

AIRCRAFT CIRCULARS
NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 162

THE D.H. 83 "FOX MOTH" COMMERCIAL AIRPLANE (BRITISH)
A Three-Passenger Light Cabin Biplane

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THE D.H. 83 "FOX MOTH" COMMERCIAL AIRPLANE (BRITISH)

A Three-Passenger Light Cabin Biplane

The D.H. 83 is an interesting production because although it has been designed with a three or even a four passenger cabin, and therefore belongs to the general utility class of commercial airplane, it incorporates a very large proportion of the standard components of the company's existing two-seat touring and training light airplanes, the "Gipsy Moth" and the "Tiger Moth." (Figs. 1, 2, 3 and 4.)

For example, the wings, with very slight modification at the roots, are the same as used on the "Tiger Moth," the complete engine nose, installation and cowling are the same as used on both the "Tiger Moth" and the "Puss Moth," the complete tail unit is identical to that of the "Gipsy Moth" and the "Tiger Moth," and a number of assemblies of smaller parts are interchangeable between the various types of the D.H. "Moth" series.

The advantages of this important feature of interchangeability are twofold. In the first case the production of the new airplane has been possible without lengthy experimentation and development and without a considerable initial outlay of capital.

Constructionally the D.H. 83 follows standard wooden "Moth" practice. Although the fabric and plywood-covered wooden airplane has aroused a certain amount of criticism in various parts of the world, this criticism has not always been borne out in practice, as has been demonstrated by the hundreds of "Moths" which have been operating in all conditions of climate for the last five or six years. It has been proved that the basic wooden structure so long as it is adequately protected is capable of standing the most rigorous treatment and there is little doubt that the wooden airplane is easier to repair by unskilled labor than is a metal airplane.

*From The Aeroplane, March 16, 1932.

Nevertheless the De Havilland Company has continued to investigate the problem of making a wooden structure weatherproof and as the result of exhaustive tests two very important features, from the weather protection point of view, have been introduced in the D.H. 83. The company has found that if wood and plywood are protected with a nitrocellulose finish they are remarkably impervious to moisture. Therefore this has been done and where possible the plywood has been covered with fabric which has been attached in the first place with a cellulose adhesive.

The trouble with bolts coming loose owing to shrinkage has been overcome by the introduction of a special system using dished spring steel washers. (Fig. 5.) Experience has shown that even with bolts slacked off half a turn the washers maintain the necessary friction. Both these features should help to remove the few remaining objections to wooden construction.

The few features which are peculiar to the D.H. 83 are the arrangement of the fuselage to accommodate the cabin, the center section and the landing gear. (Figs. 6, 7 and 8.)

The fuselage is a plywood box which has naturally been increased in cross section to accommodate two of the passengers side-by-side and to give headroom in the cabin. The increase in cross-sectional area has been used to give the fuselage a good streamline form in plan view which probably accounts for the excellent performance.

The cabin extends from the fireproof bulkhead behind the engine back to a point directly in line with the rear spars of the lower wings and takes up the full cross section of the fuselage. Across the back wall of the cabin there is a folding hammock seat which seats two comfortably side-by-side. In front of the hammock seat there is a swiveling bucket seat which may be made to face forward or backward. (Figs. 9 and 10.)

The cabin is upholstered in dark blue with red piping, which was reminiscent of the body-work that used to be a feature of expensive limousines before the days of mass production.

The above standard arrangement for three passengers may be varied so that the airplane may be suited to various purposes. As a passenger airplane de luxe, the cabin can

be expensively furnished for two occupants seated vis-à-vis.

The view is remarkably good as the windows extend the length of the cabin on each side and the back seat is so placed that one can look downward at quite a steep angle over the trailing edge and fairly steeply down over the leading edge.

Let into each side of the cabin wall are two lockers which can be lifted out and used as carrying cases. In place the lids lift up to form tables, so that the fittings are definitely economical in that a given amount of material is made to serve a variety of uses.

The windows in each door are sliding and draftproof. Fresh air is warmed by blowing through a muff around the exhaust pipe, from which it is led to a fitting in the floor.

The cabin has a door in each side, which catch conveniently open above the flying wires, thereby preventing them banging about in the slipstream. This is one of those things which are not foreseen but happen so happily in practice.

Because of the depth of the fuselage the pilot sits well off the floor and his feet are supported by the rudder bar only.

For joy-riding only somewhat crude but adequate provision can be made for the accommodation of two passengers on a special seat which replaces the single chair, thus increasing the load to four passengers. And finally the rear cross-seat and the bucket seat may be removed altogether to leave the entire cabin available for freight, of which about 750 pounds can be carried.

As has already been mentioned, the wings are standard "Tiger Moth," but the upper wings are hinged to a center section of new design. This consists of two welded-up front and rear panels of M shape which are interconnected by fore-and-aft diagonal bracing struts and two false ribs. Across the top of each M and forming part of the welded unit is a cross tube into the ends of which are sweated and riveted the eyebolts for the hinge fittings. Between the cross tubes is suspended by straps the main fuel tank, which has a capacity of 25 gallons. (Fig. 7.) A corrugated metal leading edge carried on false ribs extends forward of the tank and the whole is covered with fabric.

The other novel feature of the airplane is the landing gear. This consists of two side Vees, the front legs of which incorporate rubber-in-compression springing. The compression leg consists of two streamline tubes sliding one within the other. The outer tube forms the outer casing and in the bottom of this tube are bolted two deep collars. The inner tube slides within those two collars and carries at its upper end a pan, lined with Ferodo, above which are the nine compression-rubber blocks. These finally butt up against the welded top cover of the outer casing.

Into the bottom of the inner or sliding tube is bolted a fitting which carries the wheel axle. As the compression leg is only allowed to hinge outwardly to absorb shocks all other units of the landing gear are only bracing tubes acting in tension and compression. Two backwardly inclined tubes run from fittings bolted between the collars on the outer casing of the compression legs to the bottom long-erons in line with the rear wing spars. Two transverse tubes run from the axle fittings in the bases of the inner tubes of the compression legs to the apex of a transverse Vee below the fuselage and in line with the compression legs. No part of the landing gear is "handed" and the compression legs and bracing rods are all interchangeable. The details of the landing gear are shown in Figures 8 and 11.

The "Fox Moth" has Dunlop intermediate pressure tires like the "Puss Moth" and has the same type of wheel brakes. It is even more up-to-date than most "Puss Moths," at present seen about, in that it has a sprung tail wheel. (Fig. 12.)

The "Fox Moth" is equipped with the standard D.H. "Gipsy III" inverted in-line engine, of which the excellent reputation of known reliability is so firmly established after a splendid record of achievement.

CHARACTERISTICS AND PERFORMANCE*

Span	30 ft. 10 in.
Length	25 " 9 "
Area:	
Wings	239 sq.ft.
Ailerons	22.4 sq.ft.
Stabilizer	13.4 "
Elevator	13.8 "
Fin	2.8 "
Rudder	9.4 "
Weight:	
Tare, about	1,050 lb.
Fuel (normal tankage)	210 "
Disposable load (pilot, passengers & luggage)	790 "
Gross	2,050 "
Maximum speed, approximately	110 m.p.h.
Cruising "	90-95 "

*From Flight, March 18, 1932.

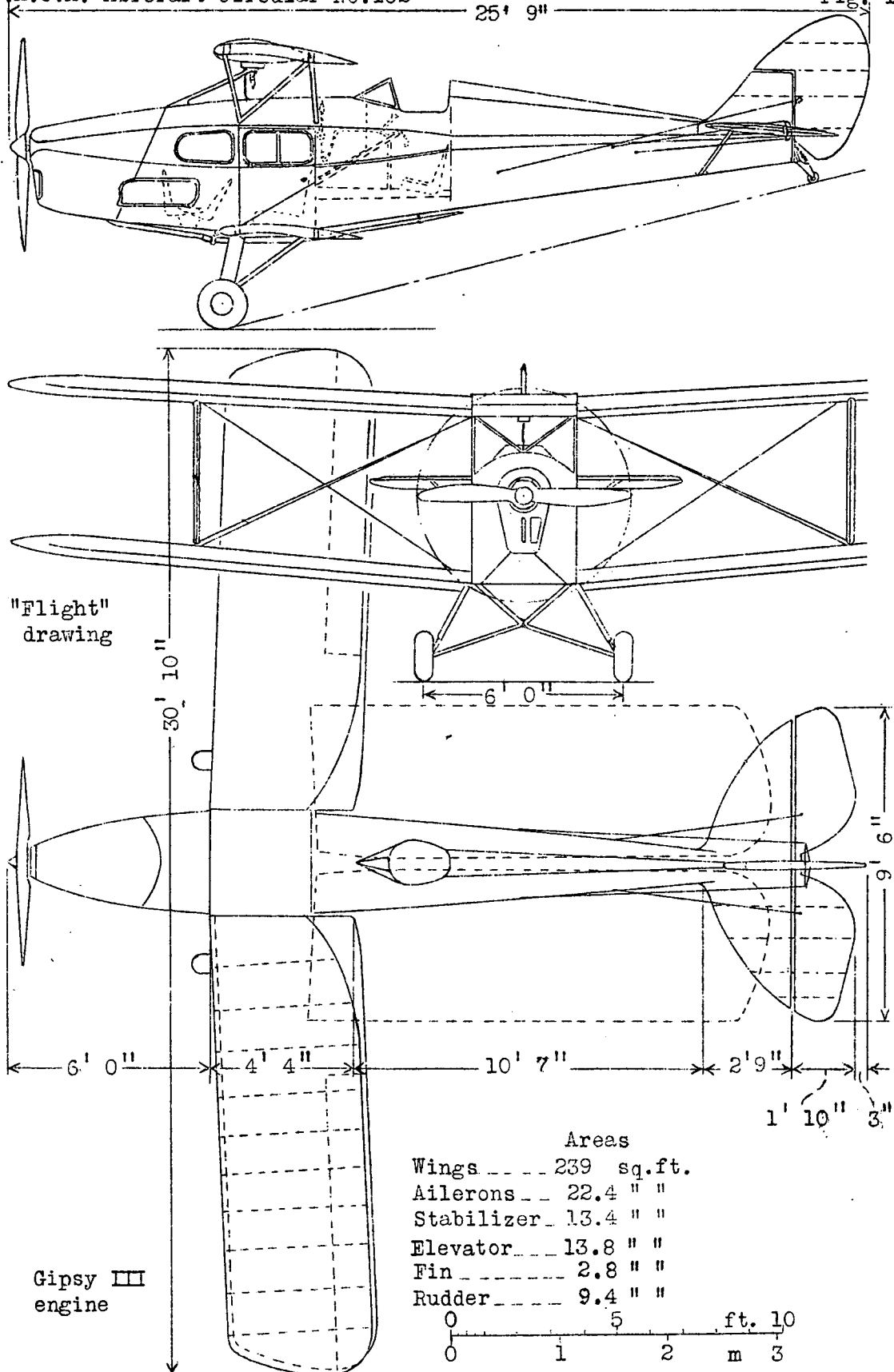


Fig.1 General arrangement drawings of the DeHavilland "Fox Moth" D.H.83

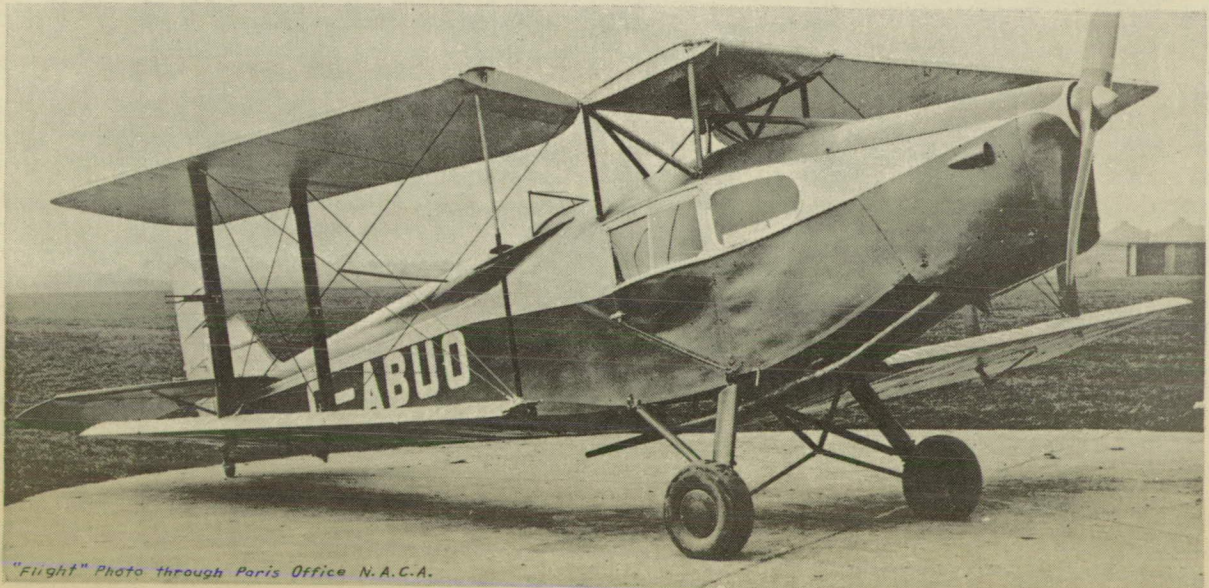


"Flight" Photo through Paris Office N.A.C.A.



"Flight" Photo through Paris Office N.A.C.A.

Figs.2,3 Views of the Fox Moth D.H.83 airplane.



"Flight" Photo through Paris Office N.A.C.A.

Fig.4 Fox Moth with right wings in the folded position.

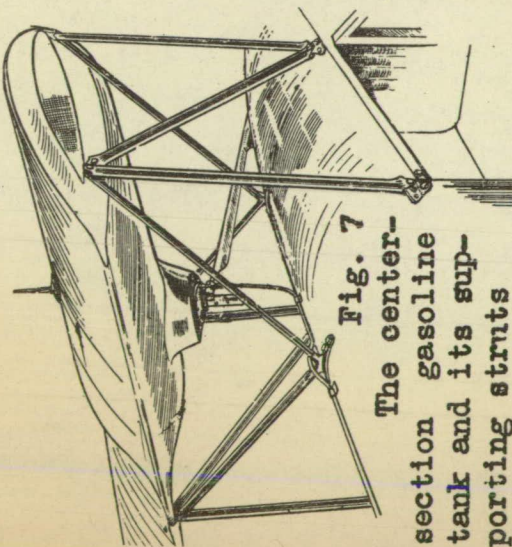


Fig. 7

The centerline section gasoline tank and its supporting struts which form a letter M in end view and an N in side view. The supply pipe to the engine runs above the cabin top.

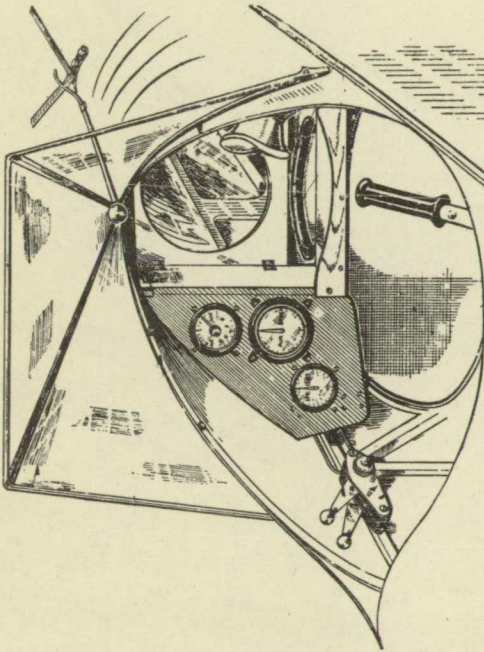


Fig. 6 The pilot's cockpit. The circular window communicates with the cabin. The wind screen consists of three triangles and gives a marked absence of draught in the cockpit.

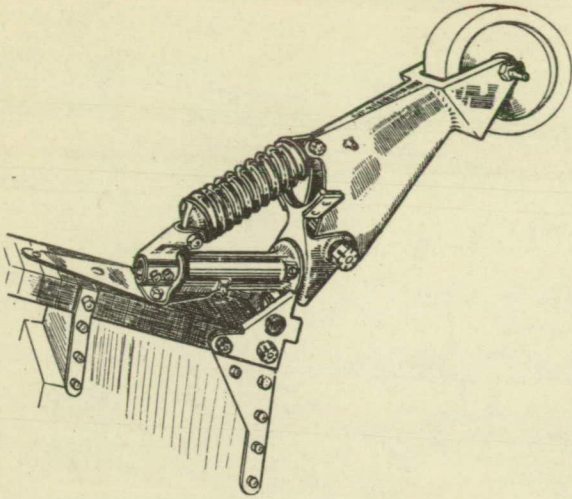


Fig. 12 The castoring tail wheel.

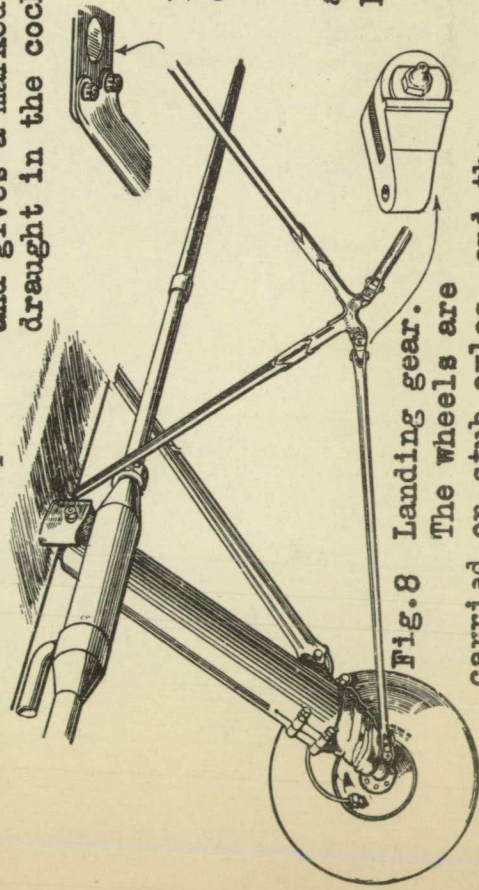


Fig. 8 Landing gear.

The wheels are carried on stub axles, and the bracing struts have universal joints

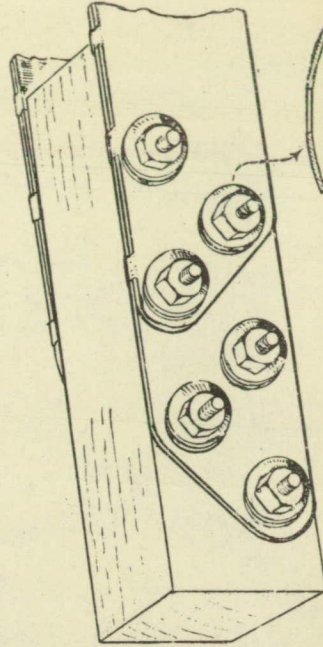


Fig. 5 Dished steel washers under all nuts ensure that pressure is maintained even when the wood under the plates has shrunk considerably.

Details of the Fox-Moth airplane.

"Flight" sketches

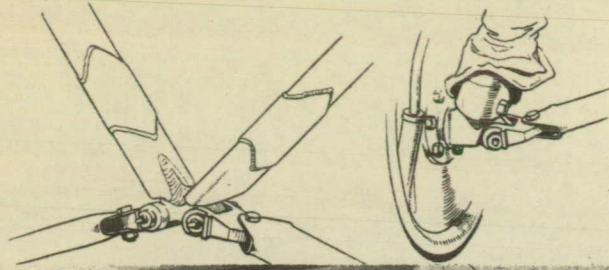


Fig.11
Details of
the landing
gear of
the Fox
Moth
airplane.

From "Aeroplane"



Fig.10 View of Fox
Moth showing
third passenger seated
facing aft. From "Aeroplane"

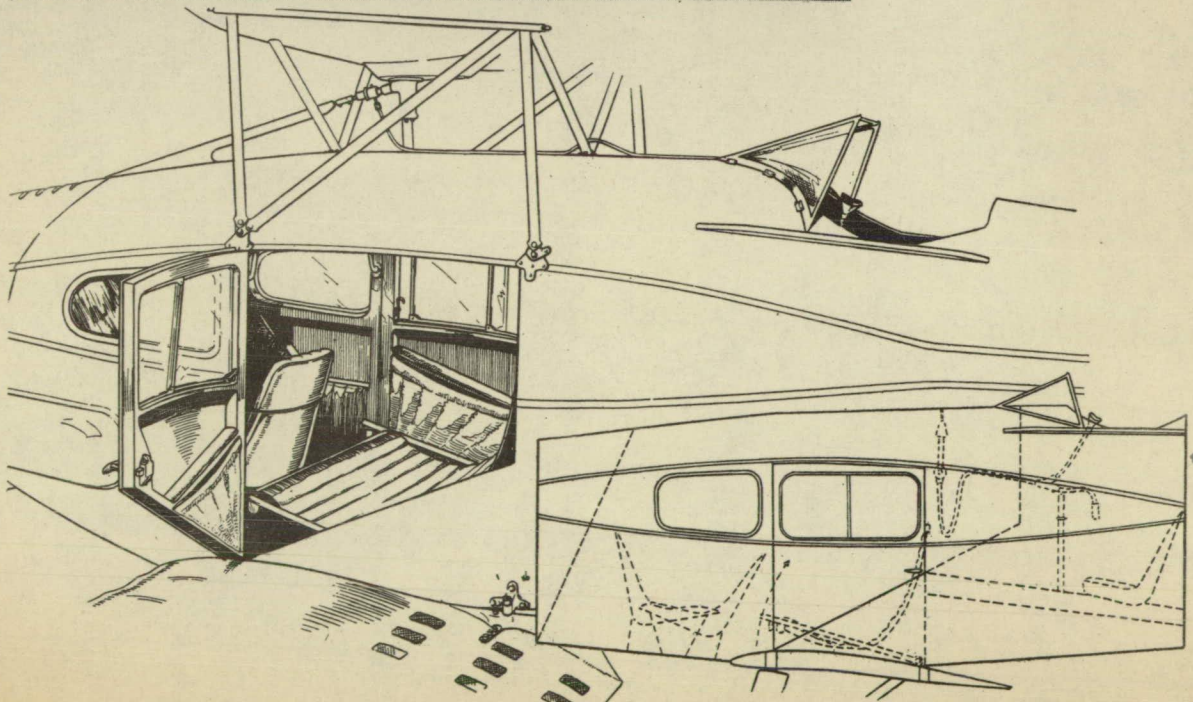


Fig. 9 A perspective sketch and side elevation of the cabin and cockpit of the Fox Moth, showing arrangement of the seats. The relative positions of the front seat when facing forwards and backwards are shown on the side elevation at lower right. From "Aeroplane"