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AIRCRAFT CIRCULARS

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 149

BREGUET 390 T COMMERCIAL AIRPLANE (FRENCH)

A Ten-Seat All-Steel Sesquiplane

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BREGUET 390 T COMMERCIAL AIRPLANE (FRENCH)*

A Ten-Seat All-Steel Sesquiplane

The Breguet 390 T is a three-engine all-metal transport sesquiplane embodying the same structural principles as the Breguet military airplane 270 (N.A.C.A. Aircraft Circular No. 127). The girder fuselage of the 270 is replaced however in the 390 T by an orthodox rectangular fuselage with accommodations for ten passengers and their baggage.

As in the 270, the lower wing has a single box spar (fig. 2) and is attached to the bottom of the fuselage by two wide triangular vertical gussets (fig. 3). This spar supports, on the one hand, the steel sleeves with bronze rings in which the landing-gear forks slide, and, on the other hand, the sheet-duralumin bearers of the two lateral engines. The lower wing can be divided into several parts: the spars and its terminals; the leading edges; the portions between the spar and the ailerons and, lastly the ailerons. The latter are elastically mounted and are operated as on the Breguet 270.

The upper wing has a medium-thick profile, uniform throughout the whole span. It consists of two symmetrical parts joined on top of the fuselage.

Both upper and lower wings have ailerons along their whole span, excepting the tips. Only the outer ailerons of the upper wings (fig. 1), however, are used for warping. They have a pinion and ratchet control, as on the 270 T.

The upper wing has two identical steel spars joined by rigid X bracing. Each spar has two flanges of drawn steel connected by a web of corrugated sheet steel. The three-part ribs are attached by tubular steel rivets to

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*From L'Aéronautique, December, 1930, pp. 448-450, and Les Ailes, April 23, 1931. This airplane is also referred to as the 39 T (Les Ailes). There are only slight differences between the 390 T and the 391 T which latter was exhibited at the Paris salon of 1930.

small stamped duralumin gussets previously threaded on the spar flanges. These gussets are also riveted to the spar webs. Each part of the rib is stamped in a single piece from sheet duralumin. The wing covering is sheet duralumin, the leading edge and tips being detachable. The wings are braced by two pairs of V struts.

The rectangular fuselage measures 1.7 × 2.35 m (5.58 × 7.71 ft.) at its largest section. (Figs. 4 & 5.) It has a number of bulkheads (fig. 6) joined by strong angle members to which the duralumin covering is riveted. The pilot's seat is on the left side and has good visibility. There is another seat beside the pilot for a second pilot, mechanic, or navigator and radio operator. Overhead there is a movable panel 1 × 0.5 m (39.37 × 19.69 in.) for exit with a parachute.

A partition with a door separates the pilot's compartment from the passenger cabin, which is 3.895 m (12.78 ft.) long, 1.6 m (5.25 ft.) wide and 1.7 m (5.58 ft.) mean height. Behind the cabin there is a lavatory, which is hidden by the door from the cabin during the entrance and exit of passengers. Its dimensions are 1.40 × 0.75 m (4.59 × 2.46 ft.). The door between the cabin and lavatory can be removed so as to admit stretchers or large packages, in case it is desired to convert the airplane into an ambulance plane or to use it for carrying merchandise. The outside door (fig. 7) is specially designed for the easy introduction of wounded persons on stretchers. There is a baggage compartment of 1 m^3 (35.3 cu.ft.) in front and another of 0.3 m^3 (10.59 cu.ft.) at the rear.

The tail surfaces have symmetrical biconvex profiles and are purely cantilever. They have steel spars and duralumin ribs. The covering is duralumin and the hinges steel.

The horizontal empennage has a span of 5 m (16.4 ft.). It consists of a stabilizer of 2.71 m^2 (29.17 sq.ft.) and a one-piece elevator of 1.94 m^2 (20.88 sq.ft.). The latter can be controlled by a small flap mounted on the middle of its trailing edge.

The vertical empennage consists of a fin with an area of 1.14 m^2 (12.27 sq.ft.), followed by a rudder of 1.54 m^2 (16.58 sq.ft.) compensated aerodynamically. The movable tail surfaces are operated from the pilot's cockpit by

dual controls of steel wire guided by pulleys along the top of the fuselage, thus facilitating their surveillance.

The type exhibited at the 12th Paris salon, the 391 T, (figs. 8, 9 & 10), is equipped with three 230 hp Gnome-Rhone "Titan" engines, which are replaceable, however, by any other radial air-cooled engines of the same weight and power. They are mounted on duralumin bearers attached to the nose of the fuselage or to the lower-wing spar by four quickly removable screw bolts. (Figs. 11, 12 & 13.) Each easily removable engine bearer forms a block comprising the engine, its immediate accessories, a fire extinguisher, an oil tank and oil radiator.

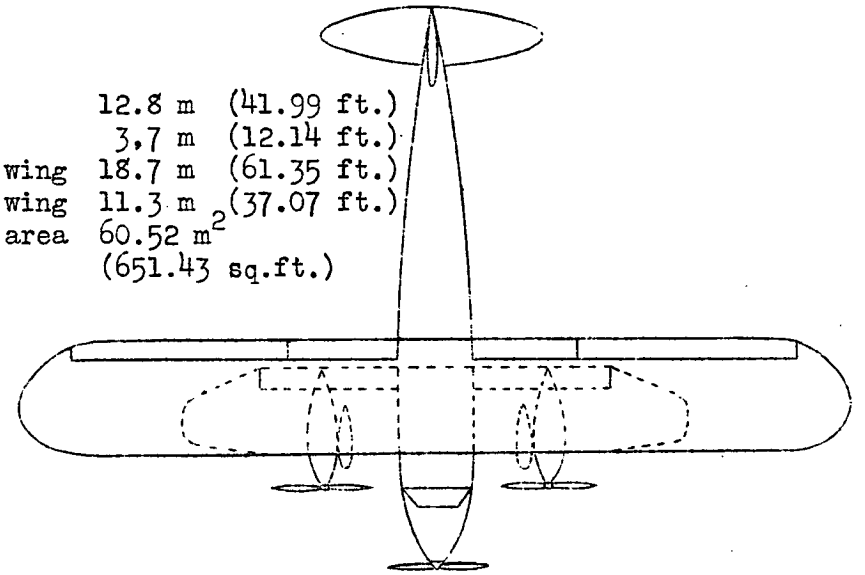
Each lateral engine nacelle contains a 300-liter (79.25-gal.) fuel tank. Two other fuel tanks, with a combined capacity of 300 liters (79.25 gal.) are located in the bottom of the fuselage and supply the central engine. (According to Les Ailes, the 39 T had only one fuselage tank of 300 liters.) All the tanks can be emptied quickly during flight. For each engine there is a stopcock at the fuel tank and another on the pump outlet. Moreover, two cocks, ordinarily closed, enable the connecting of all the fuel tanks. Each engine has its own oil tank. The oil pipe has a stopcock and a cock controlling the by-pass for regulating the temperature. The engine controls are all rigid. The airplane is designed to be able to fly with any one of its engines stopped.

The axleless landing gear has a track 4 m (13.12 ft.) wide. Each half consists of a wheel 1000 × 225 mm (39.37 × 8.86 in.) with a straight-side tire. The wheels are provided with Breguet hydraulic brakes acting simultaneously or differentially. Each wheel is mounted on a steel fork (fig. 14) attached to the lower wing spar by a steel tube. This tube slides in a steel sleeve with bronze rings traversed by two solid pins with four lugs riveted to the spar. The shock absorbers are of the Breguet oleopneumatic type. The tail wheel of 300 mm (11.81 in.) diameter is likewise mounted on a dirigible steel fork provided with an oleopneumatic shock absorber.

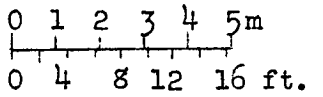
Characteristics

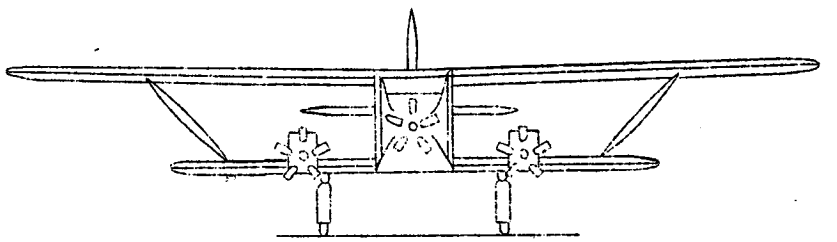
Length	12.8	m		41.99	ft.
Height (with skid on ground)	3.7	"		12.14	"
Span of upper wings	18.7	"		61.35	"
Span of lower wings	11.3	"		37.07	"
Chord of upper "	2.585	m		8.48	"
Chord of lower "	1.900	"		6.23	"
Area of upper "	44.11	m^2		474.80	sq.ft.
Area of lower "	16.41	"		176.64	" "
Total wing area	60.52	"		651.43	" "
Rated horsepower	230 x 3		690 hp	650.5	hp
Weight empty, equipped	2340	kg		5158.8	lb.
Weight of fuel	450	"		992.1	"
Weight of crew	160	"		352.7	"
Commercial load	1050	"		2314.9	"
Total load, incl. 10 passengers counted at 100 kg (220 lb.) each and 50 kg (110.2 lb.) of baggage each	4000	"		8818.5	"
Wing loading	66	kg/m^2		13.52	lb./sq.ft.
Power loading	5.7	kg/hp		12.39	lb./hp
Rated power per unit area	11.4	hp/m^2		.998	hp/sq.ft.
Speed at 1000 m (3281 ft.)	about 210	km/h		130.5	mi./hr.
Radius of action with head wind of 10 m/s = 36 km/h (22.37 mi./hr.)	500	km/h		310.7	mi./hr.

Translation by Dwight M. Miner,
National Advisory Committee
for Aeronautics.



Length	12.8 m	(41.99 ft.)
Height	3,7 m	(12.14 ft.)
Span upper wing	18.7 m	(61.35 ft.)
Span lower wing	11.3 m	(37.07 ft.)
Total wing area	60.52 m^2	
	(651.43 sq.ft.)	





Three
230 hp
engines

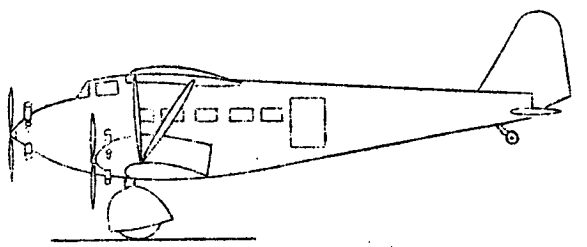


Fig.1 General arrangement drawings of the 390 T airplane.

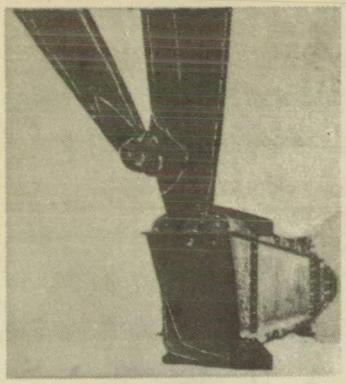


Fig.2 Attachment of strut to lower wing spar.

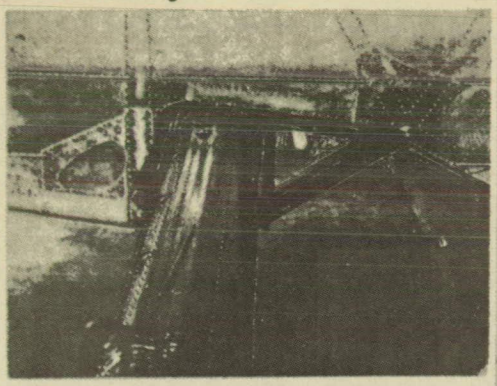


Fig.3 Attachment of lower wing spar to fuselage.

Fig.14 Landing-gear fork.

Structure of 390 T airplane

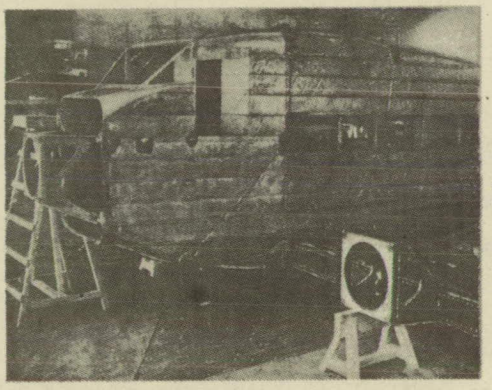
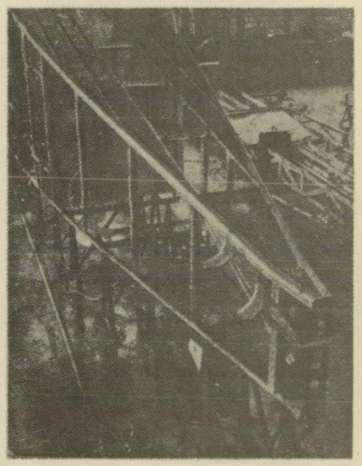


Fig.4

Fig.5



Figs.4,5 Fuselage structure,

Taken from L'Aeronautique, Dec. 1930

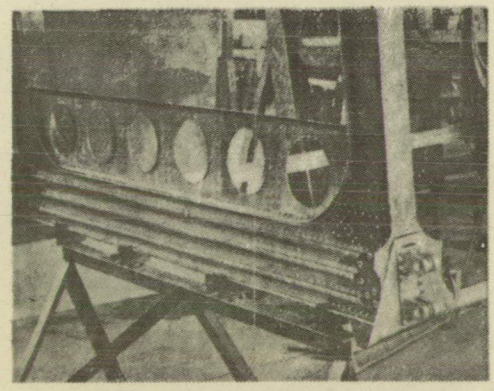


Fig.6 Main bulkhead (inverted) with attachment fittings for upper wing spar.

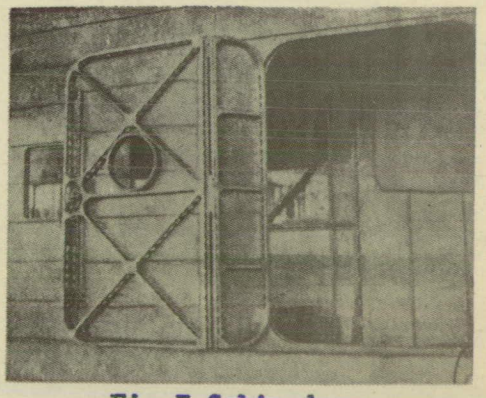


Fig.7 Cabin door.

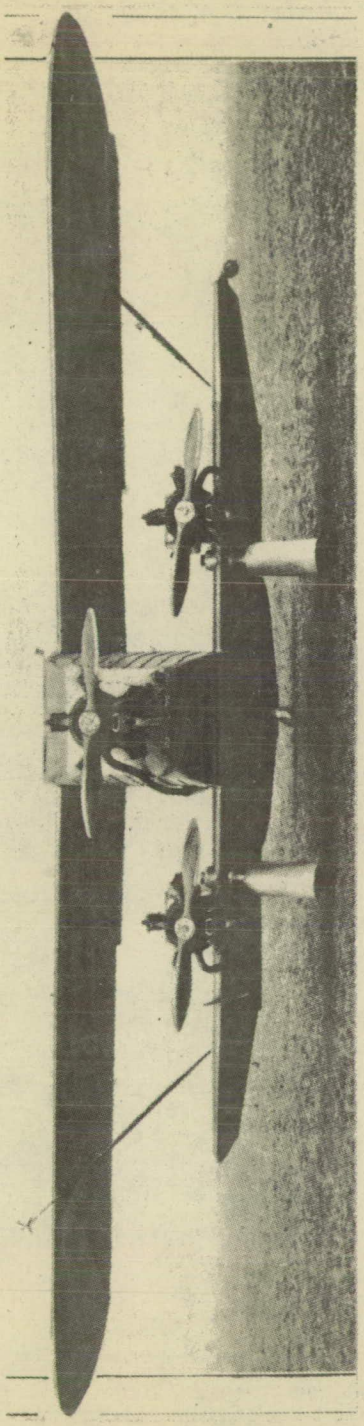


Fig.8

Fig.10

Figs.8,9,10
Breguet 391 T
airplane
Figs.8,9,10
Taken from
L'Aéronautique, June 1931

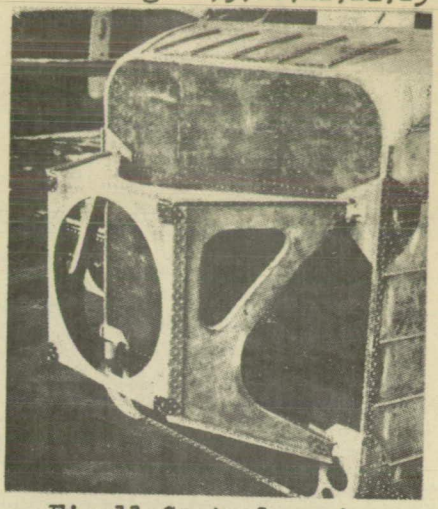


Fig.11 Central engine bearer.

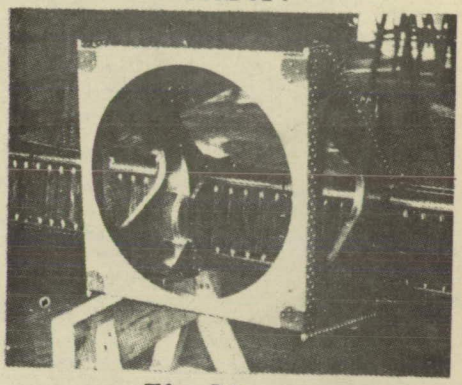


Fig.12

Fig.9

Fig.13

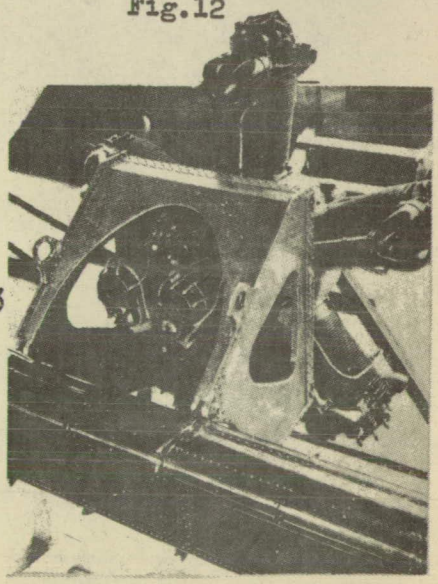


Fig.12,13 Front and rear views of lateral engine bearer with 230 hp "Titan" engine.

Engine bearers of 390 T.

Figs. 11, 12 & 13 taken from L'Aéronautique Dec. 1930