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AIRCRAFT CIRCULARS

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 142

THE MUREAUX 111 R.2 MILITARY AIRPLANE (FRENCH)

A Long-Distance All-Metal Observation Monoplane

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THE MUREAUX 111 R.2 MILITARY AIRPLANE (FRENCH)*

A Long-Distance All-Metal Observation Monoplane

The Ateliers des Mureaux (A.N.F.) have developed a new type of metal construction which is represented at the Salon by a long-distance observation plane, the 111 R.2, and a night observation plane, the 120 R.n.3. As for every all-metal airplane, the general structure is largely determined by the covering. In this case strips of duralumin of 20 to 30 cm (7.87 to 11.81 in.) width were used. These strips could be given flanged edges and be riveted together so as to form a single sheet. In the 111 R.2 (Figs. 1, 13 and 14) the strips are not flanged, but are joined together by means of narrow angle pieces.

The interior structure (Figs. 3-8 and 10) consists of the principal members (spars and longerons) and secondary members (secondary spars and frames) made of channel sections. These members are generally placed perpendicularly to the covering strips. The riveting of the strips to the channel sections changes them to closed sections best adapted to withstand local stresses. The rigidity of the covering is thus insured in one direction by the channel sections and in the other direction by the strip flanges or angle sections. These flanges or angle

*From L'Aéronautique, December, 1930, pp. 473-475, and a pamphlet issued by the manufacturers.

sections are continuous and are only flattened for the passage of the channel sections parallel to the spars.

In applying these principles, the wing is constructed as follows: Two spars, of the thickness of the wing with channel sections parallel to them, are held in position, at intervals of about one meter (39.37 inches), by box crosspieces in place of ribs. The covering strips are placed at right angles to the spars and are riveted to their flanges and to the channel sections (but not to the box crosspieces), thus obtaining torsional rigidity. The covering strips are easily riveted by beginning at one end of the wing and using a riveting hammer or tongs with jaws a little longer than the width of the strips. The covering has no other projections than the rivet heads. The leading edge, e.g., is attached by screws inclined at 45° with their heads covered by small sliding plates (Figs. 7 and 12).

The fuselage is constructed, on the same principles as the wing, of four main longerons, transverse frames and channel sections. On the sides, however, the covering strips are parallel to the longerons, and the number of channel sections is reduced. On the top and bottom, the strips are placed transversely, thus enabling a rounded form with the least preliminary shaping.

Each wing has two duralumin spars (Figs. 4, 5, 8), each with a lightened web of sheet metal 10 to 20 mm (0.4 to 0.8 in.) thick. The flanges are special metal sections, 2.5 mm (0.1 in.) thick, riveted to the web and to the wing covering. Vertical

angle sections insure the rigidity of the web. The spars are braced against each other by tubes in the plane of each flange, so as to obtain torsional rigidity. Instead of ribs there are eight box crosspieces perpendicular to the spars. Each crosspiece (Fig. 3) constitutes a Warren girder made up of channel sections 8 x 10 and 10 x 10 mm (0.3 x 0.4 and 0.4 x 0.4 in.). These crosspieces support 13 channel sections 8 x 10 mm (0.3 x 0.4 in.) parallel to the spars (Fig. 6). These sections are joined to the crosspieces by gussets.

The covering consists of strips of sheet metal 0.35 mm (0.014 in.) thick and 20 cm (7.87 in.) wide, placed perpendicularly to the spars and riveted to angle sections and to channel sections parallel to the spars. They are distributed over three zones: from the trailing edge to the flange of the rear spar; between the two spars; on the leading edge. The three zones are joined on the spar flanges in such manner that the strips of one zone overlap the strips of the adjacent zone throughout the whole width of the flange, thus giving the flange a closed section. The wing can be inspected by removing the leading edge.

The wing section or profile is almost like that of airplanes 3 and 4 C.2, but improved. Its fineness was increased from 20.5 to 22.9 and the C_m was reduced from 7 to 4.5, which diminishes the fatigue of the wings in a dive. The wing tips are thin and rounded. The wing is supported by two tubular struts and the cabane (Figs. 1 and 9).

The ailerons are set into the wing and provided with differential control, thus reducing the force required to operate them. They are narrow and not balanced. Their controls are rigid from the pilot's seat to the cabane and then again between the interior horns and the ailerons themselves. These two rigid portions of the control system are joined by cables. The travel of the depressed aileron is less than that of the elevated aileron, thus producing a gentler maneuver and diminishing the risk of a side slip.

The fuselage has four longerons of 10 × 10 mm (0.4 × 0.4 in.) angle sections which support the transverse frames (Fig. 2) made of channel sections. The covering consists of strips like those on the wing, arranged longitudinally on the sides and transversely on the top and bottom. This enables the use of the strips over the whole width and prevents their wrinkling, since they are bent only in the direction of their length. As on the wing, the covering is riveted to channel sections supported by the transverse frames. In the vicinity of the longerons, the strips overlap to form closed sections. The cross section chosen for the fuselage for reasons of visibility (trapezoidal with the shorter base down, flat sides, rounded top and bottom) proved to be good from the aerodynamic viewpoint.

The landing gear is wide, without continuous axle. The shock absorber has a stroke of 12 cm (4.72 in.). The wheels are provided with brakes. The wing struts can be removed without

disturbing the landing gear.

The dirigible tail skid has a shoe and is mounted on an oleopneumatic shock absorber.

The all-metal tail surfaces have a structure similar to that of the wing. The fin is rigid and has no brace wires. The rudder and elevator are operated by cables, only the latter being balanced by a device which is adjustable during flight. The stabilizer is braced by two struts and is adjustable on the ground.

The engine is a 650 hp Hispano-Suiza, but other engines of like power could be used. It is mounted on a removable support (Fig. 11). The water radiator is under the engine cowling, the degree of cooling being regulated by a shutter. The oil radiator is attached to the engine bed. The tanks for the oil and the fire extinguisher are behind the fire wall. The engine is provided with a muffler. The fuel is delivered by two pumps from a protected tank in the fuselage, with a capacity of about 520 liters (137.4 gallons).

The quarters for the pilot and observer are roomy. The pilot's seat is adjustable, as likewise the rudder bar, and enables the use of a seat or back parachute. The observer's seat is removable.

Characteristics*

Span	15.40 m	50.52 ft.
Length	10.00 "	32.81 "
Height	3.63 "	11.91 "
Wing area	34.90 m^2	375.66 sq.ft.
Weight empty	1440 kg	3174.65 lb.
Weight loaded	2249 "	4958.19 "
Wing loading	65 kg/m^2	13.31 lb./sq.ft.
Power loading	3 kg/hp	6.52 lb./hp

Performances

(Estimated from model tests)

Speed at 5000 m (16400 ft.)	258 km/h	160.3 mi./hr.
Ceiling	7900 m	25920 ft.
Climb to 5000 m (16400 ft.)	12 min. 12 sec.	
Climb to 7000 m (22966 ft.)	27 min. 0 sec.	
Maximum speed near ground	272 km/h	169 mi./hr.
Landing speed	97 km/h	60.3 mi./hr.

*From manufacturers' pamphlet.

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

Constructional details of the "Mureaux" 111 R.2 airplane.

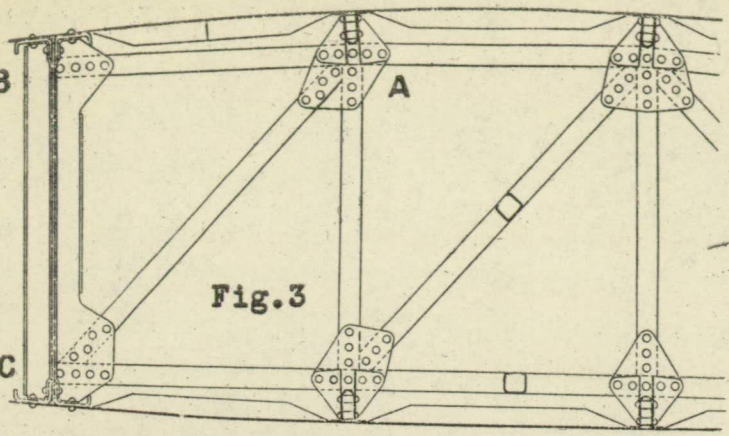


Fig.3

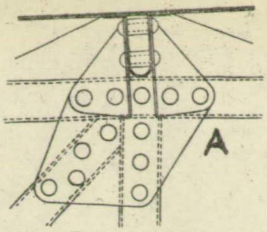


Fig.6

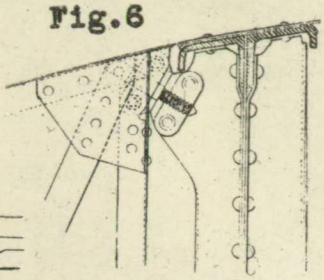


Fig.7

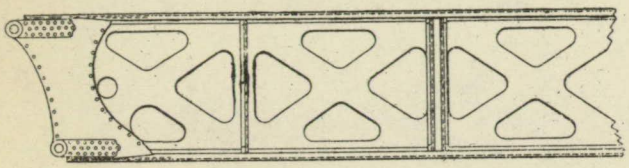


Fig.8

Fig.4 →

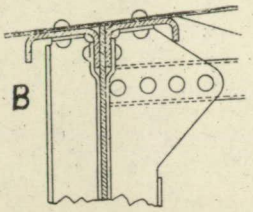
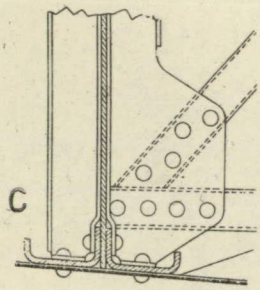
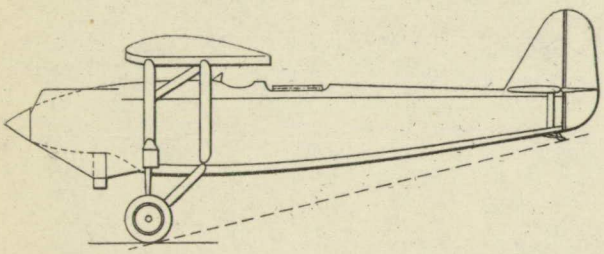
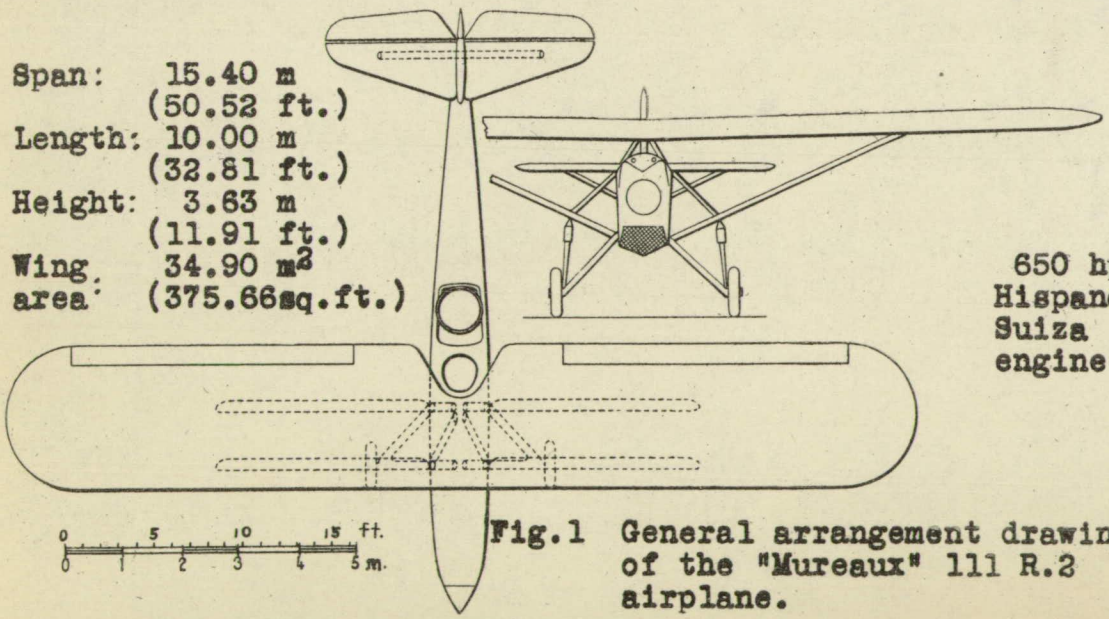


Fig.5 →





Span: 15.40 m (50.52 ft.)
Length: 10.00 m (32.81 ft.)
Height: 3.63 m (11.91 ft.)
Wing area: 34.90 m² (375.66sq.ft.)



650 hp Hispano-Suiza engine.

Fig.1 General arrangement drawings of the "Mureaux" 111 R.2 airplane.

Fig.13 Front view of the "Mureaux" 111 R.2 airplane.

Construc-tional details of the "Mureaux" 111 R.2 airplane.

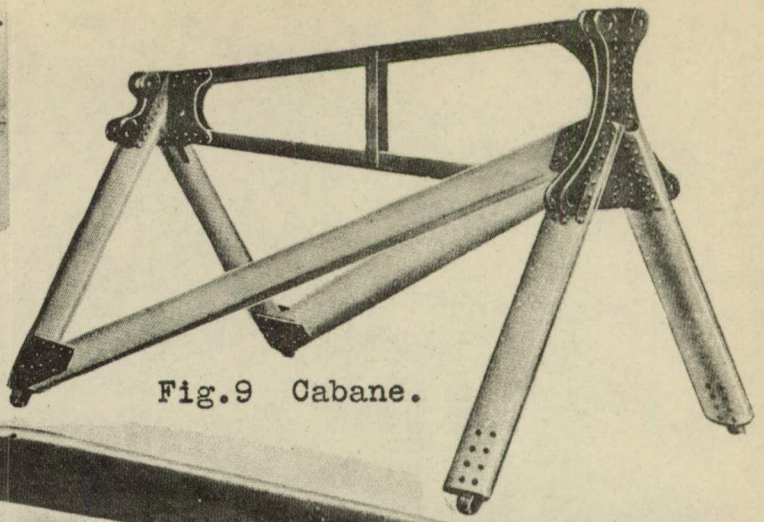


Fig.9 Cabane.

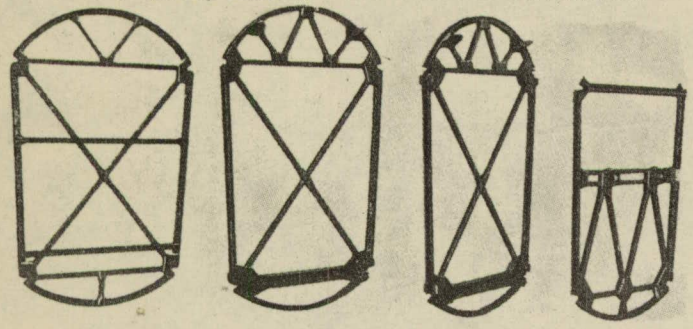


Fig.2 Fuselage frames.

Fig.14 Three-quarter front view of the "Mureaux" 111 R.2.

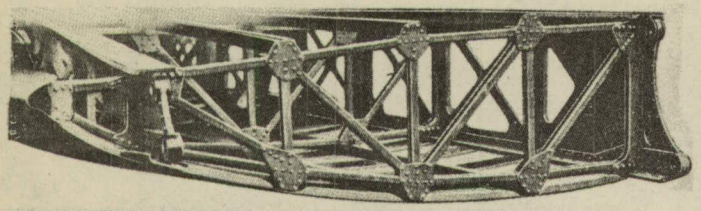


Fig.10 Detail of wing construc-tion.

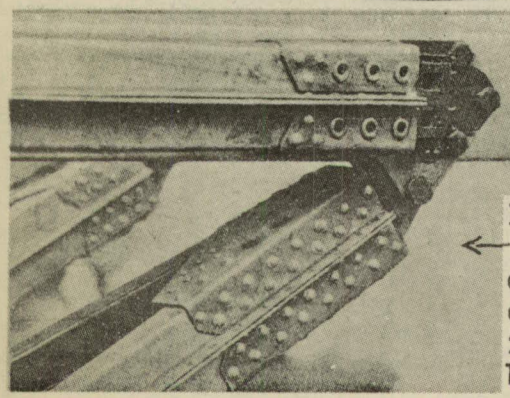


Fig.11 Hinged support of longeron extension serv-ing as engine bearer.

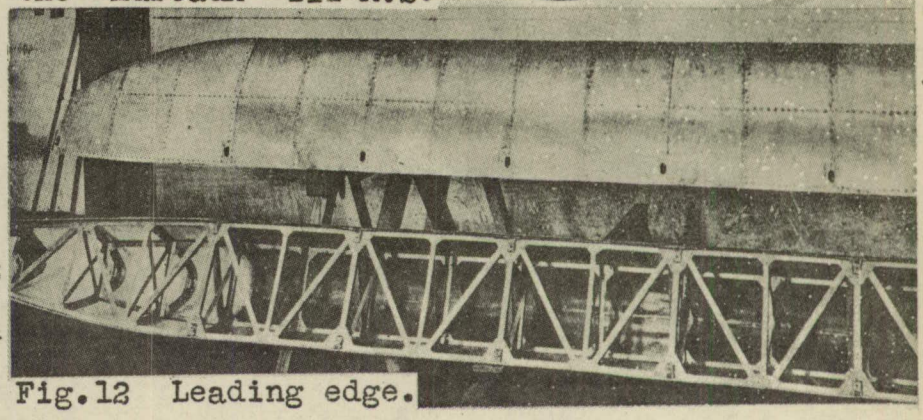


Fig.12 Leading edge.