

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

AIRCRAFT CIRCULAR NO. 91.

THE DE HAVILLAND D.H. 75 "HAWK MOTH" (BRITISH)

Cabin Monoplane

The De Havilland "Hawk Moth" represents an attempt to give in the air the comfort which one usually associates with a good motor car. It is a four-seater, with the occupants placed two by two. And in the cabin arrangement, one traces one of those "outside" considerations which may outweigh the merely aircraft ones. From the aerodynamic point of view it would have been preferable to make a very narrow fuselage, and quite conceivably a good many horsepower would have been saved by such a body. But, unfortunately, an airplane has to be something more than merely an aircraft. It has to carry people in reasonable comfort. In the "Hawk Moth" the seating accommodation is comfortable. The cabin is wide enough for two to sit side by side without crowding. And there is room to stretch one's legs, as well as to keep them in a number of different positions. Nothing is more tiring than to sit for two or three hours in a narrow seat in which there is no elbowroom, and with one's legs in one particular position only.

The sloping wind screen in front gives a very good view forward. The large side windows and the absence of a lower wing affords the occupants an unobstructed view of the ground.

*From Flight, February 7, 1929.

and the roof light, which forms the top of the cabin, enables the pilot to look back and up to ascertain if he is being overtaken by another airplane. What is the aerodynamic effect of not continuing the wing across the fuselage we do not know. It may be small and it may be large, it may be favorable or unfavorable. But it does give a very excellent view upwards, and makes the cabin quite unusually light and cheerful. The mental effect of this is likely to be considerable. Of such subjects as ease of handling, performance, etc., it is too early to express an opinion yet. The airplane has but recently been finished, and officially checked performance figures are not yet available. The preliminary test flights have indicated that the "Hawk Moth" handles very well, and that it has approximately the performance which had been expected. For instance, the cruising speed is likely to be in the neighborhood of 100 M.P.H., which is a very useful speed, and sufficient for most purposes at present.

Constructional Details

Structurally, the "Hawk Moth" is a composite, with a metal fuselage and wooden wings, although it is to be presumed that a metal wing is a likely future development (Fig. 1). In the construction of the fuselage use is made of steel tubing of square and circular section. All longerons are of square section, but in the rear portion the struts are of round section,

welded to the longerons, while in the front square section tube is used for the struts also, and bolted joints are used instead of welded. The system of construction is based upon the manufacture of the sides as complete units, these being built up "flat," and blocks have their inner ends drilled conically, the effect being to leave four tapering prongs in the corners of the tube.

The tail surfaces are of steel tube construction, welding being used to a considerable extent for jointing, as shown in Figure 4. The rudder does not, as is common practice, extend down to the bottom end of the sternpost. Instead, the fuselage terminates in a form of "cruiser stern," with the rudder wholly above it, and the extension of the fuselage houses the tail skid. In Figures 1^{and 3} a tail wheel is shown, but actually this will be supplanted by a tail skid carrying a wheel at its end. This change has been decided upon as a result of the possibility of the stern being damaged owing to the steep angle of the supporting pillar and the small diameter of the wheel, which, on meeting a hard obstacle, might receive a knock in a horizontal direction.

The wings, as already indicated, are of wood construction, with box spars and orthodox wooden ribs, fabric covered. The two halves of the wing are hinged to the top corners of the fuselage, the front spar joint having a quick-release pin and the rear spar a hinge, as the wings are designed to fold.

The wing is braced by two sloping struts on each side, attached to fittings on the lower longerons. A fairly short diagonal strut runs from front to rear main strut, and serves to stabilize the wing structure when the wing is folded. A telescopic jury strut is permanently hinged at one end, with the other held in a catch when the strut is not in use. This jury strut serves, when the wing is folded, to support the forward corner.

The landing gear is of very wide track, and rubber blocks working in compression form the shock-absorbing medium. The telescopic leg is supported at the top by Vee tubes to the fuselage, and at the lower end another Vee is formed by the bent axle and the radius rod, as shown in Figure 5.

The power plant of the first airplane is one of the new de Havilland "Ghost" engines, a Vee type air-cooled of eight cylinders (Fig. 2). In effect this engine is two "Gipsies" placed together in Vee formation. Reduction gearing is employed, and the engine delivers some 200 HP. For those who desire to use a radial engine, the Armstrong-Siddeley "Lynx" can be fitted, a suitable "nose" to take this power plant having been designed.

The gasoline tanks are placed inside the wing, one on each side, and give direct gravity feed. The fuel capacity will be about 35 gallons in each tank, which would give the airplane a duration of something like eight hours. Normally a smaller quantity would probably be carried.

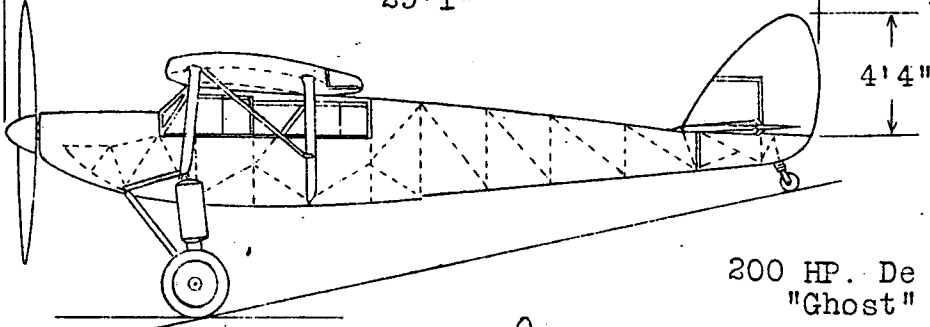
The pilot occupies the forward seat on the port side, and the controls are of somewhat unusual type in that the lateral movement of the "stick" pivots about a point some distance up; the lower portion, with its sprockets and chain, being enclosed in a casing (Fig. 6). Pedals are used instead of the more usual foot bar, and not only is provision made for adjusting the pedals, but the cross bar that supports them may be locked in any position by a simple friction device (Fig. 4). Wheel brakes are fitted, and can be operated either together or independently, thus facilitating maneuvering on the ground. The cabin is heated by a muff around the exhaust pipe, and ventilation is provided. The side windows are of the sliding type, and can be opened to a greater or smaller degree as desired.

Characteristics

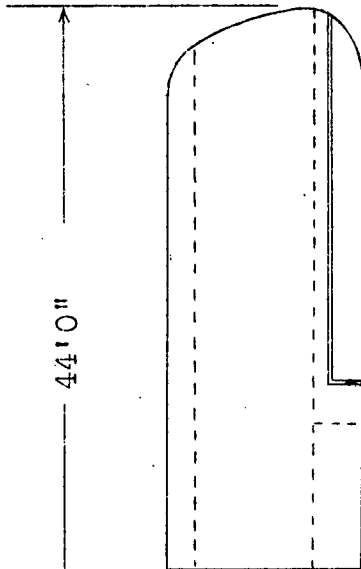
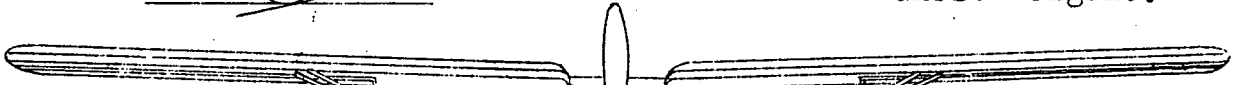
Length	29 ft. 1 in.
Span	44 " 0 "
Areas:	
Total wing	277.0 sq.ft.
Ailerons	30.0 "
Stabilizer	23.5 "
Elevators	17.0 "
Fin	3.5 "
Rudder	10.0 "

Characteristics (Cont'd)

Weight (tare)	about 2000 lb.	910 kg
Total loaded weight	3500 "	1590 "
Gross weight - normal - (made up of 4 people, 200 lb. of luggage, and about 35 gal. of gasoline and oil)	about 3200 "	1455 "
Wing loading (for normal gross weight)	11.56 lb./sq.ft.	
Power loading	16.00 lb./HP.	
Fuel consumption (normal estimated consumption at a cruising speed of about 100 M.P.H., which represents a mileage of approximately 12 miles per hour).	8 to 8.5 gal./hr.	



200 HP. De Havilland
"Ghost" engine.



Areas	
Total wing	277.0sq.ft.
Ailerons	30.0 " "
Stabilizer	23.5 " "
Elevators	17.0 " "
Fin	3.5 " "
Rudder	10.0 " "

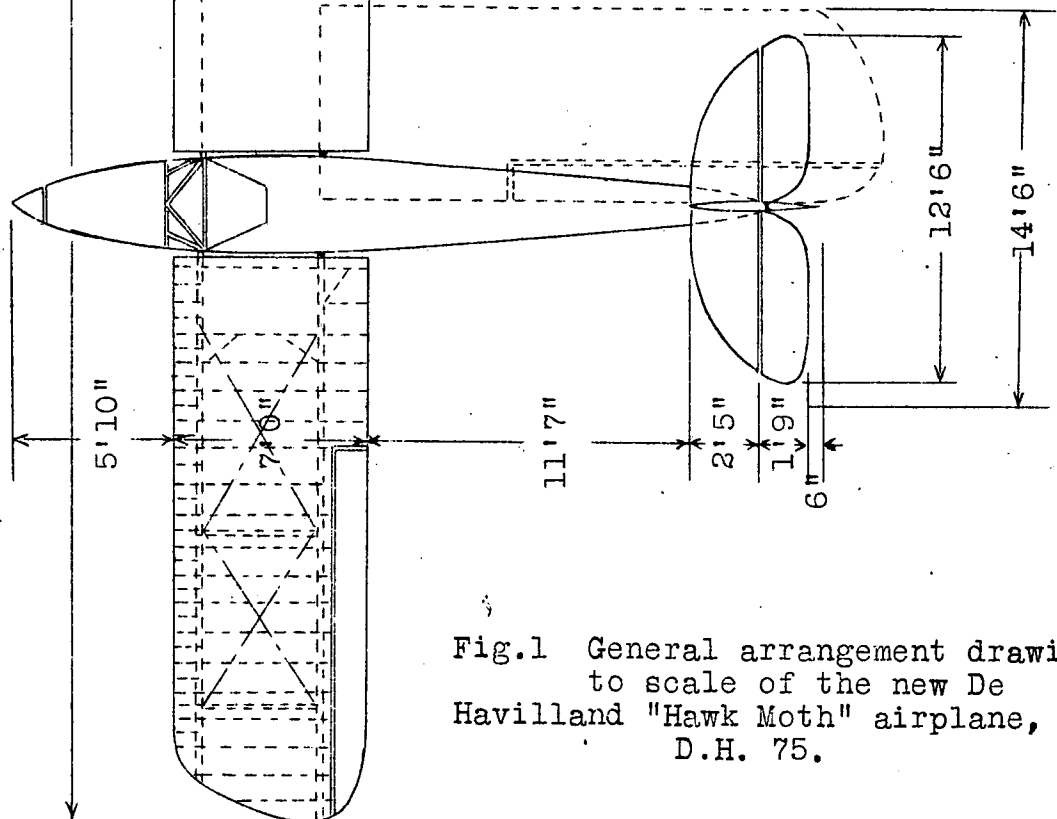
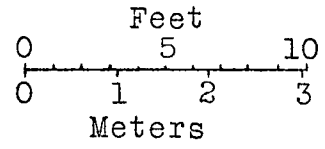
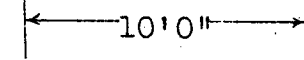


Fig.1 General arrangement drawings
to scale of the new De
Havilland "Hawk Moth" airplane,
D.H. 75.

Fig. 3

Enlarged side view of the "Hawk - Moth" airplane. Two doors are on the star-board side.

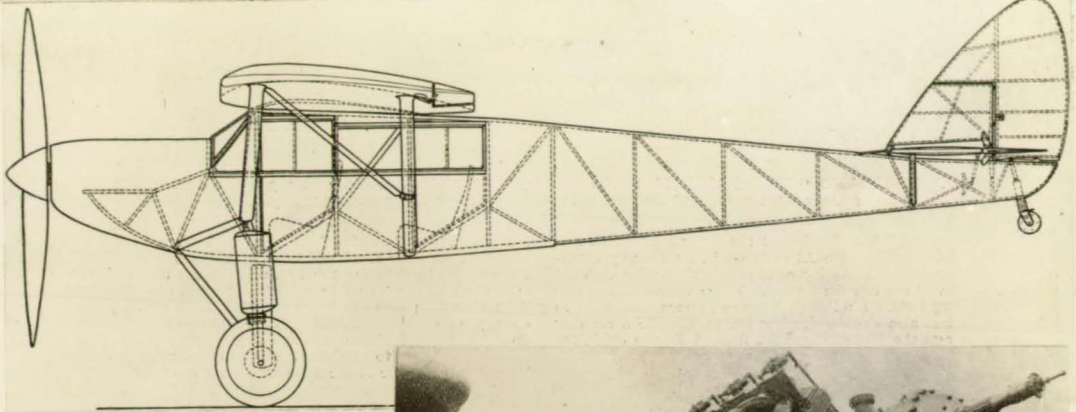


Fig. 2 The latest De Havilland engine the "Ghost" as fitted in the "Hawk Moth" airplane. This engine is of the 8 cylinder V type and is air-cooled.

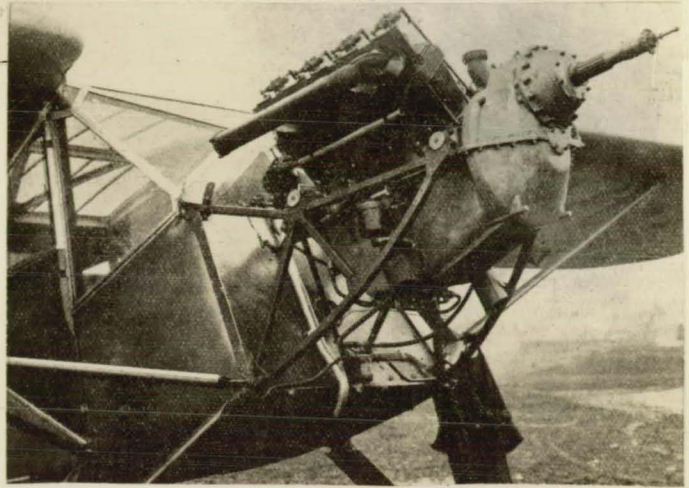


Fig. 4 Welded tubular construction is employed in the "Hawk - Moth" tail structure 1. Elevator 2 and fuselage rear portion 3.

The latter, it should be noted, uses square-section longerons and round section struts.

The side panels are made up as units, and the top and bottom struts complete the structure 4 & 5. In the front portion square-section struts are used and bolted joints 6, the strut ends being reinforced by aluminium packing blocks shaped to reduce the section gradually by conical drilling 7. To relieve the pilot on long flights, the rudder bar can be locked in position, as shown in 8.

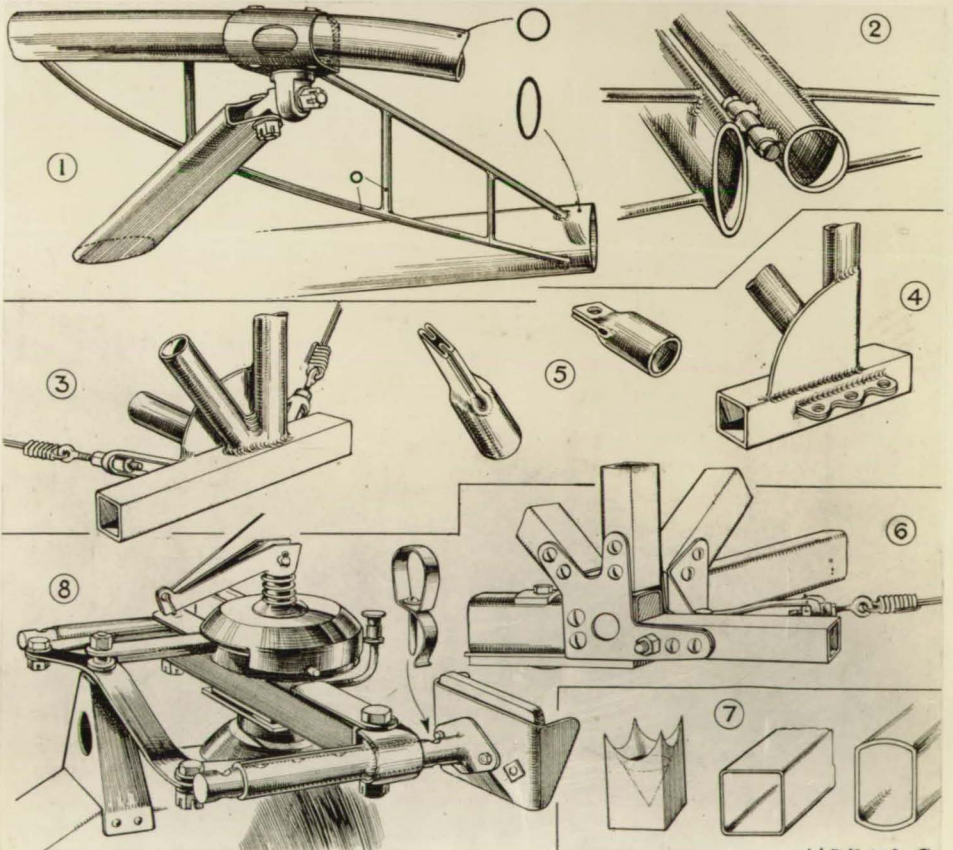


Fig.5 Some con-
structional
details of
the "Hawk -
Moth". The
diagram in
the upper
left corner
indicates
the locati-
on of the
various de-
tails illus-
trated.

The joint
of the lower
longeron to
landing gear
and wing
struts, etc.,
is shown in
1, the use
of steel -
tube longer-
ons of
square sec-
tion should
be noted. 2
shows the
attachment
of landing
gear leg and
front wing
strut.

For folding
the wing the
L shaped
spring-loaded
pin is with-
drawn, and
the wing strut
is swung with
its lower end
over to the
back strut,
where a fit-
ting receives
it. The meet-
ing of lower
longeron and
engine mount-
ing is illus-
trated in 3,
while 4 shows
attachment
of bent axle
and diagonal
strut to lower
longeron. Finally
the joint be-
tween rear
wing strut and
lower longeron
is shown in 5

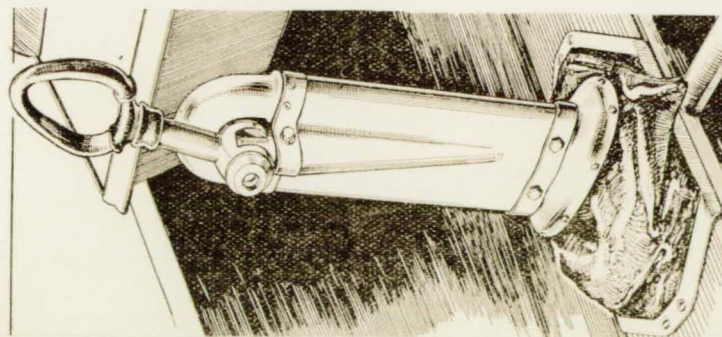
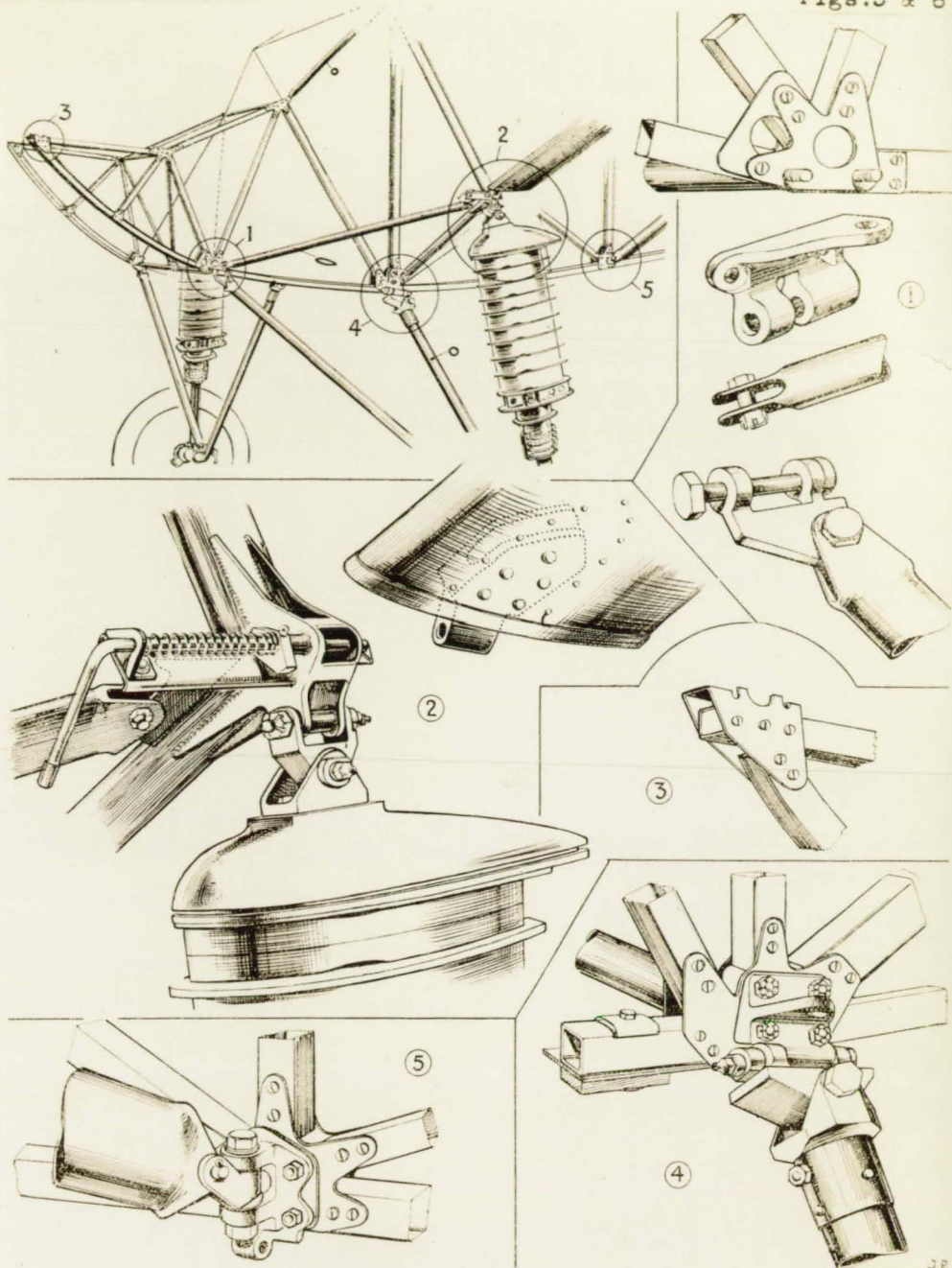


Fig.6 The control
stick of the
"Hawk Moth" hinges
some distance up,
and the lower por-
tion, with sprock-
ets and chain, is
enclosed in a
casing.