

AIRCRAFT CIRCULAR
NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 180

THE DEWOITINE D.500 PURSUIT AIRPLANE (FRENCH)

An All-Metal Cantilever Low-Wing Monoplane

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An All-Metal Cantilever Low-Wing Monoplane

The D.500 is an all-metal low-wing monoplane. It carries a radio set and oxygen apparatus in addition to the machine guns (figs. 1, 2, 3, 4).

The sharp fuselage, with carefully streamlined nose, has a 12 X hrs Hispano-Suiza engine of 500 hp nominal rating. The deep radiator under the fuselage has a very large volume and the smallest possible frontal area compatible with the cooling requirements of the powerful engine.

The ovoid section, monocoque fuselage has a length of 6 m (19.68 ft.), not including the engine bearer bolted to the first bulkhead. The fuselage has a maximum height of 1.15 m (3.77 ft.) and a maximum width, at the wing spar, of 0.9 m (2.95 ft.).

Five main and eight false bulkheads are connected by four longerons. The bulkheads are interconnected by intermediate stringers which stiffen the sheet covering riveted to the fuselage structure.

The sternpost is integral with the fuselage. The engine bearer is an oblique frame to which are bolted the crankcase attachment brackets.

The pilot's cockpit is above the trailing edge of the wing. The vertically adjustable seat is supported by springs. It can be raised four inches by means of a lever to improve visibility in landing.

The unobstructed control surfaces are small owing to the high speed of the airplane. The elevator has a span of 4 m (13.12 ft.) and the rudder a height of 1.5 m (4.92 ft.). The stabilizer, adjustable in flight, is hinged about its front spar, transverse stiffness being provided by a couple of rigid struts on each side connected to the

*From data furnished by the manufacturers.

lower edge of the fuselage. The fin is secured by four attachment fittings to the top of the rear portion of the fuselage.

The machine guns are located in front of the pilot in the V of the engine. The downward sloping nose of the fuselage increases visibility in attack maneuvers.

The axleless landing gear has a track of 4 m (13.12 ft.). Each wheel is carried by a pair of struts forming a triangle secured to the lower fuselage longeron. Vertical stresses are taken by an oleo-pneumatic strut bolted to the single spar of the central wing portion, which is integral with the fuselage. The faired wheels have oleo-pneumatic brakes.

The height of the landing gear provides for a sufficient propeller tip clearance. Yet the lower wing surface is only 1.5 m (4.92 ft.) above the ground, the landing speed being thus considerably reduced by the cushioning effect of the ground.

The fuel tanks are located in the center portion of the wing on either side of the axis of symmetry and can be slipped separately. The pipes of the slipped tank are shut off by a multi-way cock and the flight is continued with the remaining tank.

The low, elliptical, all-metal cantilever wing has an aspect ratio of 8.9. In view of the relatively small chord, the wing has only a single spar, like gliders and record airplanes, such as the D.33. The wing chord is 1.65 m (5.41 ft.) at 1.8 m (5.91 ft.) from the root and only 1.45 m (4.76 ft.) at 5 m (16.40 ft.) from the longitudinal axis of the airplane. The wing has a thickness of 0.3 m (11.81 in.) at the root and tapers off to practically nothing at the rounded-off tips.

The single spar of the D.500 is similar to that of the D.33. It has two wide, thick flanges of standard duralumin sections. Uniform strength is provided by milling the flanges which are connected by two vertical webs of thin metal sheet forming a box spar. The neutral fiber has circular holes stiffened by beaded edges. The whole structure is stiffened at intervals by internal bulkheads riveted to the spar by means of lightening holes (fig. 5).

The main spar carries the leading-edge portion which consists of stamped triangular parts, the ends of which are connected by a tube forming the actual leading edge. The upper and lower wing structure which takes the sheet covering, is made of flat sheet rib arcs with beaded edges riveted to the flanges of the single spar. The rear of the ribs has two flanges cross-braced by round tubes secured by tubular rivets to gusset plates which give the necessary stiffness of the angles. The stressed covering is of thin L 2 R alloy strips parallel to the chord (figs. 6 and 7).

The outer and center wing portions are connected by two horizontal shafts. The upper shaft passes through multiple plates of the top flange, and the lower through holes in the attachment fitting of the bottom flange. Balanced ailerons extend throughout the span, except near the fuselage, where they are suppressed to increase downward visibility. The ailerons have a length of 4 m (13.12 ft.) and a chord of 0.2 m (7.87 in.). They are operated by horns on the upper wing surface controlled by a rod transmission to the control stick.

The airplane is equipped with the new Hispano-Suiza 12 Xbrs 500 hp geared and supercharged engine. The actual power at sea level is 720 hp at 2,400 r.p.m. It is 710 hp at 4,000 m (13,120 ft.) and 630 hp at 5,000 m (16,400 ft.), the power equivalent at sea level being 1,000 hp.

The total cylinder capacity is 27 liters (1,648 cu.in.), each cylinder having a bore of 130 mm (5.12 in.) and a stroke of 170 mm (6.69 in.). The geared metal propeller has a diameter of 3.3 m (10.83 ft.).

SPECIFICATIONS

Dimensions:

Span	12.1 m	39.70 ft.
Length	7.74 "	25.39 "
Height	2.7 "	8.86 "
Wing area	16.25 m ²	174.90 sq.ft.

Weights:

Weight empty	1,262 kg	2,782 lb.
Fuel	230 kg	507.0 lb.
Military load	213 "	469.6 "
Useful load	443 kg	976.6 lb.
Total weight	1,705 "	3,758.9 "

Characteristics:

Aspect ratio	8.9
Thickness of wing at root	16 percent
Fineness	25
100 C _x minimum	1.1
100 C _z maximum	125
C _{m0}	2

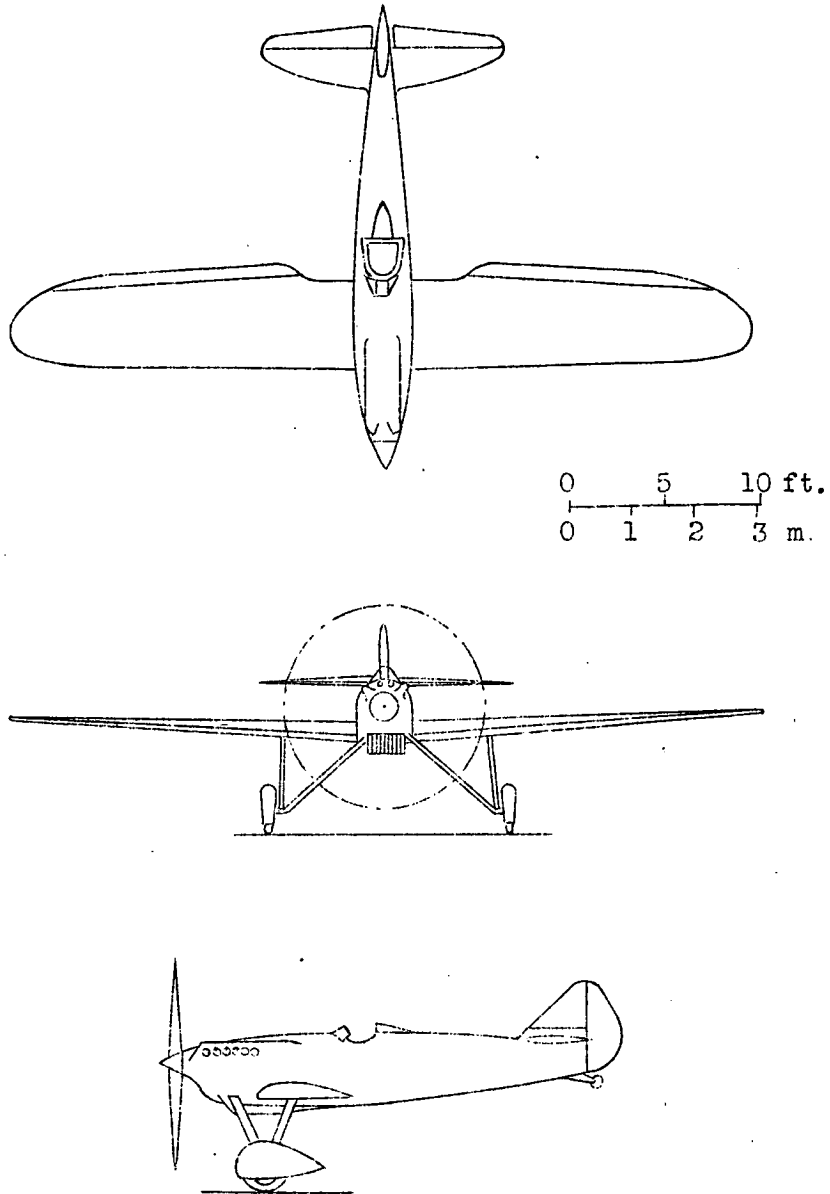
Performances:

Climb to 1,000 m (3,280 ft.)	1 min. 18 sec.
" " 2,000 " (6,560 ")	2 " 48 "
" " 3,000 " (9,840 ")	3 " 56 "

Performances (continued)

Climb to 4,000 m (13,120 ft.)		5 min. 11 sec.
" " 4,500 " (14,760 ")		5 " 50 "
" " 5,000 " (16,400 ")		6 " 38 "
" " 6,000 " (19,680 ")		8 " 19 "
" " 10,000 " (32,800 ")		25 " 5 "
Speed at sea level	318 km/h	197.6 mi./hr.
" " 16,400 ft.	371 "	230.5 "
" " 29,520 "	323 "	200.7 "
Service ceiling	10,400 m (34,100 ft.)	30 min. 28 sec.
Take-off distance	145 " (476 ")	
Landing	" 185 " (607 ")	

Translation by W. L. Kaporinde, Paris Office,
National Advisory Committee
for Aeronautics.



Span	12.10 m	39.70 ft.
Length	7.74 "	25.39 "
Height	2.70 "	8.86 "
Wing area	16.25 m ²	174.90 sq.ft.

Figure 1.- General arrangement drawing of the Dewoitine 500 airplane.

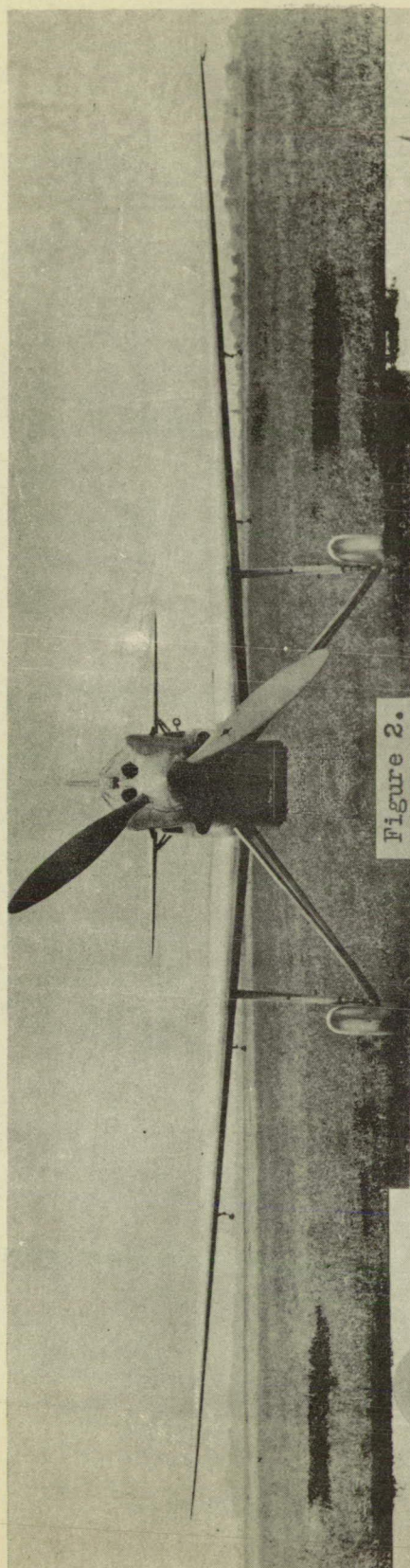


Figure 2.

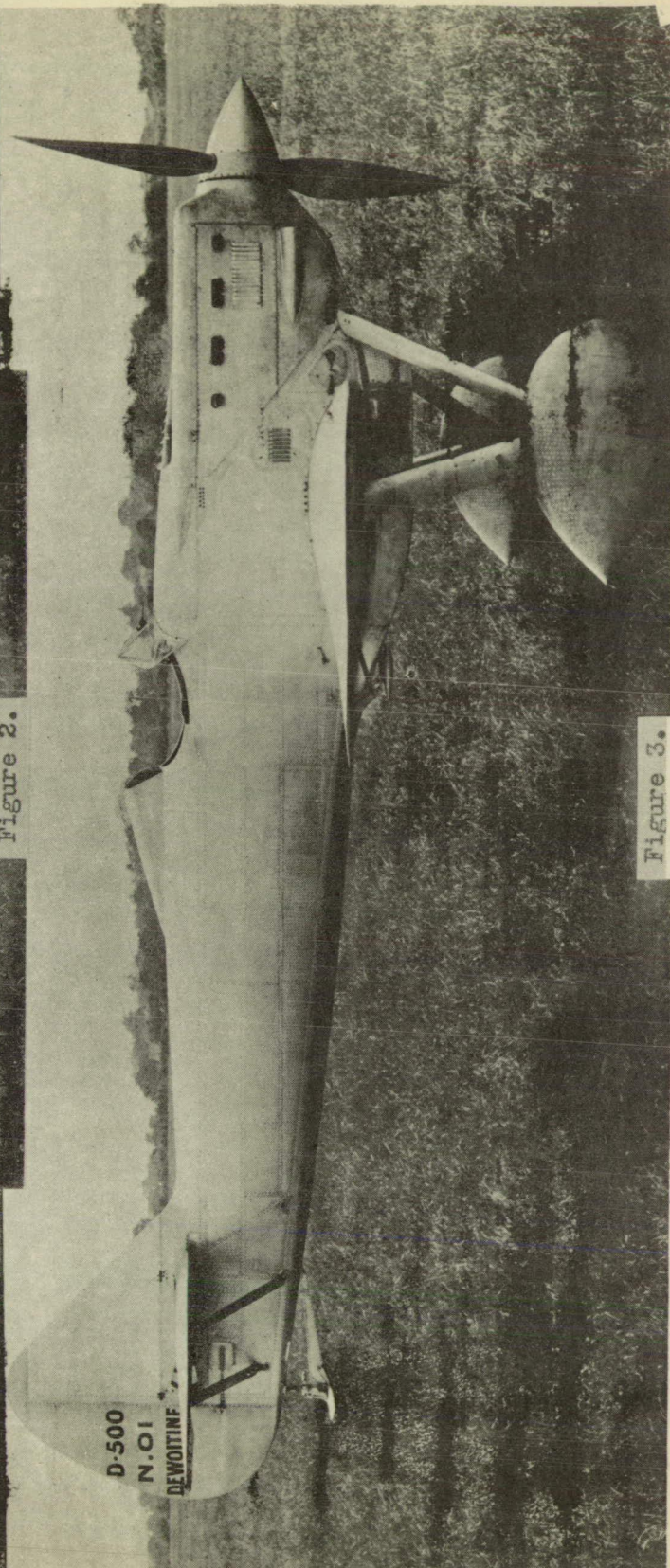


Figure 3.

Figures 2,3. - Views of the Dewoitine 500 airplane.

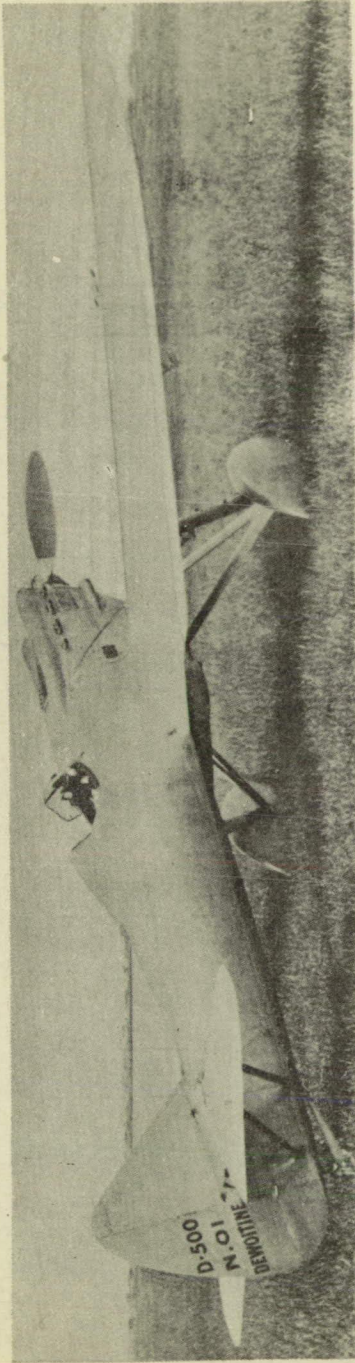


Figure 4. - View of the Dewartine 500 airplane.

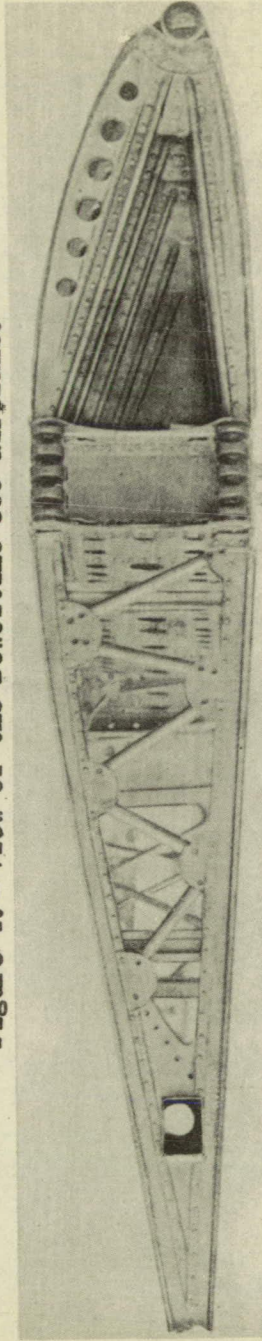


Figure 5. - Wing structure showing fuselage attachments of spar and of leading edge.

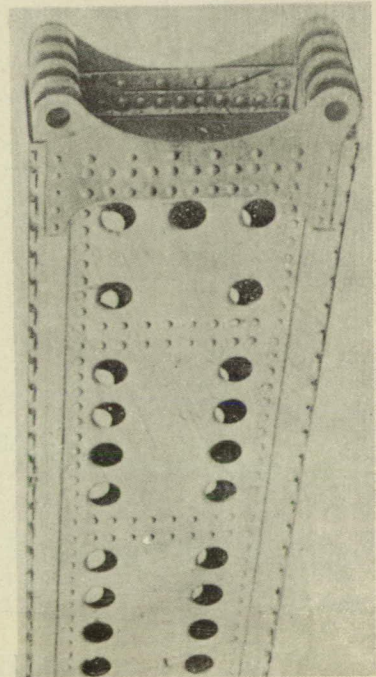


Figure 6. - Box spar.

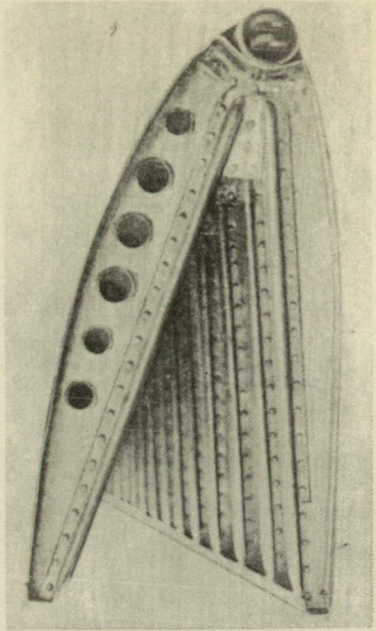


Figure 7. - Leading edge (hinged to spar)