. XB-2

engineer, J. A. Roche, who made a comparison test of the new fuselage and one of the U. S. A. O-1 fuselages, recommended the abandonment of the veneer siding for the Curtiss design because of the different moduli of elasticity of plywood and the steel wire bracing of the girder--the ply cover would give, putting the strain on the wire until it broke. He noted also that at the Curtiss plant then (June 29, 1918), some 200 fuselages were on the floor, and that this was the first fuselage test made. He also complained that the Curtiss engineers were not interested in good testing procedure. Roche reported the following table:

	<u>McCook plywood fuselage</u>	<u>U. S. A. O-1 fuselage</u>
Total load taken	13870 lb.	5155 lb.
Weight	165 lb.	275 lb.
Air resistance	80 %	100 %
Cost	50 %	100 %

Two of these new fuselages were to be fitted with the 300 H. P. Hissop, to be called U. S. B-3, and two more were to take the small Liberty, to be called U. S. B-4.

Within a month the eight girder models were abandoned because of requirements of the U. S. D-9A program and the weaknesses listed in Roche's report. It should be noted in passing that P-30 and (?) P-37, while having the proper engines, were not officially U. S. B-1 and -2 because they were rebuilt from standard British airframes, not the specified Curtiss fuselages. The U. S. B-3 and -4 were then renamed U. S. XB-1 and -2, respectively, and work on them was continued with the aims of improving the performance of the original Barnwell design and of making production easier and cheaper.

The U. S. XB-2, fitted with 2 Browning guns in the cowl, was never completed due to the unsatisfactory performance of the Liberty 8, but the -1, fitted with Marlinas, was finished and sand-tested and was ready for flight when the roof blew off its hangar, badly damaging the plane. The aircraft was then rebuilt with Brownings instead of Marlinas and called U. S. XB-1A, and flight-tested on July 3, 1919, under the McCook number P-90.

After the wartime contract for 2000 USB models was cancelled, Dayton-Wright built 40 U. S. XB-1A's in 1920-21, all powered with the 300 H. P. Wright Model "H" engine. The attached charts show the relative performances of these later fighter developments. Except for the Curtiss design whose performance (but not flight characteristics) was noticeably better than the other versions, the addition of power to Barnwell's original design added little but weight. The last Bristol Fighters which retired from Number 20 Army Cooperation Squadron, RAF, were still equipped in 1932 with Barnwell's original choice, the 275 H. P. Rolls-Royce Falcon.

Bibliography

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SPECIFICATIONS AND PERFORMANCE, F2B AND VARIANTS

	F2B*	"P-30"	USA O-1	Bristol Type 76 *	U.S. XB -1A	U.S. XB -1A	U.S. XB -1A	U.S. XB -1A	U.S. XB -1A
Span	39' 3"	39' 3"	39' 3"	39' 3"	39' 4 $\frac{9}{16}$ "	39' 4 $\frac{9}{16}$ "	39' 4 $\frac{9}{16}$ "	39' 4 $\frac{9}{16}$ "	39' 4 $\frac{9}{16}$ "
Length	25' 10"	--	26' 1 $\frac{7}{8}$ "	25' 0"	--	--	--	--	25' 6"
Weight Loaded	2848 lb	2910 lb	2937 lb	3079 lb	2994 lb	3590 lb	3791 lb	3988 lb	3679 lb
Top Speed at 6500'	119 mph	113.6 mph	138 mph	134 mph **	129 mph	124 mph	127.5 mph	121.5 mph	118.5 mph
Climb to 10,000'	11.25 min.	10.75 min.	8.5 min.		10.0 min.	12.9 min.	13.7 min.	15.3 min.	15.1 min.
Max. Ceil	21500'	25000' *	--	22150'	22400'	20400'	21000'	18500'	18700'
Engine	275 hp Falcon	300 hp Hisso	400 hp Liberty 12	425 hp Bristol Jupiter	300 hp Hisso	300 hp Wright "H"	300 hp Wright "H"	350 hp Packard 1237	300 hp Wright "H"
Propeller #	--	--	--	--	X-19677	X-24705	X-24705	X-24705	AS-01905
a/c #	A. 7183	P-30	--	G-EBCN	P-90	P-151	P-90	P-180	P-205
Type	--	--	--	--	V	VIII	X	X	X
Date of Flight Test	Jul-Aug 1917	June 1918	Mar 1918	1923	Mar 30, 1920	Apr 27, 1921	Aug 11, 1921	Aug 11, 1921	Nov 2, 1921

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British

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estimated

*
British

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Alt. unkn.