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AIRCRAFT CIRCULARS

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 160

THE S.A.B.C.A. "S.XI" COMMERCIAL AIRPLANE (BELGIAN)

A High-Wing Semicantilever Monoplane

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THE S.A.B.C.A. "S.XI" COMMERCIAL AIRPLANE (BELGIAN)*

A High-Wing Semicantilever Monoplane

By André Frachet

The aeronautic industry of Belgium consists of two or three small firms, engaged in the manufacture of light airplanes or primary-training airplanes, and of one large company, the "Société Anonyme Belge de Constructions Aéronautiques" (S.A.B.C.A.). Hitherto the work of this large factory, magnificently installed on the edge of the Haren-Evere Airdrome, near Brussels, has been almost exclusively limited to the production of foreign airplanes and engines for which it has acquired the rights.

The S.A.B.C.A. has just completed, however, its first large Belgian airplane, the S.XI, whose construction had long been contemplated. We remember seeing, in fact, at the 1928 Berlin Aircraft Exposition, the metal parts of a large commercial airplane which was then in process of construction.

This Belgian company has since purchased the Fokker patents, which fact has doubtlessly affected the design of the S.XI. This airplane has a large fuselage with a framework of autogenously welded steel tubing, made by the methods of the Dutch constructor, while its wings are made of sheet steel and light metal. Its short span is rather surprising for a monoplane of this size. Since its trailing edge, with a width of 1.9 m (6.23 ft.), is removable and therefore independent of the principal structure of the wing, one is tempted to believe that the constructors were led to provide, by this means, the additional supporting surface required. Its efficiency is another question.

However that may be, the first flights of the S.XI, made by Mr. Charles Wouters, the chief pilot of the S.A.B.C.A., showed a good behavior. We must await, however, the results of the trial flights under load for an

*From Les Ailes, September 17, 1931.

accurate knowledge of the performance possibilities of this type of airplane.

The S.A.B.C.A. commercial airplane S.XI is a braced monoplane with a wing area of nearly 97 m^2 (1044.10 sq.ft.). It has two wings attached to the upper edge of the fuselage. Each wing is supported by a pair of oblique steel-tubing struts faired with sheet duralumin. These struts connect the middle of the wing spars with the fittings of the landing-gear struts.

The wing has the plan form of a perfect rectangle (except for the balancing tips of the ailerons). It has no dihedral nor sweepback, and its thickness is uniform throughout its whole length. The ailerons are relatively long and wide and are balanced by large surfaces at their outer ends. (Figs. 2 and 3.) The wing structure consists of two spars of high-resistance steel, connected by ribs (figs. 4 and 5) and covered with plain sheet duralumin. The removable trailing edge is attached to the rear wing spar.

The fuselage, of rectangular cross section, has a framework of autogenously welded steel tubing covered with fabric. The enclosed pilot's cockpit is installed immediately behind the central engine. It is separated from the passenger cabin by a partition with a door. It has dual controls and is large enough to accommodate a navigator.

The cabin affords accommodations for twenty passengers. It is 5.8 m (19.03 ft.) long, 2.6 m (8.53 ft.) wide and 2.2 m (7.22 ft.) high. The seats are arranged in five rows of four seats each with a central aisle 0.6 m (23.62 in.) wide. The windows are provided with sliding panes of glass.

Behind the cabin there are a lavatory and 4.8 m^3 (169.51 cu.ft.) of space available for baggage. Moreover, the chairs being removable, it is possible to use for merchandise the whole cabin, which has a volume of about 34.6 m^3 (1221.88 cu.ft.). The cabin may be provided with six couches for night flights.

The horizontal empennage rests on the fuselage. It has a total span of 6.02 m (19.75 ft.) and a chord of 2.1 m (6.89 ft.). It consists of a stabilizer, adjustable during flight and braced underneath by two struts, and of a two-part balanced elevator.

The vertical empennage consists of a triangular fin, likewise adjustable by the pilot during flight, in case of the stopping of one of the side engines, and of a balanced rudder. The spars and ribs and the covering of all the tail surfaces are made of duralumin. (Figs. 6 and 7.)

The S.XI is equipped with three 420 hp Jupiter engines. (It would be possible to install three 500 hp engines on the S.XI to improve its performances.) Thus equipped, with a total power of 1260 hp, it is expected to attain a speed of 220 to 230 km (137 to 143 miles) per hour, with a commercial cruising speed approaching 210 km (about 130 miles) per hour at 0.8 of its maximum power at low altitude. With a power of 2000 hp, these performances could be increased to a maximum speed of 260 km (161.6 miles) per hour and a cruising speed of 220 km (137 miles) per hour. The power of the S.XI is sufficient to insure flight with either of the three engines stopped. The central engine is mounted in the nose of the fuselage on a steel-tubing bearer. The side engines are mounted in the front end of two nacelles of sheet duralumin installed on both sides of the fuselage directly under the wing. They are cowled with sheet elektron.

The fuel tanks, likewise of sheet elektron, have a total capacity of 2880 liters (about 760.8 gal.), sufficient for a flight of 1350 km (about 840 miles) with its pay load reduced to 500 kg (1100.3 lb.). The pay load can be increased to 1000 kg (2205 lb.) for a flight of 975 km (606 miles); to 1300 kg (2865 lb.) for a flight of 750 km (466 miles); and to 1600 kg (3527 lb.) for a flight of 500 km (310.7 miles) or less.

The landing gear has a track width of only 3.75 m (12.3 ft.). The two-part steel axle is hinged to the apex of an inverted pyramid under the center of the fuselage. The wheels, 1500 x 300 mm (59.06 x 11.81 in.) have Bendix brakes. They are joined by two V's to fittings on the lower longerons of the fuselage, the front strut of each V being provided with a shock absorber.

The elektron tail skid is situated a little forward of the sternpost and carries a large shoe.

CHARACTERISTICS

Span	22.12 m	72.57 ft.
Chord	4.50 "	14.76 "
Length	16.90 "	55.45 "
Height	4.30 "	14.11 "
Wing area	96.80 m ²	1041.95 sq.ft.
Power 3 x 420 =	1260 hp	
Weight empty	4137 kg	9120.51 lb.
Disposable load	2463 "	5429.98 "
Total weight	6600 "	14550.49 "
Wing loading	68.20 kg/m ²	13.97 lb./sq.ft.
Power "	5.24 kg/hp	11.55 lb./hp
Power per unit area	13 hp/m ²	1.21 hp/sq.ft.

PERFORMANCES (theoretical)

Maximum speed at sea level	220 km/h	136.7 mi./hr.
Cruising speed	200 "	124.3 "
Landing "	90 "	55.9 "
Ceiling	3500 m	11483 ft.
Flight range according to pay load:	500 to 1350 km	310 to 839 mi.

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

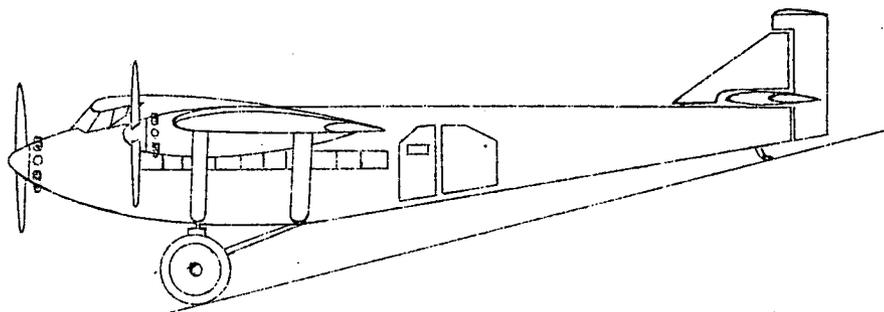
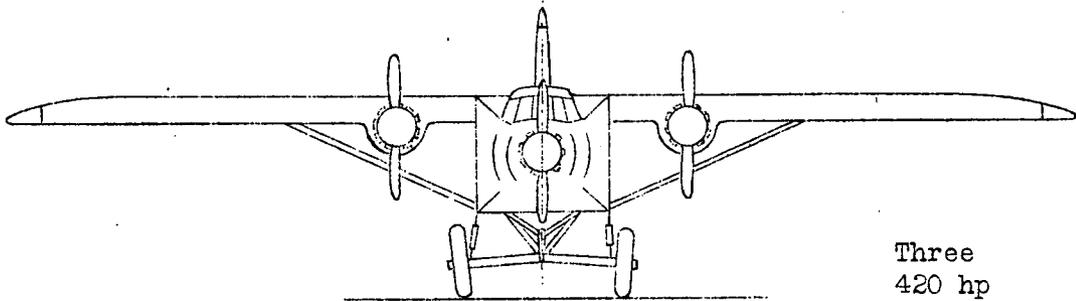
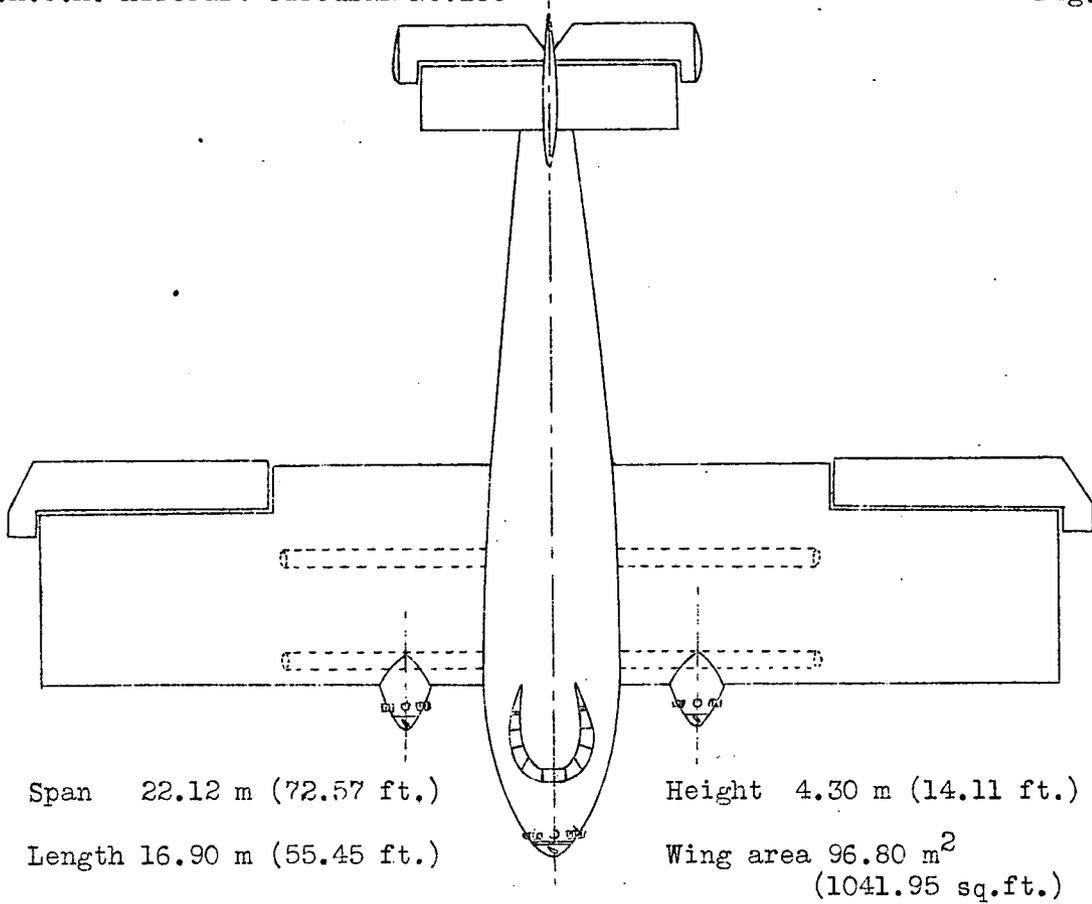
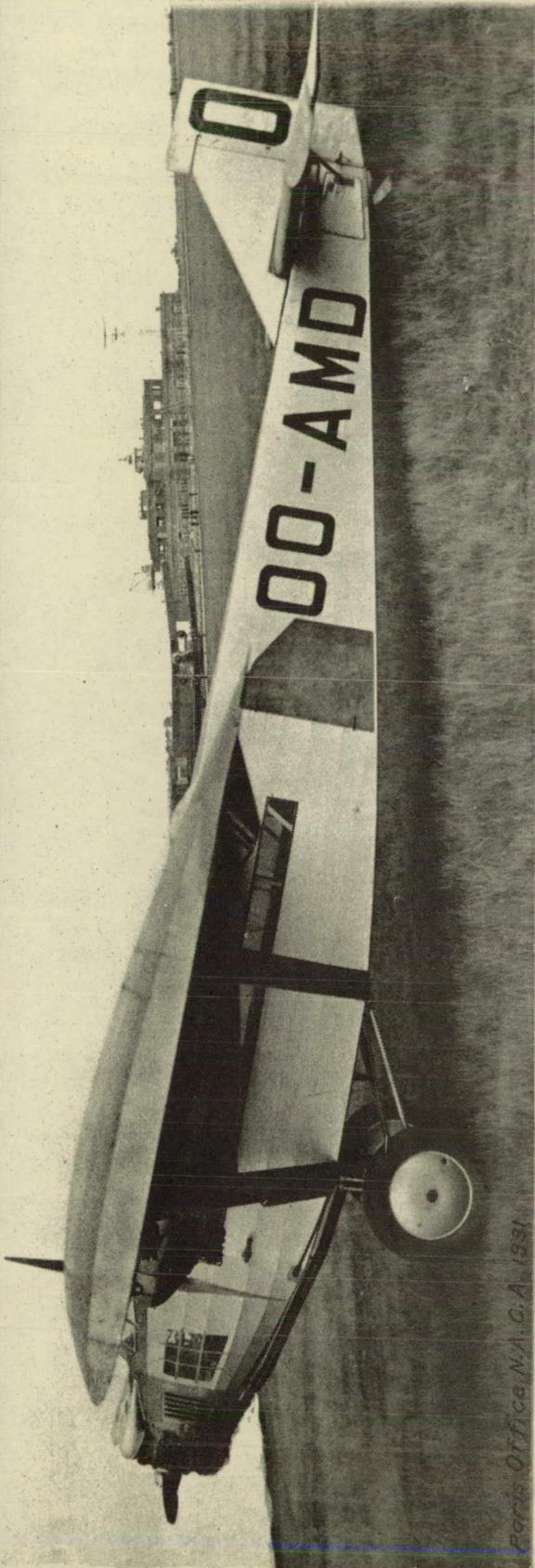
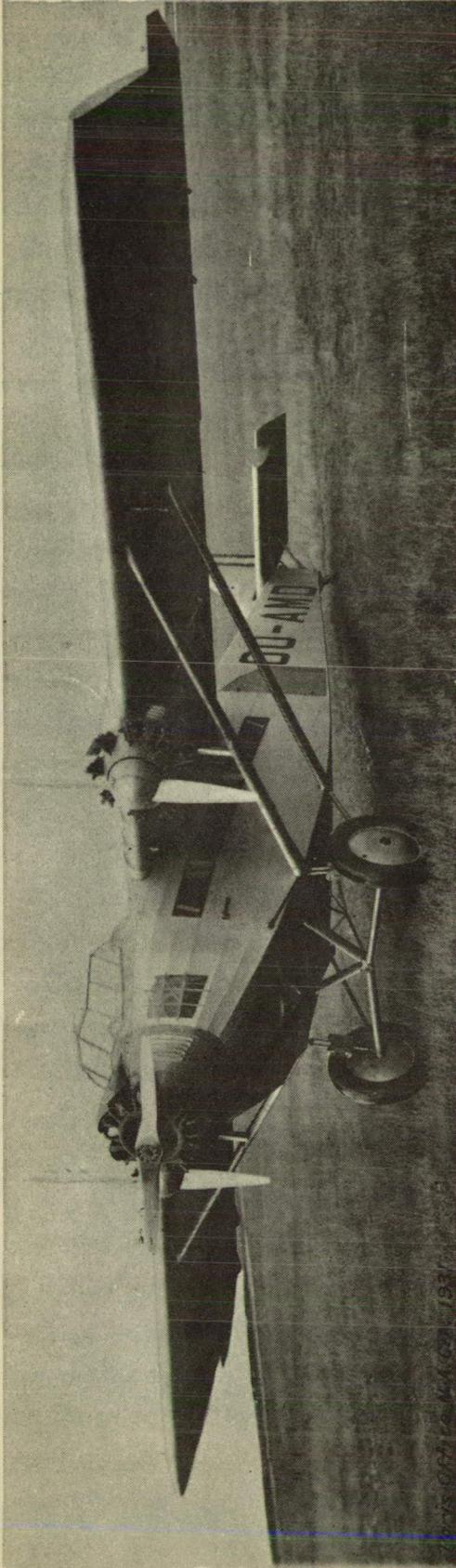


Fig.1 General arrangement drawing of the S.A.B.C.A. S XI airplane.



Figs.2 and 3 Views of the S.A.B.C.A. commercial airplane S.XI.

Paris Office N.A.C.A. 1937

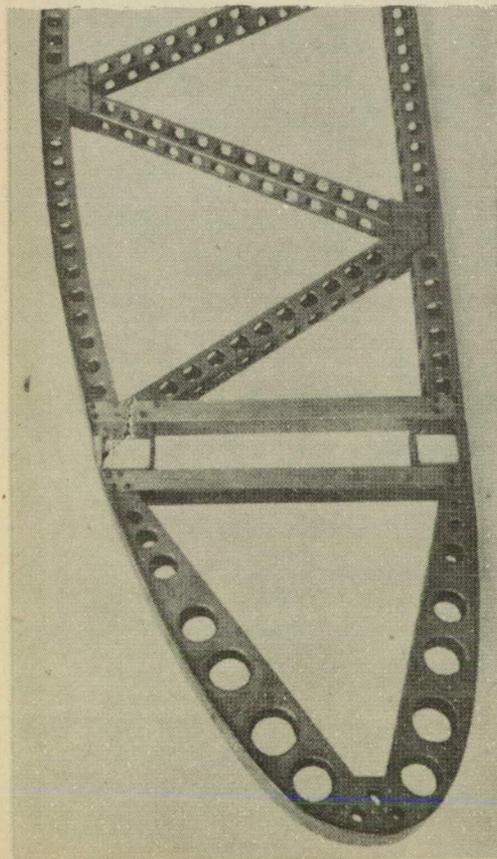


Fig. 4 Wing rib.

From
L'Aeronautique, Nov. 1931

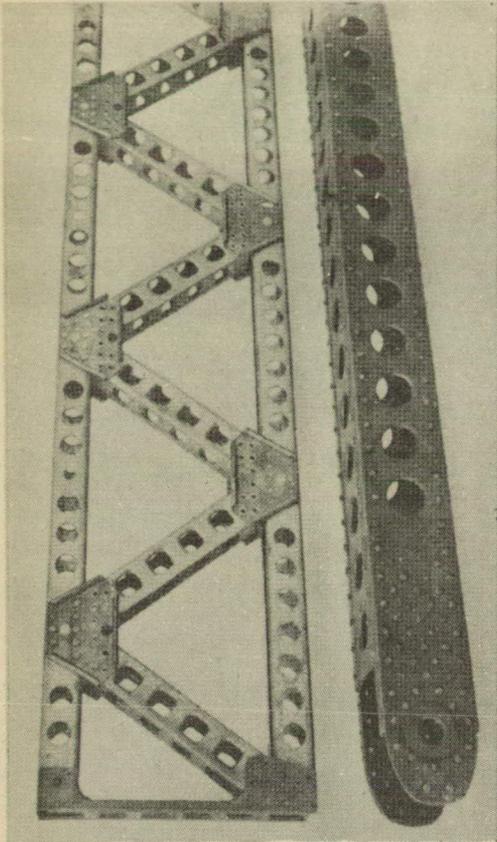


Fig. 6 (Upper) Stabilizer spar.

Fig. 5 (Lower) Wing strut.

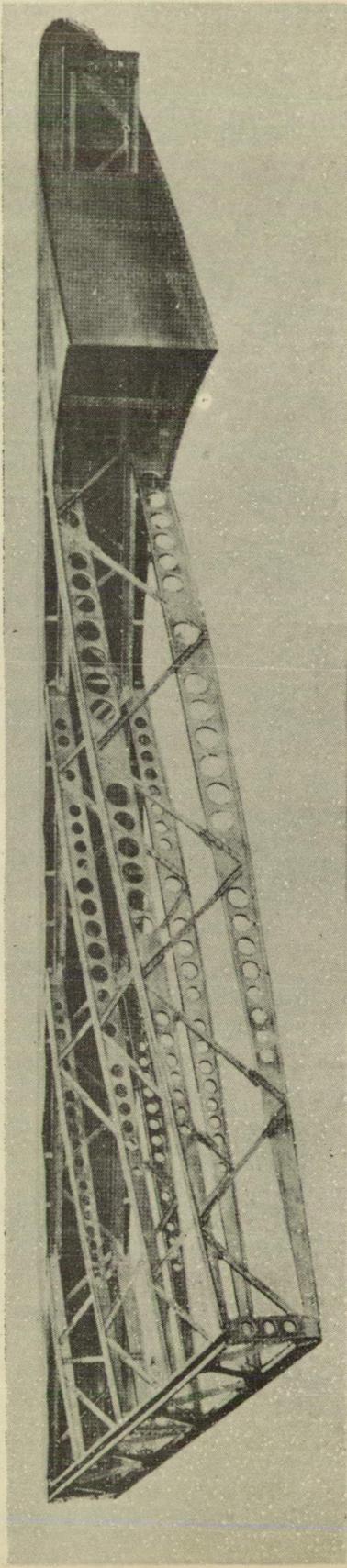


Fig. 7 Fin.

Structural details of the S.A.B.C.A. S.XI.