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No. 173

NIEUPOORT-DELAGE 590 MILITARY AIRPLANE (FRENCH)
A Two-Place High-Wing Cantilever Monoplane

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NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

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NIEUPOORT-DELAGE 590 MILITARY AIRPLANE (FRENCH)*

A Two-Place High-Wing Cantilever Monoplane

The Société Générale Aéronautique has completed the Nieuport-Delage three-engine colonial cantilever monoplane which meets the requirements of the program established by the French Government. (Figs. 1, 2, and 3.) The remarkable features of this type have aroused considerable interest. The special shape of the fuselage insures excellent downward visibility and a very wide downward and rearward field of fire. The air flow is deflected to a point behind the cabin, which is completely open on both sides. The pilot's cockpit, of the enclosed type, has open sides provided with side deflectors. The airplane is of all-metal construction with L2R light alloy structure and covering and special steel fittings. To facilitate transportation, the airplane can be separated into a certain number of parts (wings, center section, tail group, landing gear, engine bearers, cabin and rear portion).

The Nieuport-Delage 590 can be equipped with photographic apparatus (for vertical and oblique photography), short-wave radio set or ambulance installation for the transportation of two wounded men. The armament comprises twin Lewis guns on a ring mount, a box for 50 grenades and two bomb gears.

The all-metal wing consists of two cantilever portions attached to the sides of a central section. (Fig. 4.) Each portion of the wing consists of a central box-type element to which are secured the leading (figs. 5 and 6) and trailing edges. The structure of the box portion comprises two lattice spars of L2R alloy connected by ribs of the same construction. It is cross braced and covered with thin plates of L2R alloy suitably reinforced. The sections of the leading edge are bolted to the front spar. The trailing edge is hinged to the flanges of the rear spar. It covers the aileron-hinge spar of the two outer wing sections and the false spar of the central sec-

*From Revue de la Société Générale Aéronautique, October, 1932, pp. 11-17.

tion. The aileron structure consists of several ribs and a light spar supporting the covering. The controls are of the rod and wire type.

The fuselage consists of three parts, the engine mount in front, the cabin proper and the rear part carrying the tail. The engine mount is made of sheet L2R with stiffening ribs. The mount is attached at four points, thus permitting the use of various engine types.

The pilots' cockpit is in the cabin which consists of two box-type side walls braced by bulkheads. Only the upper portion of these walls extends abaft the rear bulkhead of the cabin. These elements are interconnected by the top of the fuselage and by an arched ceiling. The rearward extension of the lower part of the walls forms a nacelle connected with the upper part by T-shaped bulkheads. The floor is made of corrugated plates secured to the fuselage bottom by cross beams.

The rear portion of the fuselage forms an extension of the cabin. Its structure consists of three longerons supported by T-shaped bulkheads and covered with thin sheet L2R, stiffened by longitudinal ribs. The unusual shape of this fuselage was specially developed for the purpose of reducing blind areas to the minimum, especially downward and rearward. (Figs. 7, 8, and 9.)

Complete dual controls are provided, only the elevator control being disconnectible. The rigid elevator and rudder controls run along the inside walls of the cabin and are continued by wires in the rear part of the fuselage. The aileron controls are rigid till they reach the wings and are then continued by wires, bell cranks, and rods. (Figs. 10, 11, and 12.)

The cantilever tail surfaces are all-metal. The horizontal stabilizer consists of a box-type central portion with a demountable leading edge, secured to the top of the fuselage at four points. The elevator is hinged to the rear edge. The vertical fin is of the same construction as the horizontal stabilizer, to which its front end is attached. Its rear end is secured to the fuselage.

The landing gear consists of two independent triangulated parts with wheels 1,100 x 250 mm (43.3 x 9.84 in.). Each part has a bent axle of variable circular cross section, a streamline drag strut of sheet L2R and an oleopneu-

matic shock absorber transmitting the stresses to the central portion through the intermediary of the main bulkhead of the engine nacelle.

The tail wheel is carried by an orientable fork with spring shock absorbers. The airplane is equipped with hand-operated differential brakes with oleopneumatic control.

The lateral engine nacelles are suspended by streamline struts below the junction points of the central and outer wing sections. (Fig. 13.) The nacelles are shells of thin sheet L2R stiffened by longitudinal ribs. (Fig. 14.) The structure which withstands the landing stresses consists of a forward ring, to which the engine is bolted, a main box-type bulkhead, an intermediate ring and a terminal bulkhead. The two engine nacelles are interchangeable.

The airplane is equipped with three 300 hp air-cooled Lorraine engines. The engine controls are mounted below the instrument board within easy reach of both pilots. The Viet starter is on the left of the chief pilot.

The three droppable fuel tanks, one for each engine, are located in the corresponding wing sections. The fuel-tank outlets and the delivery pipes of the pumps have the same stopcocks. The tanks are interconnected by pipes with cocks.

There are three oil tanks, one right and one left in the leading edge of the central wing section for the lateral engines, and one in the fuselage for the central engine. The oil and fuel cocks operate simultaneously.

The engines have ring-shaped exhaust stacks with mufflers. The airplane is equipped with two-blade metal propellers. The engine control instruments and fire alarms are on the instrument board.

All the instruments required for flight and engine control are mounted on the instrument board. A drift meter, map table, watch, altimeter, and compass are also provided for the navigator. (Figs. 15 and 16.) A methylbromide fire extinguisher is provided. It is automatic or operated by the pilot. A portable extinguisher is also kept in the cabin. The pilots have seat-type parachute

packs. Two cockpit parachutes are placed in the center of the cabin and one near the door. The airplane carries night-flying equipment, including landing lights and flares.

The airplane is equipped with a Richard Labrely F.50 camera mounted on a hinged support which permits vertical and oblique photographs at angles up to 45° . Although fitted with remote control, the camera is mounted in front of the observer and readily accessible in flight.

There is a T.O.E. short-wave radio set with fixed antenna and auxiliary generator for use on the ground.

The armament comprises a T.O.7 gun ring at the rear end of the cabin, affording a maximum field of fire downward and to the rear. Twin Lewis guns with 10 cartridge packs or one machine gun and 5 packs are carried according to the mission. The offensive armament comprises a slip box containing 54 grenades and 2 F.12.10 bomb-release gears with 24 bombs of 10 kg, and an S.T.Aé. sight. There are also 8 signal flares in a slip box, two rifles with 100 cartridges and signal flares for desert regions and Michelin lighting bombs for emergency landings.

The composition of the crew varies according to the mission. The seats, except those for the pilots, are folding. Their location affords perfect visibility for the passengers, which is greatly facilitated by the special shape of the cabin. An additional seat may be substituted for the camera for inspection missions.

Cases, easily accessible in flight and on the ground, contain the provisions, fabric covers, tools and, if necessary, the medical supplies. The two superposed stretchers carried in the ambulance plane are suspended elastically at the center of gravity of the cabin.

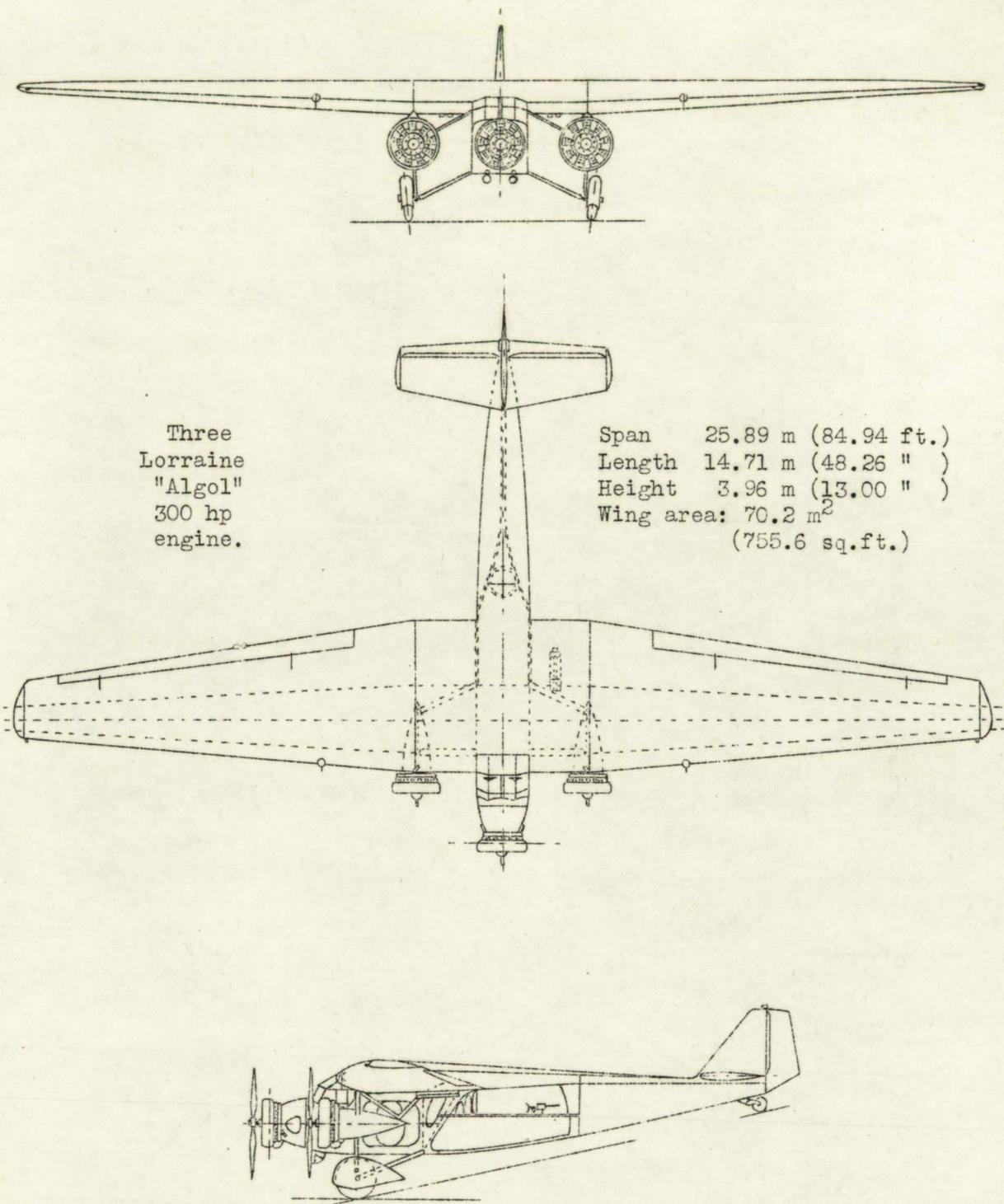
CHARACTERISTICS

Span	25.89 m	84.94 ft.
Length	14.71 "	48.26 "
Height	3.96 "	13.00 "
Wing area	70.2 m ²	755.63 sq.ft.
Horizontal- empennage area	7.25 "	78.00 "
Vertical- empennage area	3.24 "	34.9 "
Lorraine "Algol" engines	3 x 300 hp	
Power equivalent	3 x 370 "	
Rated engine and propeller r.p.m.	1,800	
Wing loading	72.00 kg/m ²	14.75 lb./sq.ft.
Power loading (equivalent)	4.54 kg/hp	10.00 lb./hp
Weights:		
Airplane	1,885 kg	4,156 lb.
Power plant	1,356 "	2,989 "
Equipment	<u>162 "</u>	357 "
Weight empty	3,403 kg	7,502 "
Fuel	1,000 "	2,205 "
Crew	160 "	353 "
Military load	467 "	1,029 "
Total weight	5,030 "	11,089 "

PERFORMANCES

Maximum speed at sea level	212 km/h	132 mi./hr.
Minimum speed at sea level	105 "	65 "
Maximum speed at 6,560 ft.	211 "	131 "
Range with no wind	1,300 km	808 mi.
Climb to 2,000 m (6,560 ft.)		6 min. 40 sec.
" " 4,000 m (13,120 ft.)	16 "	0 "
" " 7,000 m (22,960 ft.)	48 "	20 "
Ceiling	8,000 m	26,240 ft.

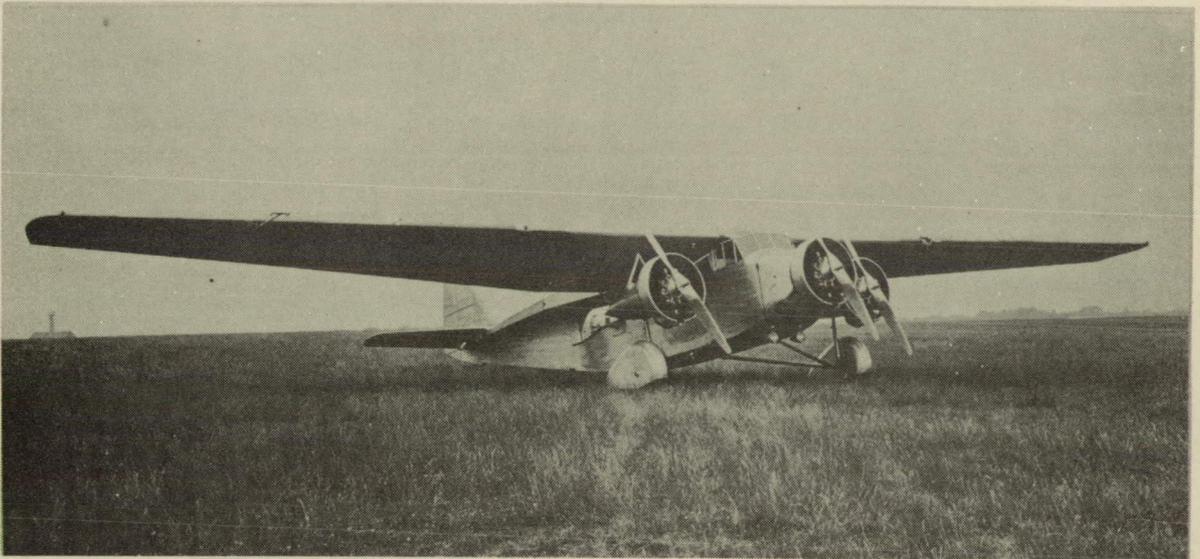
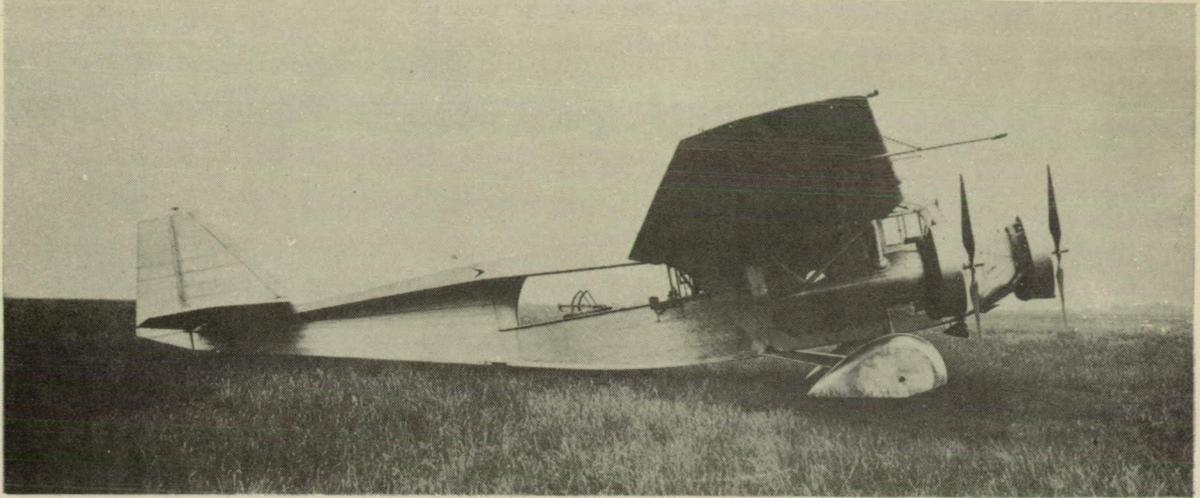
Translation by W. L. Koporindé, Paris Office,
National Advisory Committee
for Aeronautics.



Three
Lorraine
"Algol"
300 hp
engine.

Span 25.89 m (84.94 ft.)
Length 14.71 m (48.26 ")
Height 3.96 m (13.00 ")
Wing area: 70.2 m²
(755.6 sq.ft.)

Fig.1 General arrangement drawings of the Nieuport-Delage 590 airplane.



Figs.2,3 Side and three-quarter front view of Nieuport-Delage 590 equipped with three Lorraine "Algol" engines.

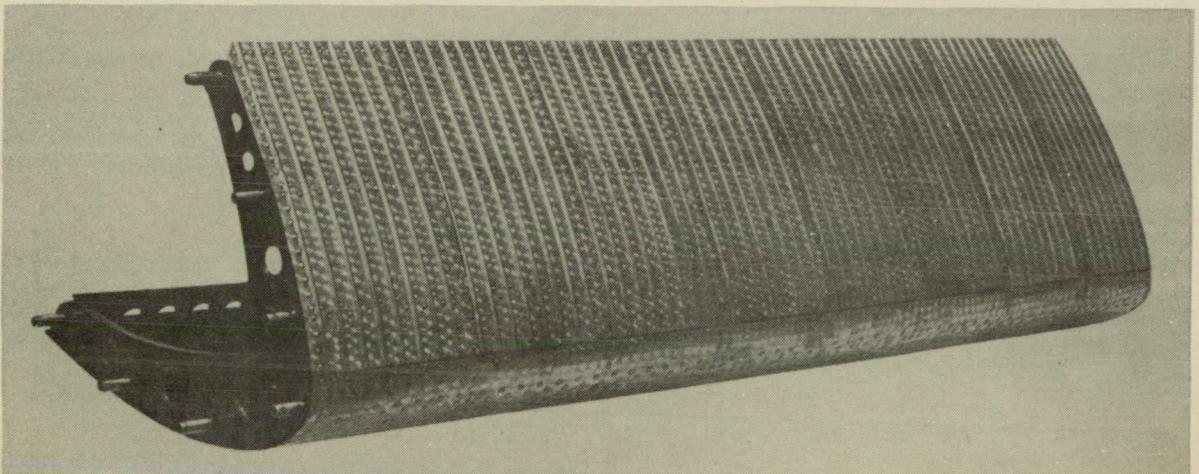


Fig.5 Demountable leading edge.

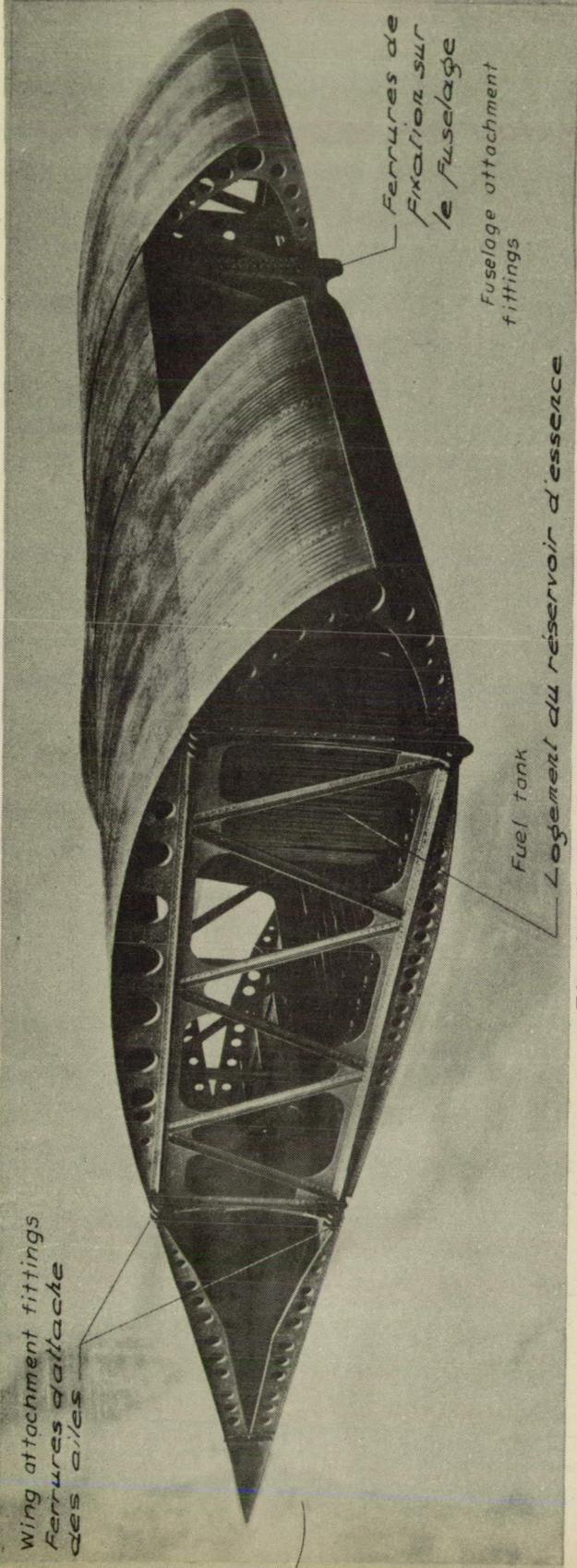


Fig. 4 Central section of wing.

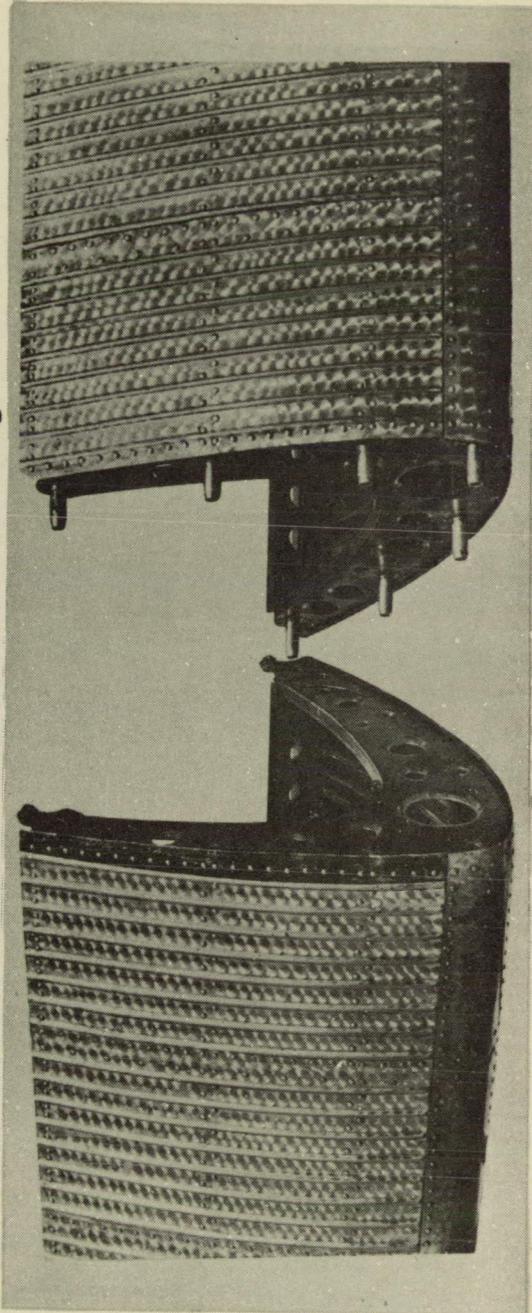


Fig. 6 Demountable leading edges.

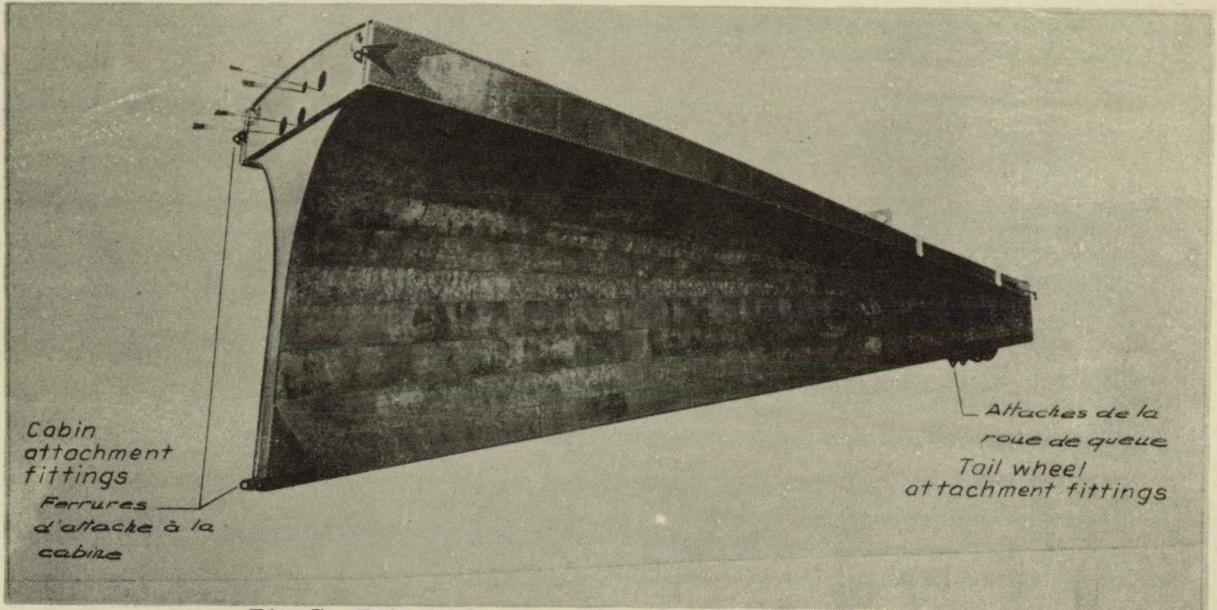


Fig.7 External view of rear part of fuselage.

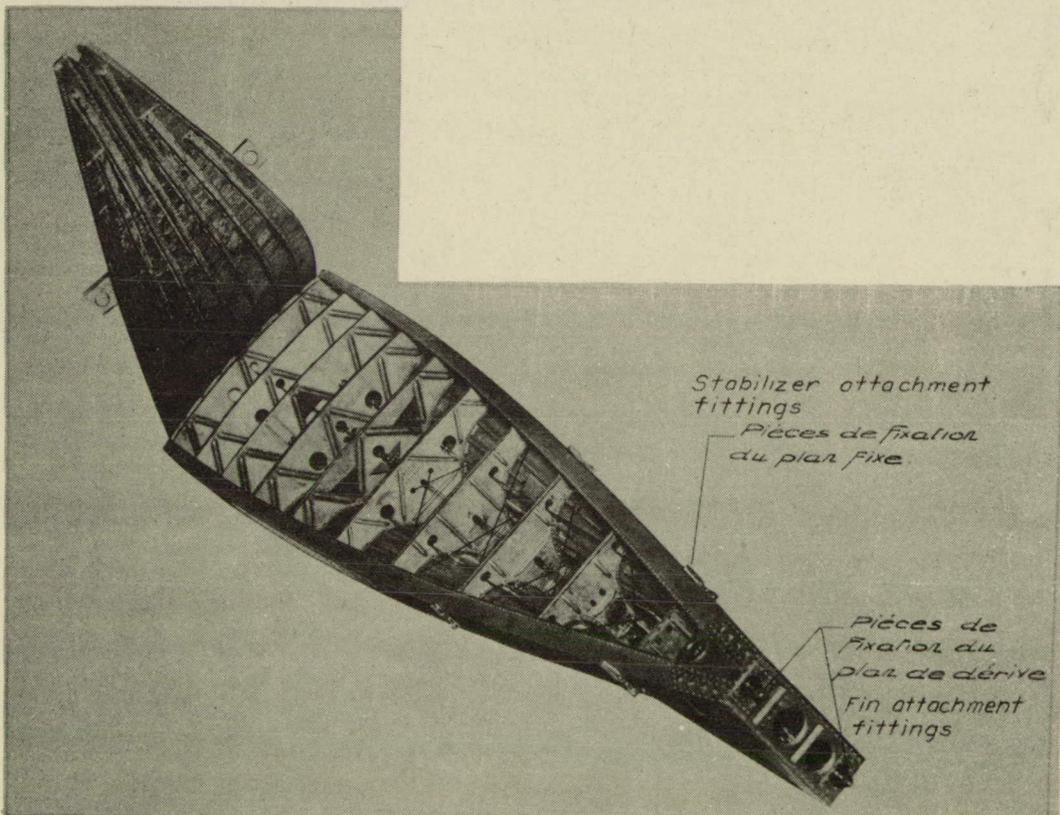


Fig.9 Internal view of rear part of fuselage.

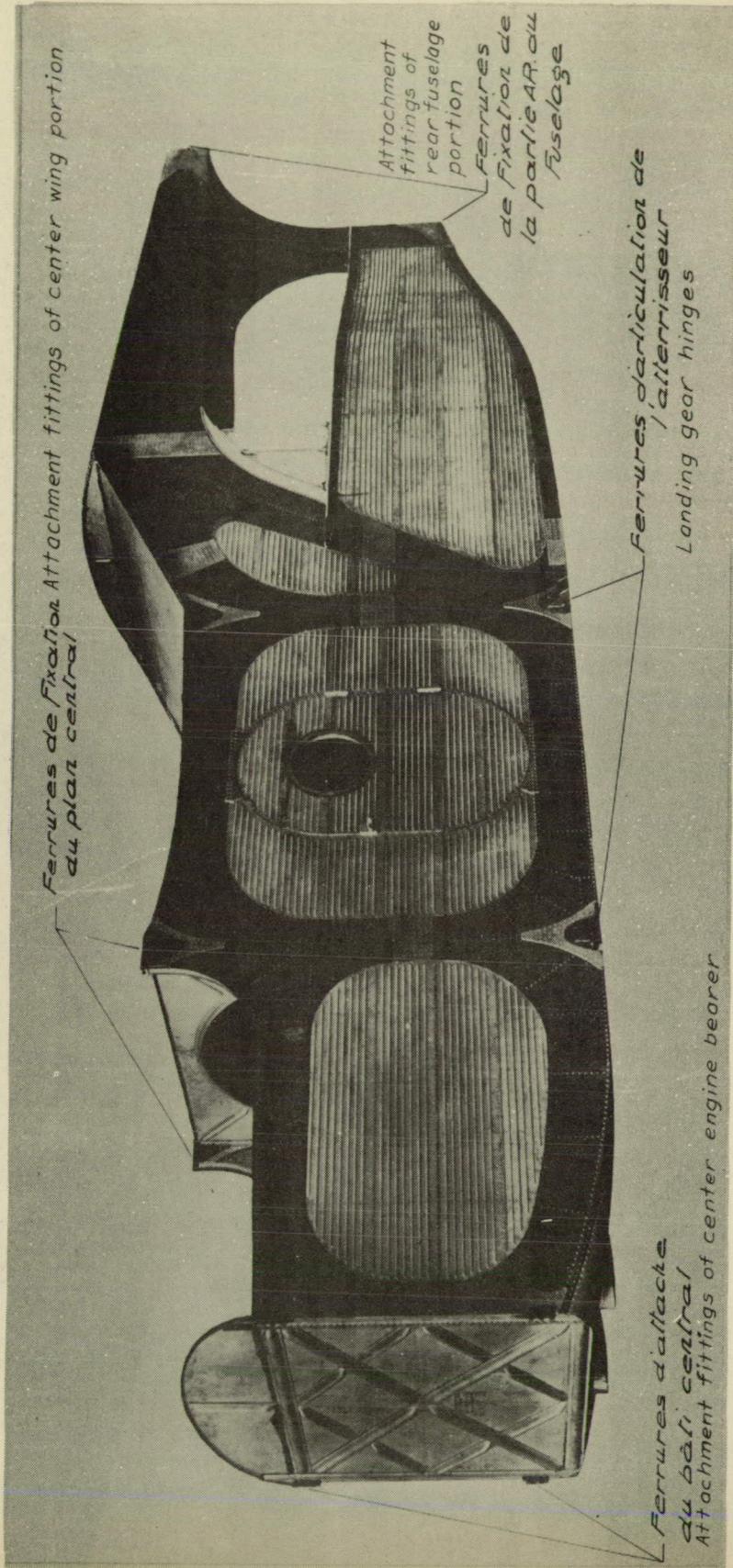


Fig.8 Fuselage-cabin section.

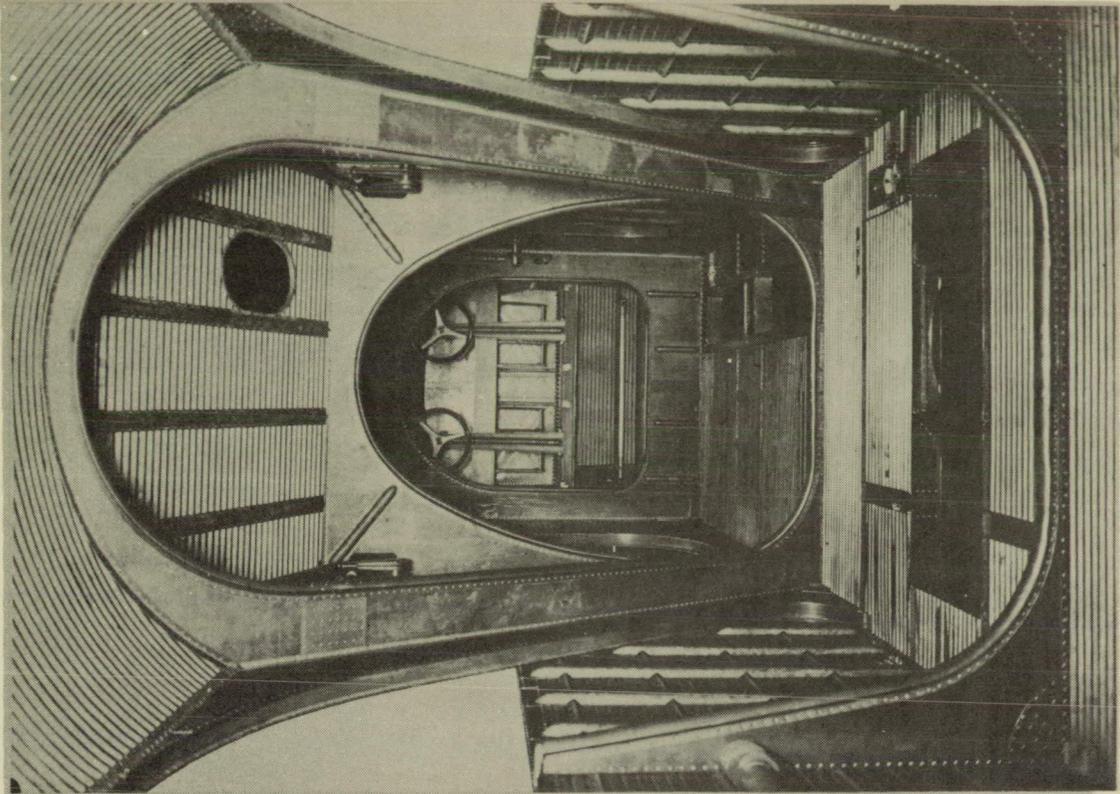
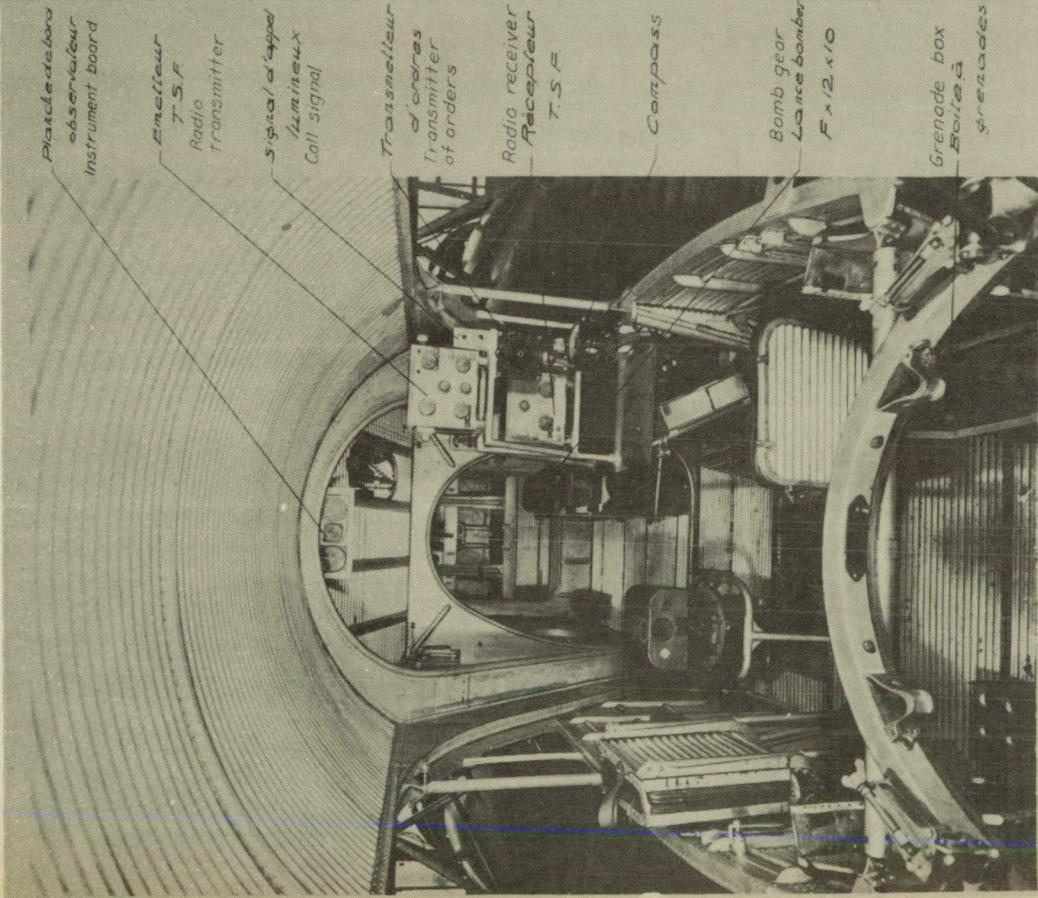


Fig. 11 Unequipped cabin.



Plaque de bord
observateur
Instrument board

Emetteur
T.S.F.
Radio
transmitter

signal d'appel
lumineux
Call signal

Transmetteur
d'ordres
Transmitter
of orders

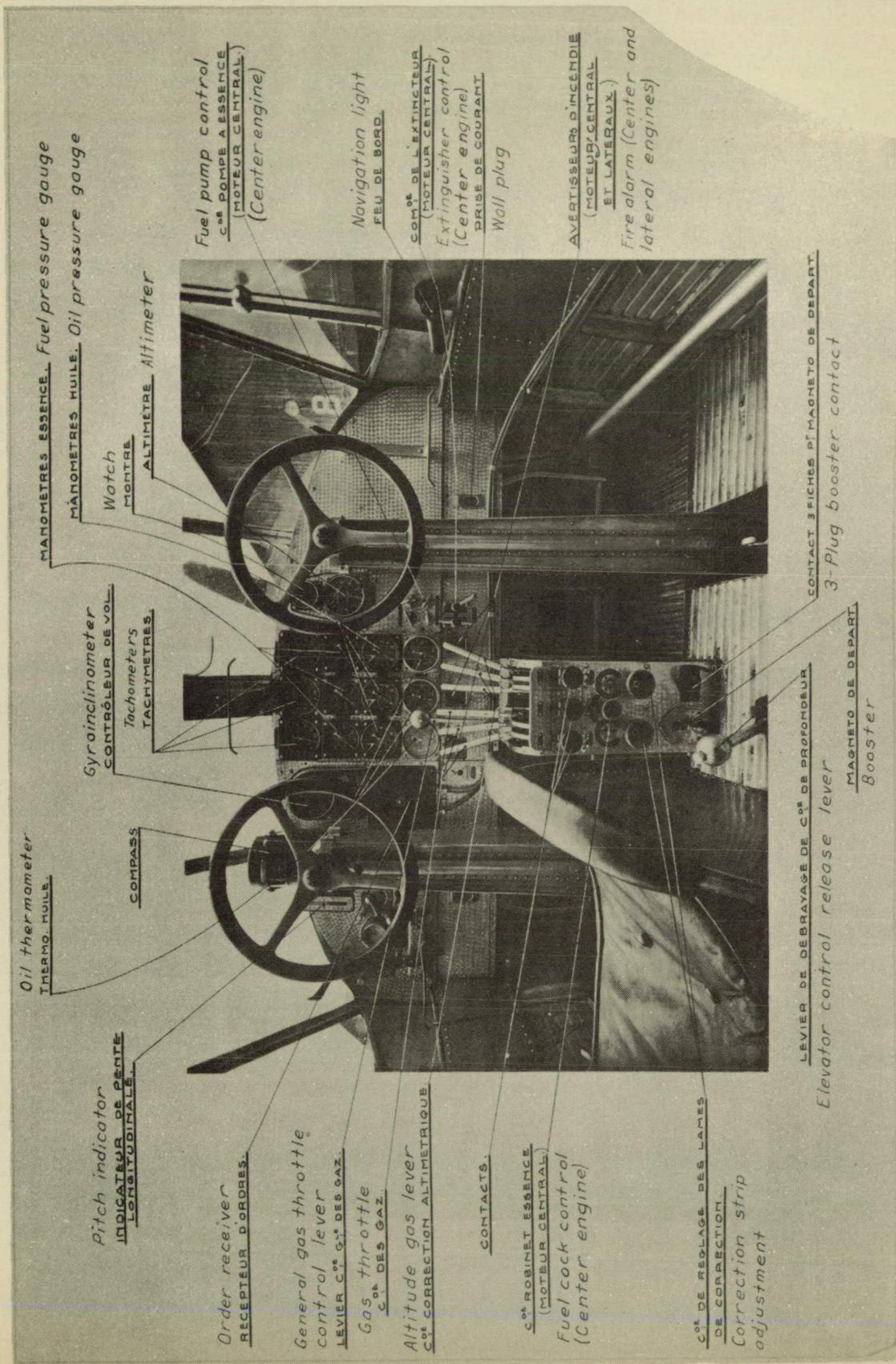
Radio receiver
Recepteur
T.S.F.

Compass

Bomb gear
Lance bombe
F x 12 x 10

Grenade box
Boite a
grenades

Fig. 10 Cabin looking aft.



Oil thermometer
THERMO. HUILE.

Pitch indicator
INDICATEUR DE PENTE
LONGITUDINALE.

Order receiver
RECEPTEUR D'ORDRES.

General gas throttle
control lever
LEVIER C.^o G.^o DES GAZ.

Gas throttle
C.^o DES GAZ.

Altitude gas lever
C.^o CORRECTION ALTIMETRIQUE.

CONTACTS.

C.^o ROBINET ESSENCE
(MOTEUR CENTRAL)
Fuel cock control
(Center engine)

C.^o DE REGLAGE DES LAMES
DE CORRECTION
Correction strip
adjustment

MANOMETRES ESSENCE. Fuel pressure gauge
MANOMETRES HUILE. Oil pressure gauge

Watch
MONTRE

ALTIMETRE. Altimeter

Fuel pump control
C.^o POMPE A ESSENCE
(MOTEUR CENTRAL.)
(Center engine)

Navigation light
FEU DE BORD.

C.^o DE L'EXTINGUIEUR
(MOTEUR CENTRAL)
Extinguisher control
(Center engine)
PRISE DE COURANT
Wall plug

AVERTISSEURS D'INCENDIE
(MOTEUR CENTRAL
ET LATERAUX)
Fire alarm (Center and
lateral engines)

LEVIER DE DEBRAYAGE DE C.^o DE PROFONDEUR

Elevator control release lever
MAGNETO DE DEPART
Booster

CONTACT 3 FICHES ET MAGNETO DE DEPART.

3-Plug booster contact

Fig. 12 Pilot's cabin.

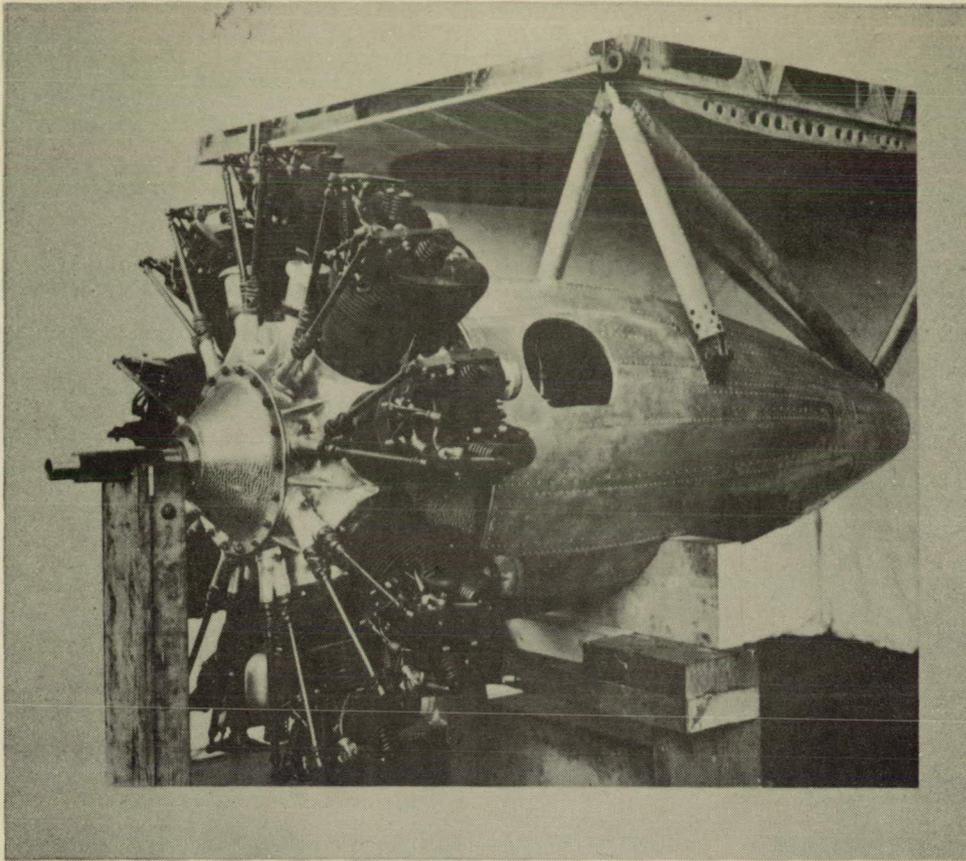


Fig.13 Lateral-engine nacelle.

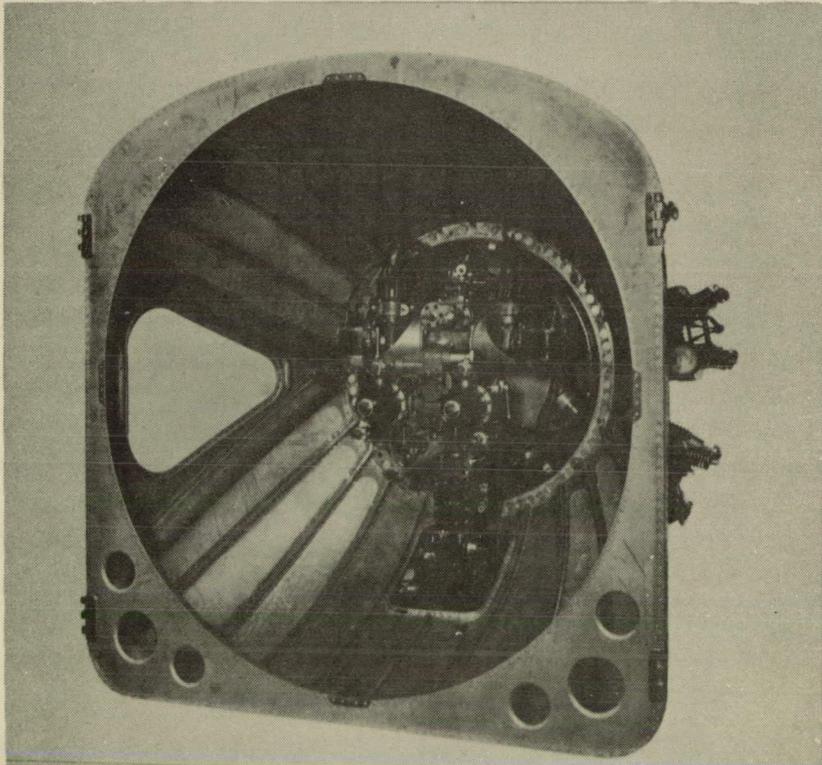
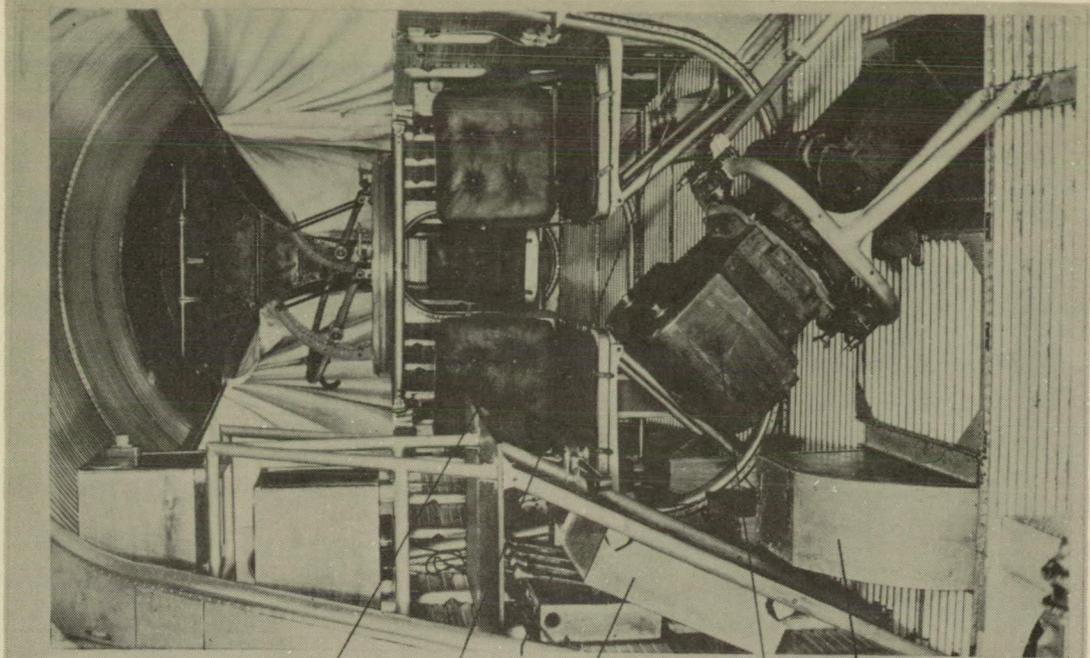


Fig.14 Center-engine mount.



M.G. ring
Tournelle T O 7

Gunners seat
Siège mitrailleur
Cartridge boxes
Boîtes à cartouches

Observer's seat
Siège observateur

Folded observers seat
Siège observateur replié

Signal flares
Fuses de signalisation

Bomb control station
Poste de Com. lance bombes

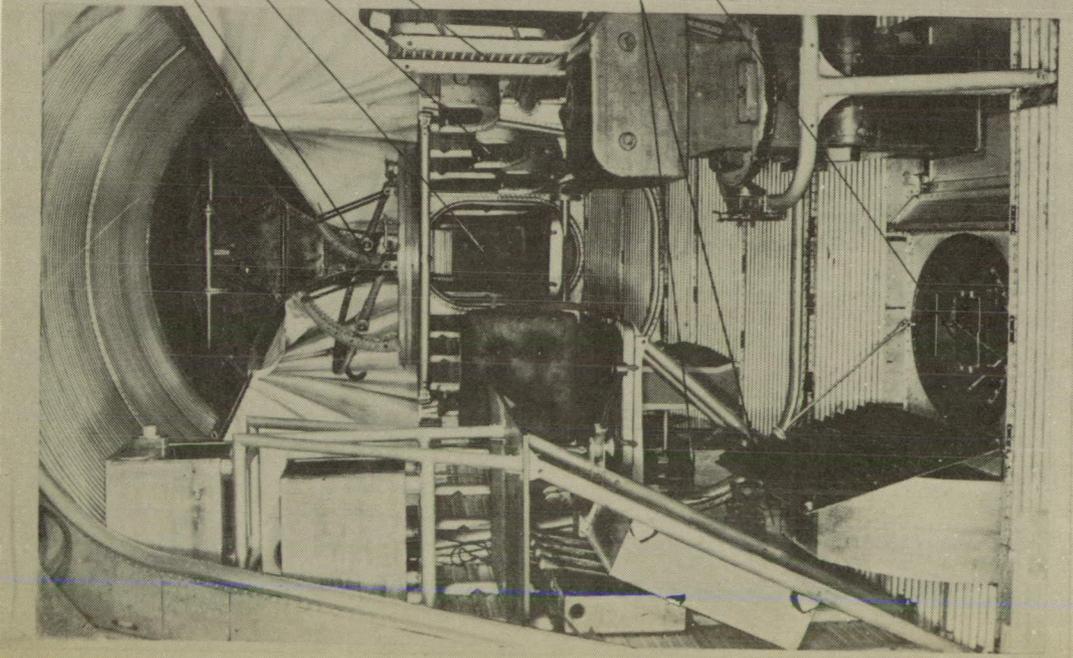
Map stand
Casier à cartes

Wireless batteries
Boîtes d'alimentation TIF

Drift indicator
Dérivomètre S.T.Az.

Camera for oblique photography
Appareil photo F. 50 pour
prise de vues obliques

Fuses de signalisation
en zones désertiques
Desert signal flares



Figs. 15, 16 Cabin looking forward.