

2

AIRCRAFT CIRCULARS
NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 151

BREGUET MILITARY AIRPLANE, TYPE 33
A Two-Place Long-Distance Sesquiplane
for Observation and Bombing

DOCUMENT ON LOAN FROM THE FILES OF

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS
LANGLEY MEMORIAL AERONAUTICAL LABORATORY
LANGLEY FIELD, HAMPTON, VIRGINIA

RETURN TO THE ABOVE ADDRESS.

REQUESTS FOR PUBLICATIONS SHOULD BE ADDRESSED
AS FOLLOWS:

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS
1724 SIXTH ST., N.W.,
WASHINGTON 25, D.C.

Washington
September, 1931

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

AIRCRAFT CIRCULAR NO. 151

BREGUET MILITARY AIRPLANE, TYPE 33*

A Two-Place Long-Distance Sesquiplane

for Observation and Bombing

General Description

The wings are similar to those of the 27A2. They consist essentially of a lower wing with a single steel spar in the form of a girder extending throughout its whole length and of two upper wings, with a central cabane, which are attached to the tips of the lower wing by V struts of steel. (Figs. 2 & 3.) The chord and thickness of the wings are uniform, except at their tips where their plan form becomes elliptical and their spars taper. (Figs. 1 & 4.)

The upper wing has two identical steel spars braced by rigid steel diagonals. (Fig. 4.) Each rib consists of three pieces. The secondary ribs are made of the light alloy L-2R and the main ribs of steel (corresponding to the aileron hinges). A cutaway in the middle of the trailing edge of the upper wing gives the pilot perfect visibility upward. (Fig. 1.)

The ailerons are hinged to secondary spars on the upper wings. They are four in number and are mounted elastically. Inclinable deflectors make it possible to regulate their range of deflection during flight. The two inner ailerons are independent of the pilot, while the two outer ones are operated by the pilot, like ordinary warping ailerons, by means of a differential control.

The lower wing (fig. 5) consists of a single all-steel spar and boxes forming the body of the wing attached to the spar in such a way as to be easily removable. The frames and covering of these boxes are made of the alloy L-2R, except the front ends of the ribs which are of steel. The lower wing contains four quick-emptying fuel tanks, two of which form the leading edge of the box girder, and the other two, situated behind this girder, form the lower

*From Repertoire des Avions Louis Breguet, June, 1931.

surface of the wing. The lower wing is attached to the central box by steel bolts.

The V struts are attached to the tips of the lower wing and to both spars of the upper wings by ball-and-socket joints. An eccentric placed at the point of attachment of the foot of the rear strut to the foot of the front strut makes it possible to regulate the incidence of the upper wing. (Figs. 2 & 3.)

The fuselage consists of a central box, to which is attached the removable engine bearer (fig. 6), and of a fuselage girder which contains the pilot's cockpit and supports the landing gear.

The engine bearer is made entirely of steel. Its two spars and four struts are attached to the central box by six bolts.

The central box is of large size and rectangular section with a steel framework, covered with sheet L-2R. Each lateral face contains a large door with a window. The cabane is attached to the top of the central box. The inside of this very spacious box may serve for various special uses, such as baggage, additional fuel tanks for long flights, bomb-dropping devices, etc., or may even be quickly arranged for carrying one or two mechanics or other passengers.

The single-piece fuselage girder (fig. 7) is made entirely of steel. Its faces are provided with ports for inspecting the controls. It is attached to the bottom of the rear face of the central box by four steel bolts and to the four angles of the rear frame of the central box by four steel struts.

The fuselage girder supports the body containing the cockpits for the pilot and observer, the metal tail surfaces, the tail wheel with oleo-pneumatic shock absorber and the brackets for supporting the Labrely photograph camera.

The Breguet 33 has dual control. The control stick has a milled knob which controls the balancing device of the elevator and enables the pilot to regulate the longitudinal equilibrium according to the flight speed. A device for securing the control stick to the pilot's seat makes it possible to lock the stick in any desired position.

The observer's control stick is removable. The rudder is operated by pedals. The observer's pedals can be disconnected and sunk in the floor. The control rods are all rigid and their displacement is regulated by bronze bushings or connecting rods. The differential coupling of the aileron controls is accomplished by rack and pinion.

The tail surfaces (fig. 7) are all metal with no outside bracing and have symmetrical biconvex profiles. The principal stabilizer spars are steel and its hinge spar L-2R, as also its ribs and covering. It is attached to the fin by spindles and bolts. The elevator is made of L-2R alloy. Its steel control lever is attached to a central steel rib, with steel hinge pins. An adjustable deflector or balancer, mounted on its trailing edge, makes it possible to vary the position of equilibrium of the elevator in the relative wind. The fin has the same structure as the stabilizer in which it is imbedded. It is attached to the fuselage girder by bolts cottered with split-pins. The rudder has the same structure as the elevator. Its upper part is balanced.

The landing gear consists of two wheels mounted on independent forks and a tail wheel. The forks slide in "Alpax" sleeves attached directly by screw bolts to the spar of the lower wing. The absence of an axle diminishes the drag and facilitates landing on uneven ground.

The damping of the motion of the forks in their sleeves is accomplished by Breguet oleo-pneumatic shock absorbers with a stroke of 120 mm (4.72 in.). The elastic system is supplied by compressed air and the damping results from the passage of a mixture of glycerine and alcohol through calibrated orifices of variable section. Each fork is provided with a socket, which makes it convenient to lift the airplane by means of jacks for changing a wheel with facility. The wheels are held in their forks by two wing nuts. There is a braking device inside of each wheel.

The wheel brakes are operated hydraulically by the pilot by means of a lever, as shown in Figure 8. This lever is provided with a device which enables the pilot to brake either wheel separately or both together. The braking effect is proportional to the pull exerted by the pilot on the lever and ceases when the lever is released.

A milled knob makes it possible to hold the brake lever in any desired position when, for example, the pilot wishes to test the engine at a fixed point, thereby dispensing

with the necessity of blocking the wheels for this test and reducing the length of the take-off run. The actual braking of the wheel is accomplished by the tightening of the two flanges, lined with Ferrodo, against both sides of the rim. This system has the advantage of avoiding excessive braking, even in case of rupture of the lining springs. The dirigible tail wheel is mounted on a shock-absorbing fork.

The first examples of the Breguet 33 are equipped with 650 hp water-cooled Hispano-Suiza engines with 12 cylinders in V and a normal speed of 2000 r.p.m. (Fig. 9.) The removability of the engine group of the Breguet 33 enables it to be easily equipped with any other type of engine of 600 to 1100 hp including those with superchargers. The engine controls consist of rigid steel rods operated by large push buttons or levers accessible to both pilot and observer. The starter is of the Viet 120 type. A removable lever enables the mechanics, when the airplane is on the ground, to operate the starter pump from the outside.

The fin water-radiator is of the Breguet type and is situated in the propeller slipstream under the engine cowling. The cooling of the radiator is regulated by a shutter with movable slats operated by the pilot and placed under the engine cowling in front of the radiator.

The propeller is metal and of the Breguet type. Its pitch is adjustable on the ground.

The fire extinguisher is of the Standard type with automatic alarm.

The fire wall between the engine and the central box forms the front face of the latter. It is of sheet steel reinforced on both sides by intersecting ribs and is hermetically tight.

All the control instruments of the engine (the oil and fuel manometers, the oil and water thermometers and the tachometers) are conveniently arranged on the pilot's instrument board and are easy to read.

The four fuel tanks are in the lower wing as already mentioned. They can be instantly emptied, two at a time and on the same side, right or left, by means of rigid rods with large handles on the right side of the instrument board. The two rear tanks are provided with shields against machine-gun bullets.

The fuel is delivered to the engine by two A.M. pumps right and left, each supplied by the two tanks on the same side as the pump. In case of poor functioning or stopping of either pump, the other pump suffices to supply the engine. The pumps are started from the pilot's seat. Each of the four tanks is provided with a gauge. The total capacity of the tanks is 475 liters (125.5 gal.), 81.5 liters (21.5 gal.) in each of the front tanks and 156 liters (41.2 gal.) in each of the rear tanks.

The cylindrical oil tank is under the rear part of the engine and in front of the fire wall. It has a capacity of about 55 liters (14.5 gal.). Oil radiators are applied to the circular faces of the oil tank which coincide with the right and left faces of the engine cowling. A by-pass controlled by a thermostat allows the oil returning from the engine to cool in the mass of oil in the tank or to return immediately to the engine, according to its temperature.

Equipment

The military equipment of the Breguet 33 was planned with the greatest care and has the following advantages:

- Maximum field of fire;
- Perfect visibility for the crew;
- Convenience, simplicity and safety in using the equipment;
- Comfort and safety of the crew itself.

These advantages are due principally to the following particular characteristics of the Breguet 33:

- Elimination of the dead angle due to the fuselage by the elimination of the rear portion of the latter and its replacement by a box girder of small cross section (fig. 7);
- Body with straight sides and very tapering rear (fig. 19);
- Elimination of brace wires;
- Narrowness of lower wing and of the struts;
- Cutaway in upper wing and location of seats;
- Large trapdoors for sighting in front of pilot and observer.
- Large inside dimensions of body;
- Finish and structural strength of equipment details;

Side doors to the compartments;
 Effective protection of pilot and observer from the wind;
 Ease of verbal communication between pilot and observer;
 Long distance of the quick-emptying fuel tanks from the engine;
 Ease of using parachutes through drop doors.
 The Breguet 33 can be equipped for the following uses:

A. Observation

1. Long-distance observation with radio instruments for transmitting and receiving.
2. Long-distance observation with photography.
3. Long-distance observation with radio and photography.

B. Bomb Dropping

1. Long-distance bomb dropping.
2. Heavy night bomb dropping.

The Br. 33 can be equipped to carry bombs up to a total weight of 1366 kg (about 3000 lb.) distributed as follows:

2 or 4 G.P.U. under lower wing girder, 472 kg (about 1000 lb.)

2 bomb-racks 8 x 50 cm (3.15 x 19.69 in.) or 10 x 32 cm (3.94 x 12.6 in.) with a maximum load of 894 kg (about 2000 lb.).

General Equipment

The Br. 33 is designed to carry the following instruments.

a) In pilot's cockpit: (Fig. 10.)

1 QSC27 compass; 1 clock; 1 altimeter; 1 map holder; 1 longitudinal inclinometer; 1 air-speed indicator.

b) In observer's cockpit:

1 QSC27 compass; 1 clock; 1 altimeter; 1 map holder; 1 Philippe drift indicator; 1 Impar "taximètre" for checking the drift:

Safety devices:

2 Munerelle oxygen apparatus, one each for pilot and observer, with control indicators; 1 seat parachute for the pilot on an adjustable seat and 1 back parachute for the observer, attached by a locking mechanism to the rear gun mount. (Fig. 20.) This parachute serves as a back to the observer's seat.

In order to keep the observer's parachute belt continually open and to enable him to don it quickly, the ends of the belt are inserted in leather pockets on the walls of the cockpit.

Electric apparatus for lighting and heating:

1 generator mounted on the right leading edge of the lower wing, (fig. 11), which furnishes a direct current;

1 "S.E.V. Marine" switch board for controlling the voltage, placed at the right of the observer's cockpit;

2 heat switches, 1 each for pilot and observer;

Various terminals and switches for the pilot's and observer's cockpits, particularly for lighting the compasses, the sights and the navigation lights;

1 rheostat and 1 switch for lighting the O.P.L. sight; enabling the use of the current from the generator or from a battery of 7 dry cells.

Special Equipment

a) Radio.— The Br. 33 can be fitted for receiving any type of radio instruments. At present the system used is the "E-35" enabling reception and broadcasting with a range varying from 500 to 1000 km (311 to 622 miles). The sending and receiving instruments, for which space is provided in front of the observer's cockpit (fig. 13), are very easily accessible. The power supply for these instruments is located in the rear part of the observer's cockpit. (Fig. 12.)

Two keys are placed where the observer can operate them conveniently, either when he is facing the front or the rear of the airplane.

The Y alternator is mounted on the leading edge at the left tip of the lower wing. The two antennas are mount-

ed inside the wing between the right and left sides of the central box and the lower coverings of the upper wings, by means of rings provided for this purpose.

b) Photography.- Especially designed for long-distance observation, the photographic equipment of the Br. 33 comprises all the supports, trapdoors and controls for the practical execution of photographic missions of this character. Provision is made for using the Labrély automatic camera for vertical and oblique views and the Duchatellier hand camera.

The support of the Labrély camera, consisting essentially of a fork hinged to steel fittings riveted to the fuselage girder, is balanced by a sandow (rubber cable), which makes it possible to give the camera any desired inclination (vertical or oblique). A convenient lever makes it possible to lock the camera in any desired position.

Oblique views are taken with the Labrély camera through a window with two shutters in the left wall of the cockpit (figs. 15 and 19), the opening of the shutters being controlled by a milled knob. Vertical views are taken through an opening in the front floor of the cockpit (fig. 14), which is closed by shutters operated by a hand lever.

c) Armament.- The armament of the Br. 33 consists essentially of:

1. Two fixed Vickers machine guns firing through the propeller (figs. 9 & 16);
2. Two twin Lewis machine guns on a balanced ring mount TC-7. (Fig. 17.)

The two Vickers guns, with remote control by the pilot, are mounted on each side of the crankcase inside the engine cowling.

This arrangement has the following advantages:

- Increase of the field of vision of the pilot, whose view is not obstructed by guns placed above the cowling;
- Practical elimination of the risk of long firing by reducing as much as possible the distance between the guns and the plane of rotation of the propeller;
- Heating the guns by the air around the engines;
- Accessibility of the guns for inspection on the ground;

Reduction of the drag.

The installation of each Vickers gun includes a box of 250 cartridges and a box for catching the links. The cartridge cases may be caught or not, as desired. The sight used is either the G.H. collimator "Chrétien" or the O.P.L. sight.

The two rear Lewis machine guns, on the balanced TO-7 mount, are conveniently operated by the observer in the shelter of an effective wind shield. Thirteen brackets for Lewis magazines are distributed about the observer's cockpit.

A box of signal flares, which can be dumped in flight, and a bracket for a pyrotechnic pistol complete the armament.

The body of the Breguet 33 R 2 was designed to provide the crew with two roomy cockpits offering maximum visibility, absolute freedom of motion, maximum convenience and minimum fatigue.

The pilot's cockpit follows the large central box. It is entered by two doors, right and left, mounted on hinges. On the inner side of each door, a case is attached for holding tools or provisions. The covers of these cases have leather cushions and serve as elbow rests. Both doors can be immediately dropped, in order to facilitate quick evacuation of the cockpit in case of necessity. The floor consists of corrugated sheet L-2R alloy. The seat is adjustable and permits the use of a seat parachute. The pilot is protected by a large windshield of triplex glass.

The pilot's view, which is particularly important from the standpoint of safety, is perfect in all directions, due to the following conditions, some of which have already been mentioned:

- Location of seat so as to reduce dead angle of upper wing;
- Narrowness of cabane struts and windshield supports;
- Large cutaway in trailing edge of upper wing;
- Narrowness of lower wing;
- Narrowness and remoteness of wing struts;
- Elimination of all brace wires;
- Shape of engine cowling and of fuselage (straight sides);

Location of front machine guns inside engine cowling;
Large trapdoors for sighting in the bottom of the central box in front of the pilot's feet, which enable the pilot to follow accurately a path on the ground, especially for taking photographs.

The arrangement and large dimensions of the observer's cockpit enable him to perform his various duties with the maximum convenience. The observer's rudder pedals can be disconnected and sunk into the corrugated sheet-metal floor. Likewise the observer's control stick can be removed and attached to the right wall of the cockpit.

The observer has three kinds of seats, to enable him to sit in the best position for the different kinds of work: (Figs. 20 & 21)

1. A comfortable seat with a leather cushion, folding under the rear part of the gun mount, thus enabling the observer to sit facing forward for convenient visual observation and for piloting;

2. A wide strap-seat, suspended under the front part of the gun mount, used when operating the radio or observing toward the rear;

3. A seat provided with a leather cushion and hinged to the fuselage girder. This seat when not in use, forms part of the cockpit floor. On this seat the observer is within easy reach of the photograph camera.

The observer's view is perfectly assured in all directions and in all his positions of work:

Toward the rear and sides, by the narrowness of the fuselage girder, the elimination of tail braces, the tapering rear of the fuselage and its straight sides;

Toward the front, by the same characteristics as those assuring the pilot's view outside the cowling, with the still greater distance between the observer and the wings and the presence of various trapdoors and windows in the front of the observer's cockpit (two windows in the sides, trapdoors in the floor and side openings for taking photographs). Like the pilot, the observer enters his cockpit through a large hinged side door, which can be immediately dropped.

The observer's windshield is provided on the top and sides with orientatable slats always making it possible for

him to be protected from the wind. Lastly, the central part of this windshield has an opening through which the observer can easily communicate with the pilot.

Performance.

Even when heavily loaded for long-distance observation and bomb-dropping expeditions, the performance of the Br. 33 is clearly superior to other airplanes of its class and greatly surpasses the performance of observation airplanes of the type A2, despite their smaller load.

With a total weight of 2598 kg (5728 lb.) equipped with a 650 hp Hispano-Suiza engine, without supercharger, and hence with the possibility of great improvement in altitude by using a supercharged engine, it has attained the figures indicated in the accompanying table.

Among these figures the following are particularly noteworthy from the standpoint of the military utilization of the Br. 33.

Speed at 5000 m (16400 ft.)	230 km/h (143 mi./hr.)
Climb to 5000 m (16400 ft.)	19 min. 2 sec.
Take-off run	140 m (459 ft.)
Landing run	120 m (394 ft.)

It is well to note that these performances were made with an all-metal airplane, with heavy covering, and also that the Br. 33, in order to make the long-distance military expeditions for which it was designed, is subject to additional structural drag due to accessories (large windshield for observer and shortened fuselage to increase the field of fire and observation).

Likewise, in order to appreciate the excellence of these performances, it is useful to remember that the Br. 33 has within its fuselage a disposable cube of large dimensions (the central box) and that, from this fact, the comparison of the Br. 33 with other airplane types must be made with regard to equal load capacity (especially for bombs). It is due to the aerodynamic excellence of its wings and to the extreme reduction of its frontal area that the increase in drag did not prevent the Br. 33 from outclassing all existing observation and bombing airplanes.

Lastly, and still to the advantage of the Br. 33, it may be observed that, since the Br. 33 is perfectly rigid and not affected by the weather, these performances are not impaired by length of service, as is the case with other airplane types, which quickly lose their ability to maintain their original performance.

Performances of the Br. 33 with 650 hp

Hispano-Suiza 12 Nb Engine

Total load 2598 kg Fuel and oil 318 kg
(5727.6 lb.) (701.1 lb.)

External obstructions: 1 SEV generator, 1 alternator, 1 twin Lewis gun, 1 drift indicator, 2 radio antennas, 1 machine-gun camera, 3 position lights.

Climb to	500 m (1641 ft.)	1 min. 22 sec.
" "	1000 m (3281 ft.)	2 " 42 "
" "	2000 m (6562 ft.)	6 " "
" "	3000 m (9843 ft.)	9 " 37 "
" "	4000 m (13123 ft.)	13 " 44 "
" "	5000 m (16404 ft.)	19 " 02 "
" "	6000 m (19685 ft.)	25 " 45 "
" "	7000 m (22966 ft.)	37 " 08 "

Speed at sea level	250 km/h. (155.3 mi./hr.)
" " 5000 m (16404 ft.)	230 " (142.9 ")

Theoretical ceiling	8250 m (27067 ft.)
Take-off run	140 " (459 ")
Landing run	120 " (394 ")

Characteristics

Span of upper wing	17.012 m (55.81 ft.)
" " lower "	7.580 " (24.87 ")
Length	9.850 " (32.32 ")
Height	3.690 " (12.11 ")
Area of upper wing	39.835 m ² (428.78 sq.ft.)
" " lower "	7.910 " (85.14 ")
Total wing area	47.745 " (513.92 ")
Engine, 650 hp - Hispano-Suiza 12 Nb	

Estimate of weight and range of action.- The total military load of the Br. 33 is 734 or 1709 kg (1618 or 3768 lb.), according to whether it is used with the safety factor of the "Pursuit" class or of the A2 class. With the latter load, the safety factor of the wings of the Br. 33 is still considerably higher than that required for the bombers.

The following table gives, under the above conditions, practical examples of disposable loads of the Br. 33 corresponding to the principal uses for which it was designed, together with the range of action for the different loads. It is interesting to note that the Br. 33 still has a ceiling of 6000 m (nearly 20,000 ft.) with a total load of 3551 kg (7829 lb.), corresponding to the mission (night bombing) requiring the heaviest load.

Examples of Disposable Loads of the Breguet 33
734 to 1709 kg (1618 to 3768 lb.)

	Mission I long-dis- tance ob- servation with radio	Mission II long-dis- tance obser- vation with photography	Mission III long-distance observation with radio & photography
	kg	kg	kg
Fuel and oil	318	318	318
Navigation instruments	14.855	14.855	14.855
Parachutes	24.000	24.000	24.000
Oxygen apparatus	18.800	18.800	18.800
Generator for heat & light	11.300	11.300	11.300
Storage batteries	-	-	-
Lights	-	-	-
Signalling apparatus	-	-	-
Landing flares	-	-	-
Radio (alternator and instruments)	35.250	1 (cable)	35.250
Photograph camera	-	40.020	40.020

Examples of Disposable Loads of the Breguet 33
734 to 1709 kg (1618 to 3768 lb.) (continued)

	Mission I long-dis- tance ob- servation with radio	Mission II long-dis- tance obser- vation with photography	Mission III long-distance observation with radio & photography
	kg	kg	kg
Armament, (2 Vickers, 1 twin Lewis OPL gun sight, dry cells & py- rotechnic pistol)	56.610	56.610	56.610
Bomb rack & sight	-	-	-
Michelin flare hold- ers	-	-	-
Vickers car- tridges	16.500	16.500	16.500
Lewis maga- zines	33.500	33.500	33.500
Signallights	3.200	3.200	3.200
Bombs, 10, 50 or 100 kg(22.05, 110.23 or 220.5 lb.)	-	-	-
Michelin flares	-	-	-
Crew	<u>160.000</u>	<u>160.000</u>	<u>160.000</u>
Total dis- posable weight	692.015	697.785	732.035
Dead load with sta- tionary equipment, Series R2	1866	1866	1866
Total weight	2558	2564	2598
Range of ac- tion(with tanks in series)	900 km	900 km	900 km

Examples of Disposable Loads of the Breguet 33
734 to 1709 kg (1618 to 3768 lb.) (continued)

	Mission IV long-distance day bombing	Mission V long-distance night bombing
	kg	kg
Fuel and oil	356	260
Navigation instruments	14.855	14.855
Parachutes	24.000	24.000
Oxygen apparatus	18.800	-
Generator for heat and light	11.300	11.300
Storage batteries	-	21.000
Lights	-	6.900
Signalling apparatus	-	1.000
Landing flares	-	2.300
Radio (alternator and instruments)	-	-
Photograph cameras	-	-
Armament (2 Vickers, 1 twin Lewis, OPL gun sight, dry cells and pyrotechnic pistol)	56.610	41.710
		(1 Vickers only)
Bomb rack and sight	79.000	125.000
Michelin flare holders	-	2.700
Vickers cartridges	16.500	8.250
Lewis magazines	33.500	24.000
Signal lights	3.200	3.200
Bombs, 10, 50 or 100 kg (22.05, 110.23 or 220.5 lb.)	540.000 (2 - 100, 32 - 10)	950.000 (2 - 100, 8 - 50, 28 - 10)
Michelin flares	-	29.000
Crew	160.000	160.000
Total disposable weight	1313.765	1685.215
Dead load with stationary equipment, Series R2	1866	1866
Total weight	3180	3551
Range of action (with tanks in series)	1000 km	700 km

Susceptible of numerous variations both in weight of fuel and of equipment or armament, the above estimates are, of course, given only by way of suggestion, to indicate the wide range of use of the Br. 33, a military airplane of the very first rank.

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

Span:

Upper wing 17.012 m (55.81 ft.)

Lower " 7.580 m (24.87 ft.)

Length 9.85 m (32.32 ft.)

Height 3.69 m (12.11 ft.)

Wing areas:

Upper wing 39.835 m²(428.78 sq.ft.)

Lower wing 7.91 m²(85.14 sq.ft.)

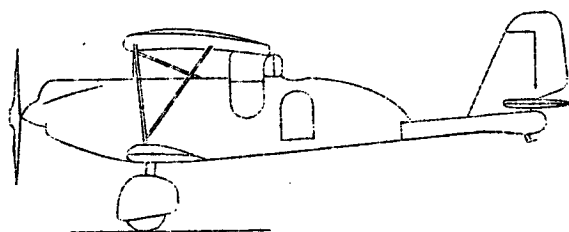
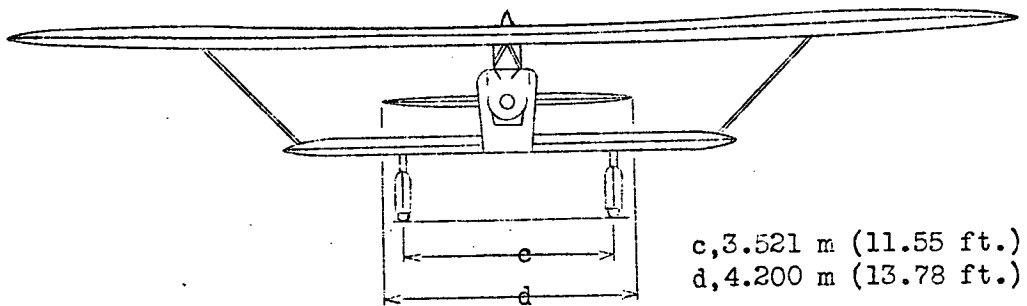
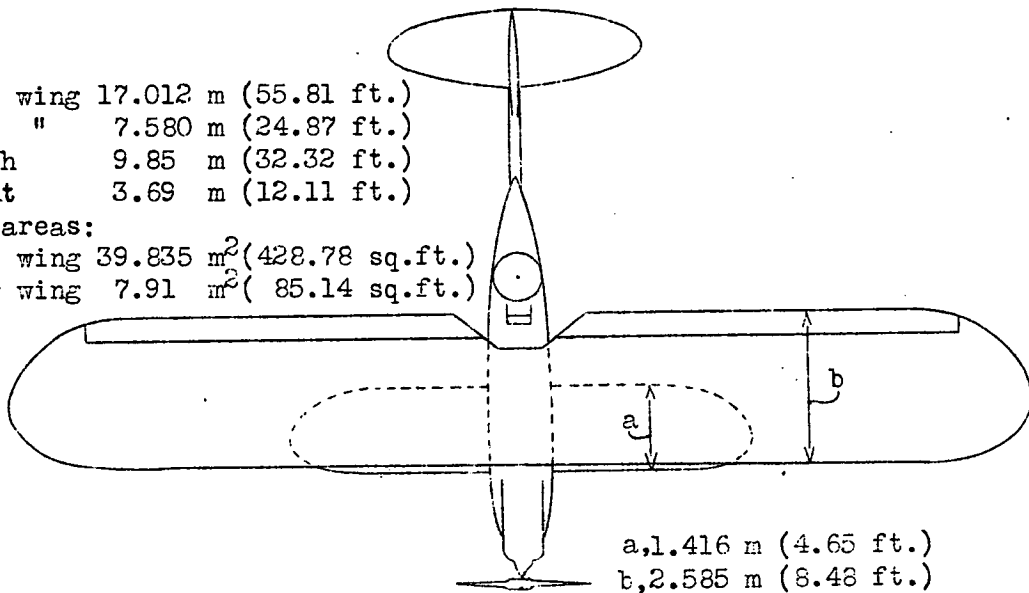


Fig.1 Breguet 33 military airplane.



Fig. 2, Breguet 33
military
airplane.

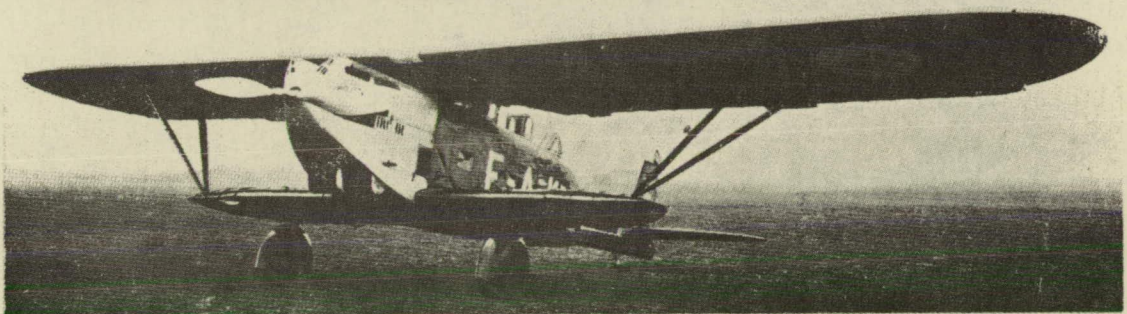


Fig. 3, Breguet 33 military airplane.

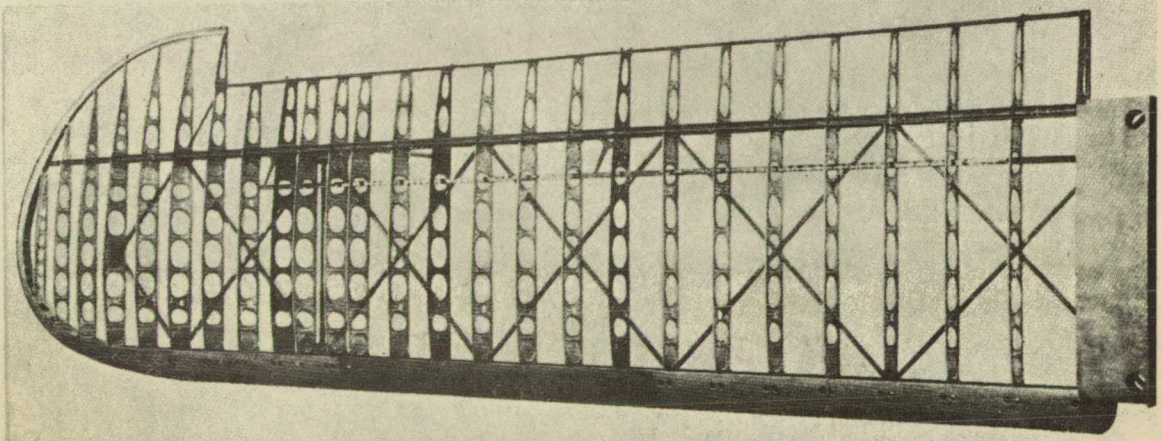


Fig. 4, Upper-wing structure with rigid brace rods.

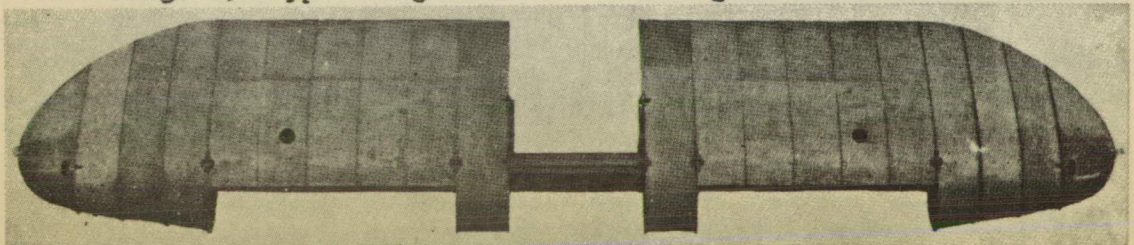
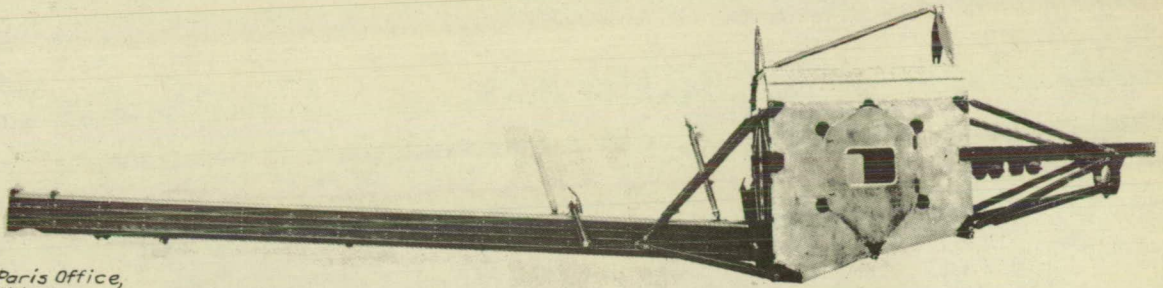


Fig. 5, Lower wing minus leading-edge tanks.

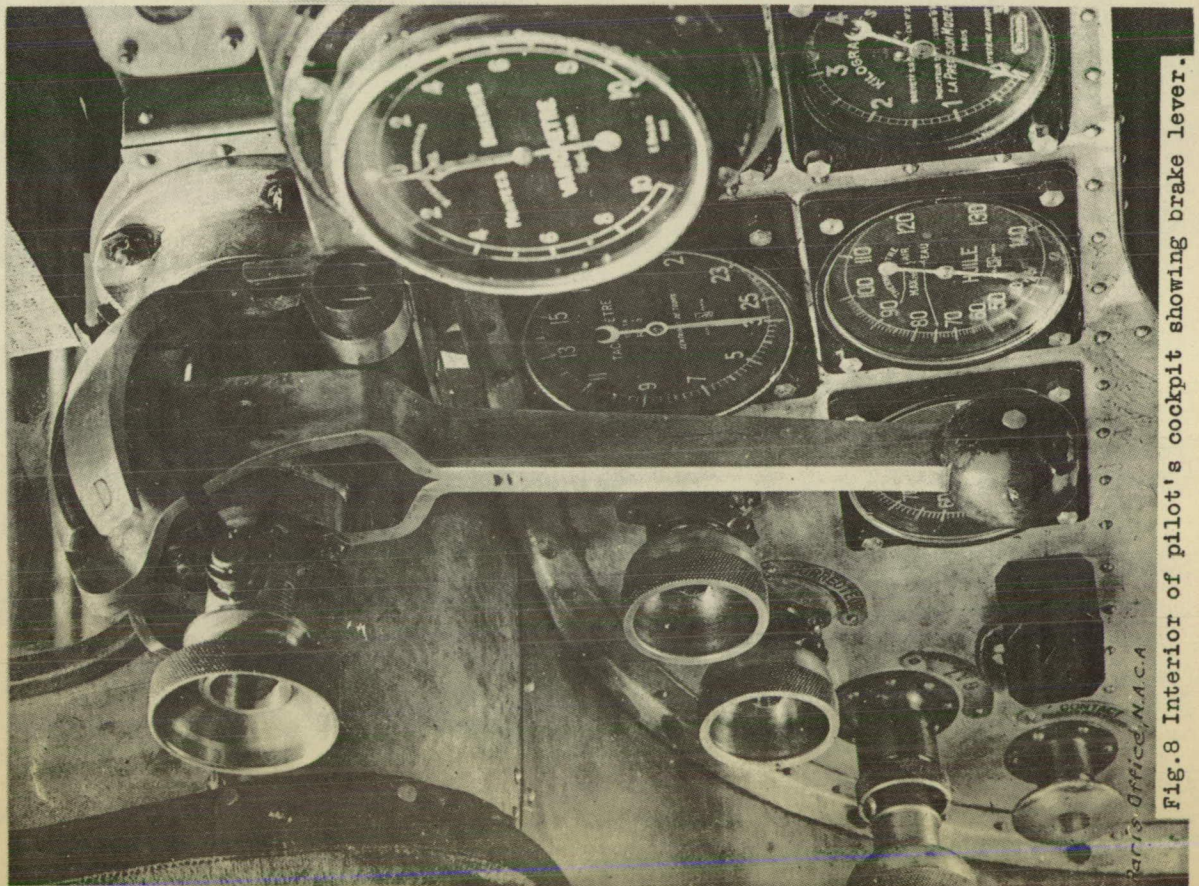


Paris Office,
N.A.C.A.

Fig.6 Assembly of engine bearer,central box and fuselage girder.



Fig.7 Rear part of fuselage girder
with tail surfaces,tail wheel
and rear end of body.



Paris Office, N.A.C.A.

FIG.8 Interior of pilot's cockpit showing brake lever.

Fig.9 Mounting of 650 hp Hispano-Suiza engine.

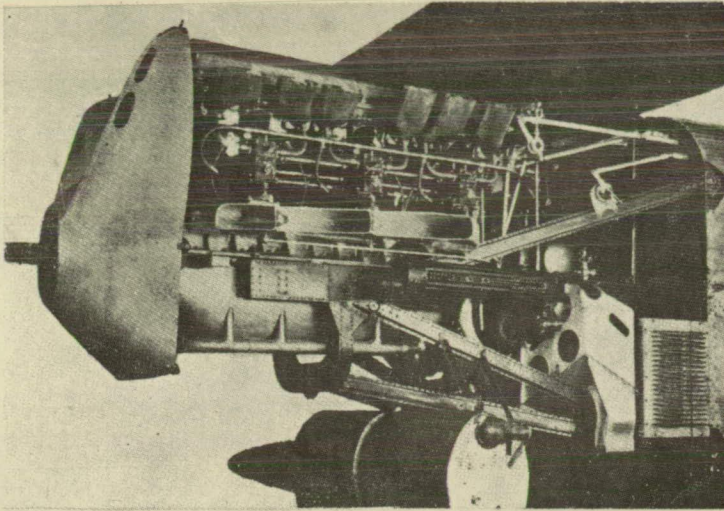


Fig.12 Support for power supply of E35 radio set.

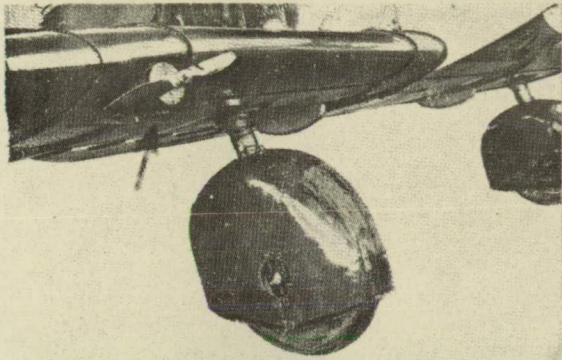
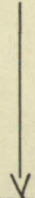


Fig.11 Direct-current generator on lower wing.

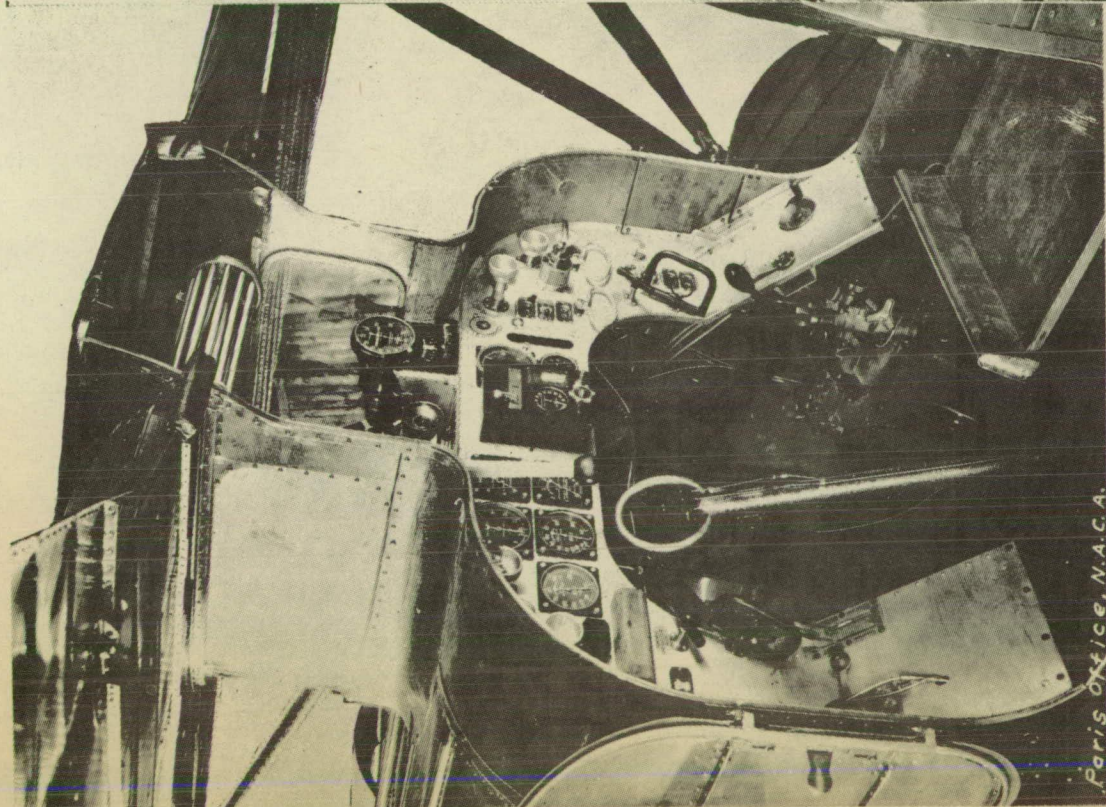


Fig.10 Pilot's cockpit with doors open.

Paris Office, N.A.C.A.

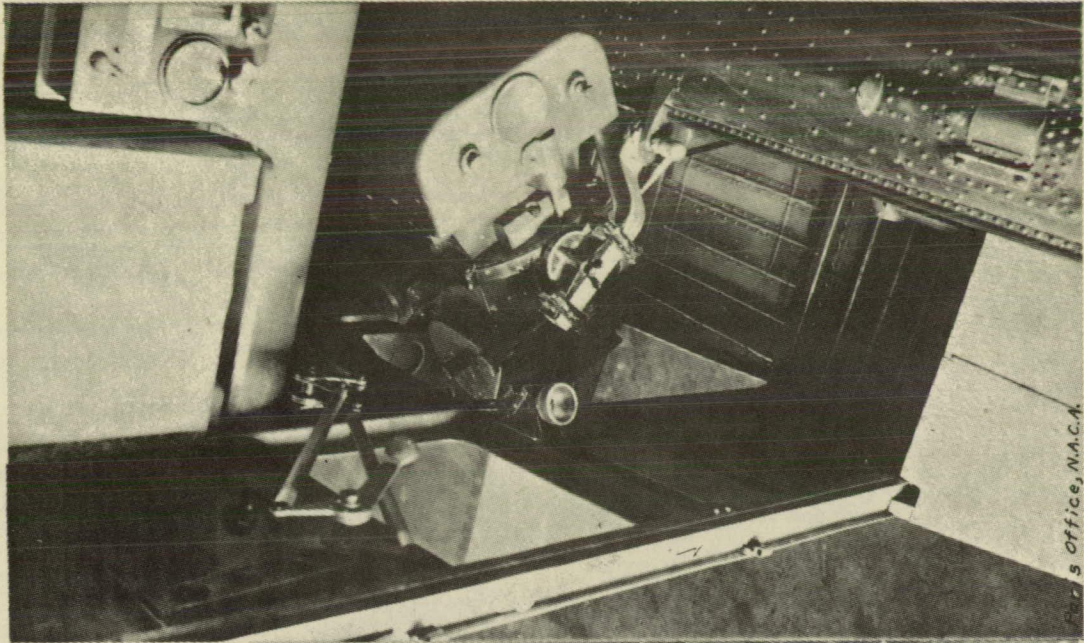


Fig.15 Camera in position for taking oblique pictures.

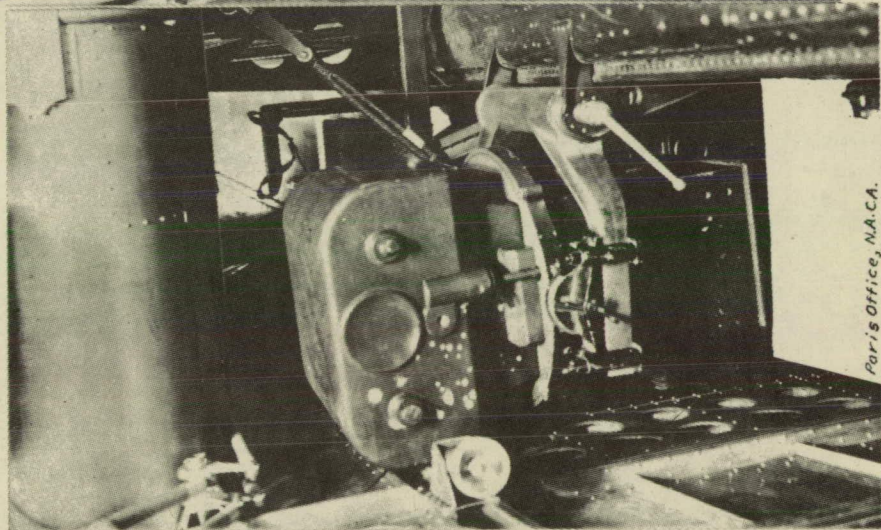


Fig.14 Camera in position for taking vertical pictures.

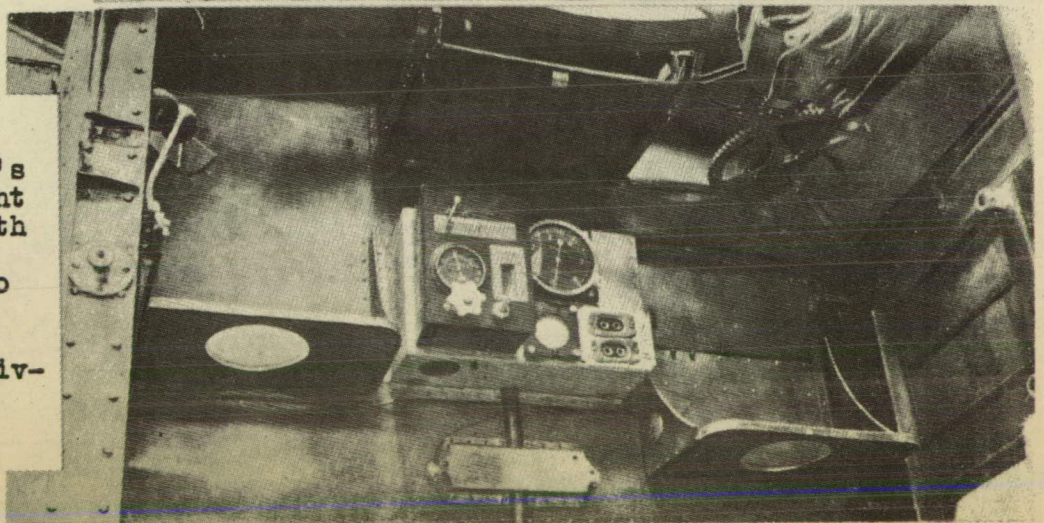


Fig.13

Observer's instrument board with brackets for radio (transmitting and receiving) instruments.

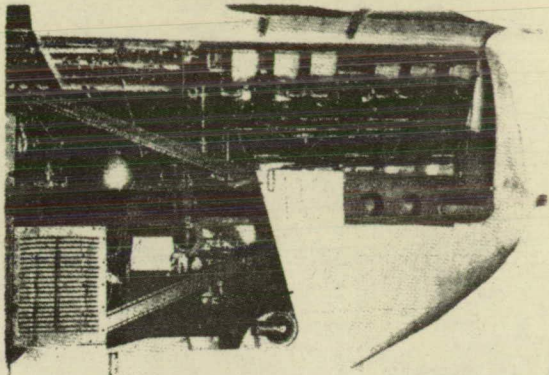


Fig.16 Mounting of Vickers machine gun.

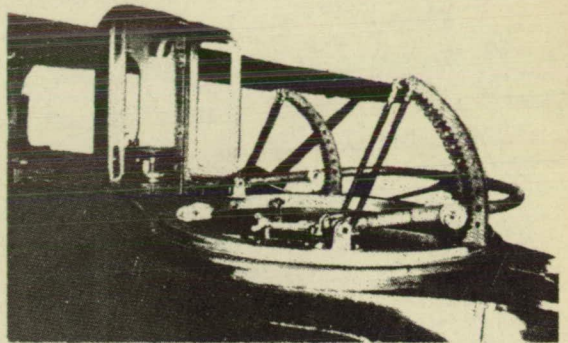


Fig.17 Observer's gun mount

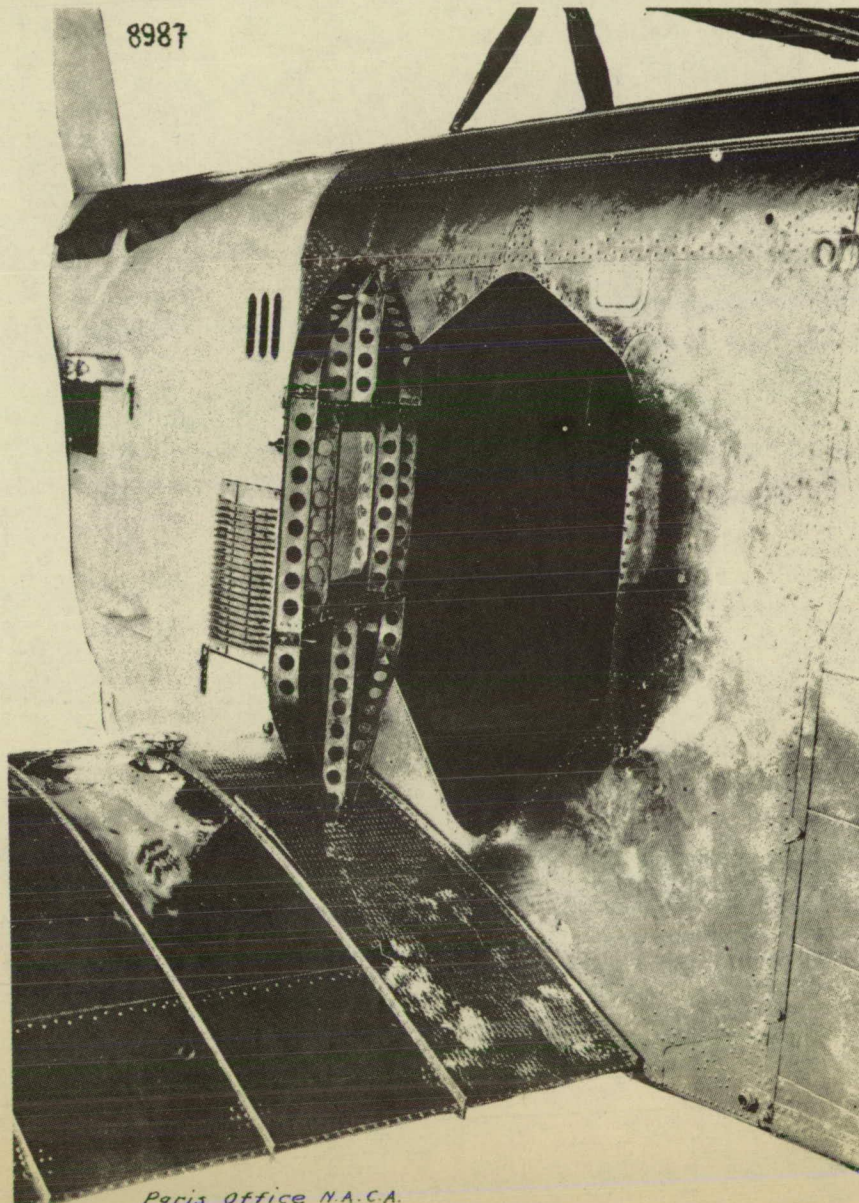


Fig.18
Door to
central
box,
where
one or
two
vertical
bomb
racks
can
be
installed.

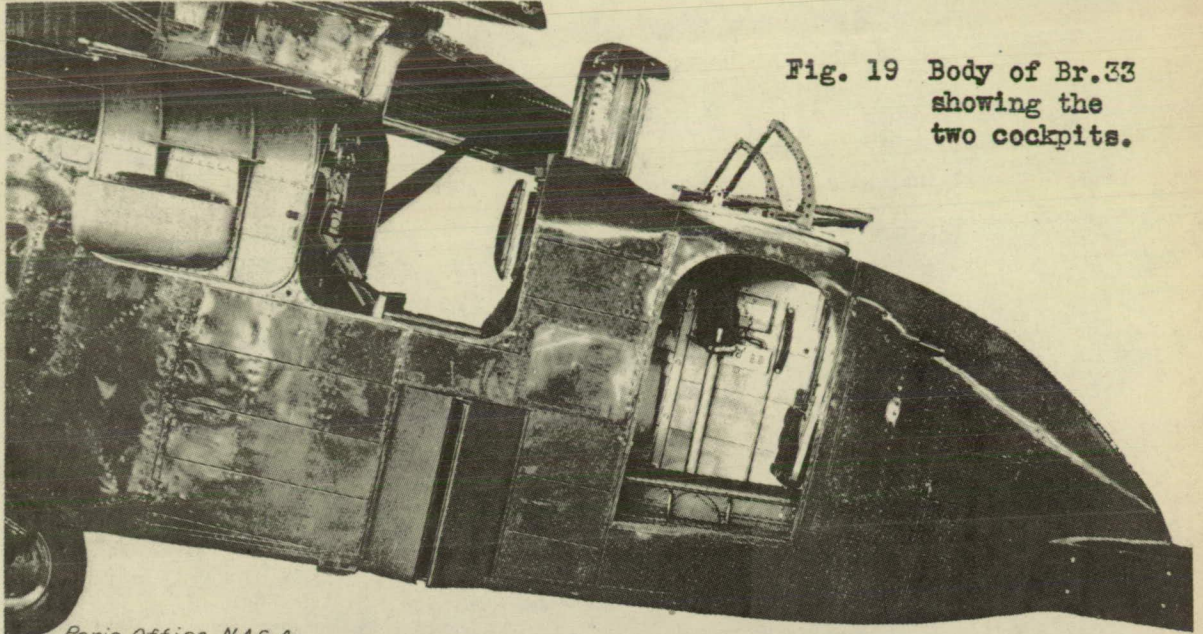


Fig. 19 Body of Br.33 showing the two cockpits.

Paris Office, N.A.C.A.



Fig. 22 Narrowness of fuselage girder affords good visibility and firing range.

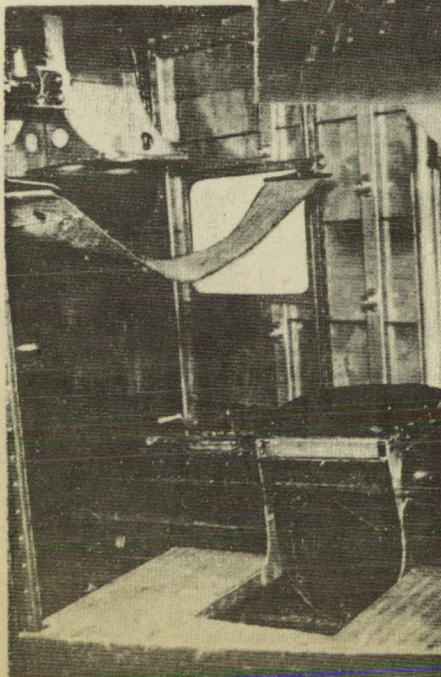


Fig. 20 Observer's cockpit showing rear seat folded.

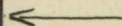


Fig. 21 Observer's cockpit showing strap seat and bracket seat which can be merged in floor.

