AIRCRAFT CIRCULARS

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 14

THE ARMSTRONG-WHITWORTH "ARGOSY"

The Latest Three-Engined Commercial Airplane

From "Flight," July 1, and August 5, 1926.

Washington
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THE ARMSTRONG-WHITWORTH "ARGOSY" *

The Latest Three-Engined Commercial Airplane.

The multi-engined airplane is undoubtedly gaining increasing favor as regards commercial work and, what is more important, its various advantages are being substantiated in actual practice more and more as development progresses. In theory these advantages have always been unquestionable, but there have been, in the past, certain difficulties that have arisen when it came to actual practice - primarily, the problem of perfect balance and control under all conditions, especially when one or other of the engines is cut out.

These difficulties, however, are today fast disappearing, and we think it can be said that the multi-engined airplane is now as practical a proposition as is the single-engined type. This is apparent when it is remembered that the multi-engined airplane is now adopted as the standard type for their commercial air services by Imperial Airways, Ltd.

Last week we were fortunate to be able to witness the trial flights of one of the latest designs in this class of commercial aircraft, i.e., the Armstrong-Whitworth "Argosy," which was seen in public for the first time at the R.A.F. Display. This

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huge air liner, which has a span of 90 ft. 7½ in. and has accommodation for 20 passengers, is fitted with three Siddeley "Jaguar" engines, developing a total of nearly 1200 HP.

One of its engines is mounted in the nose of the fuselage, while the remaining two engines are mounted midway between the main wings, one on each side of the fuselage. All three engines drive tractor propellers. The wing engines, which project slightly beyond the leading edges of the wings, are mounted on steel tube nacelles carried by the center-section interplane struts.

Upper and lower wings are set at a dihedral angle, but are not swept back. They are built up in five main sections - center (the lower unit actually is in two sections, being divided by the fuselage), intermediate and outer. Balanced ailerons are fitted to both top and bottom wings. The large biplane tail, placed comparatively high in relation to the line of thrust, is adjustable as to incidence from the pilot's cockpit.

The fuselage, of rectangular cross section, is of tubular steel construction (which, by the way, is employed largely throughout the construction of this airplane), noteworthy for the fact that welding is conspicuous for its absence. The pilot's cockpit is located high up in the forward portion of the fuselage. Provision is made for two pilots, seated side by side, and seated high up, well in front, as they are, they have an excellent all-round view. Dual control is provided, and the

arrang ement and equipment of this cockpit is about the best we have had the pleasure of seeing.

Immediately behind the pilot's cockpit is a space which contains the wireless outfit, while a small window enables one pilot to look back right into the main cabin. Aft of this comes the main passenger cabin, some 30 ft. in length and about 6 ft. high. There is, in fact, an exceptional amount of room for the passengers, who enter the cabin by a door on the port side of the fuselage, and there is no transverse bracing of any kind inside this part of the fuselage.

The passengers are accommodated in two rows of very comfortable wicker armchairs, with a central gangway. Spacious windows (which can be opened), level with the passengers' heads, extend the entire length of the cabin walls, so that the interior of the cabin is not only very bright and cheerful, but an excellent view of the country below is obtained. Above the seats are racks for hats and light luggage.

For night flying the cabin is provided with electric light, while on the front wall of the cabin are instruments indicating the speed and altitude of the airplane. A lavatory adjoins the main cabin, and another compartment behind is provided for luggage - there being also another space for small packages beneath the pilot's cockpit.

The total weight of the "Argosy" is nearly 8 tons, of which 2 tons are paying load. Sufficient gasoline is carried for a

flight of 400 miles. Its top speed is in the neighborhood of 110 M.P.H. and the normal cruising speed is 90-95 M.P.H.

The "Argosy" was put through its final trials before going for the Air Ministry tests. This huge airplane put up an exceptionally good performance. It takes off after a remarkably short run; in fact, it is able to take the air after a run of some 350 yards, and can attain an altitude of 3000 ft. in five minutes. It flies well and comfortably on only two engines, making right and left turns without difficulty with either wing engine cut out.

It is an exceptionally comfortable airplane to fly in, there being comparatively little noise from the engines inside the cabin, and even with Barnard's remarkable banked turns, we felt entirely at our ease seated in one of the roomy and comfortable chairs.

The first of the new three-engined Armstrong-Whitworth "Argosy" passenger-carriers has now been taken over by Imperial Airways, and from what we can gather the airplane has created an exceptionally favorable impression at Croydon, where usually critics have no difficulty in discovering features or peculiarities of airplanes about which to exercise their wit.

Constructionally the Armstrong-Whitworth "Argosy" is characterized by a steel tube fuselage and wooden wings, although the center sections have steel tube spars, for reasons connect-

ed with the arrangement of the two wing engines, etc. The fuselage is a plain rectangular section structure, with steel tube longerons and struts braced by tie rods. The attachment of struts to longerons is of the type shown in one of our sketches, and a feature of the bracing is that the longerons are kept of fairly light gauge and with the main fuselage struts placed relatively wide apart. In order to steady the longerons between supports, hinged auxiliary struts are fitted half-way between the main struts, the diagonal bracing running through the center of these hinged struts. The arrangement is similar in principle, although different in detail, to that employed in the wing bracing of certain early types of Spad biplane, and still used on almost all Savoia flying boats. One of our photographs shows an external view of a portion of the cabin in which the arrangement of main and auxiliary struts is shown.

Ball and socket joints are used fairly extensively in the construction of the "Argosy" and one such joint occurs at the point of attachment of the lower wing spars to the fuselage. Another ball and socket joint occurs at the point where the divided wheel axle meets the inverted pyramid cabane, and is illustrated in Fig. 3. As regards its shock-absorbing portion, the "Argosy" shows the typical large diameter large section coil spring with Oleo damping gear, which has been a feature of Armstrong-Whitworth airplanes for a number of years. In spite of its size only two wheels are used on the "Argosy," these being

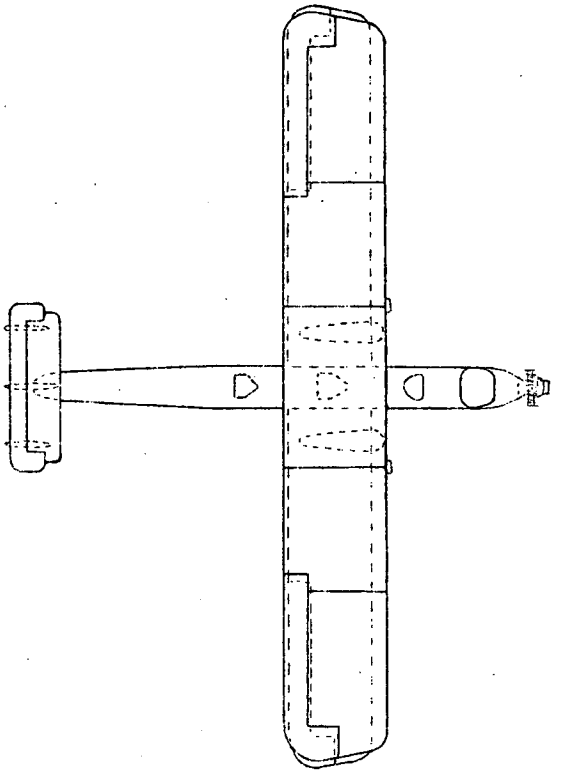
Palmer wheels of very large diameter.

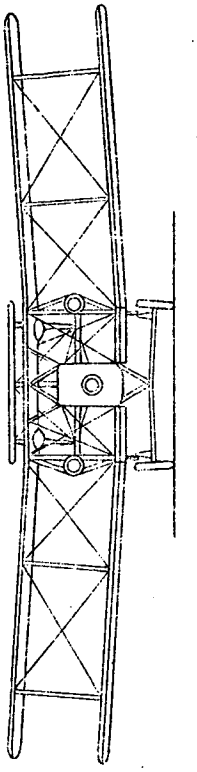
Regarding the cabin suspension, this is in the form of transverse members which stop short just inside the main steel tube structure, to which it is attached by steel brackets sloping down at an angle, as shown in Fig. 4. Longitudinal stringers running between the transverse beams of the floor serve to support the three-ply which forms the floor boards, and thus the weight of the cabin and its occupants is taken direct on to the vertical members of the fuselage structure. The cabin itself is not a complete box of three-ply as is the case, for instance, in the De Havilland "Hercules." It consists mainly of the floor and of a fairly shallow three-ply skirting board rising to the height of a foot or so from the floorboards and serving to protect the fuselage structure against accidental kicks. The cabin walls are for the rest formed of fabric, but a shallow box runs along some distance up the sides and serves as a support for the windows of the cabin.

The wing construction is on normal lines, but it is worthy of note that in the outboard portions the main spars, which are of spruce, are spindled out to an I-section. At a time when spruce in such lengths is difficult to obtain in good quality, it is perhaps significant that the firm should have insisted upon this somewhat expensive form of spar in preference to taking the line of least resistance and using built-up box section spars. In the center sections, where local loads are apt to be

somewhat heavy, the spars are in the form of circular section steel tubes of generous proportions, and to these are attached the engine mounting struts, the landing gear struts and, in the case of the top center section, the two large gravity gasoline tanks.

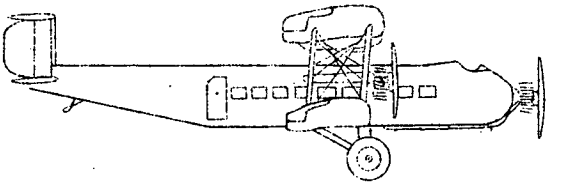
A type of engine mounting of somewhat unusual form has been adopted in the "Argosy." The "saucepan" which forms part of all Armstrong Siddeley Jaguar engines, is bolted in the "Argosy" to a sheet steel engine plate which is in turn supported on four short cantilever beams joining the fuselage structure at the four corners (Fig. 5). The necessary rigidity of this engine structure is provided by the particular design of the four cantilever beams, which are built up from sheet steel corrugated in a manner shown in the figures. These four beams provide their own bracing, so that there is a total absence of any diagonal members, with a consequent gain in the ease with which the back of the engine can be reached.





Span 90' $7\frac{1}{2}$" (27.62 m)
Length 65' (19.81 m)
Wing area 1886 sq.ft.(175.22 m^2)

3 Armstrong Siddeley "Jaguar" Engines.



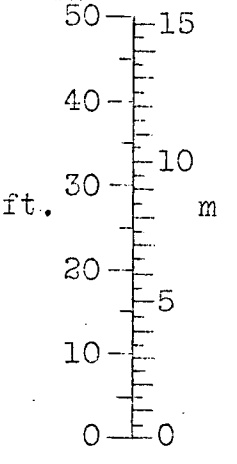


Fig.1 The Armstrong-Whitworth "Argosy" 20 passenger airplane.

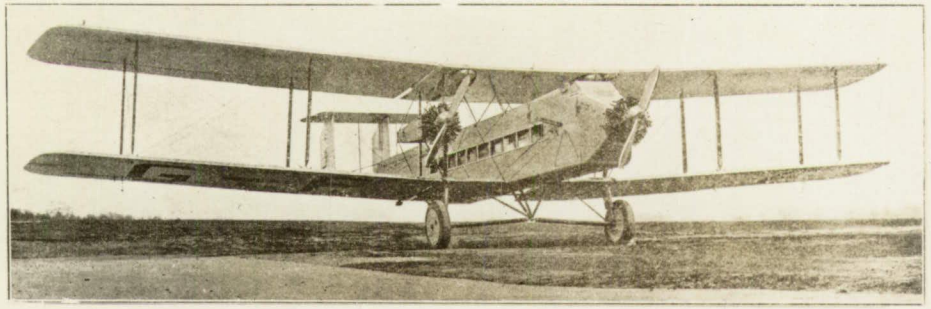


Fig. 2 Three-quarter front view of the Armstrong-Whitworth "Argosy" commercial airplane with three engines

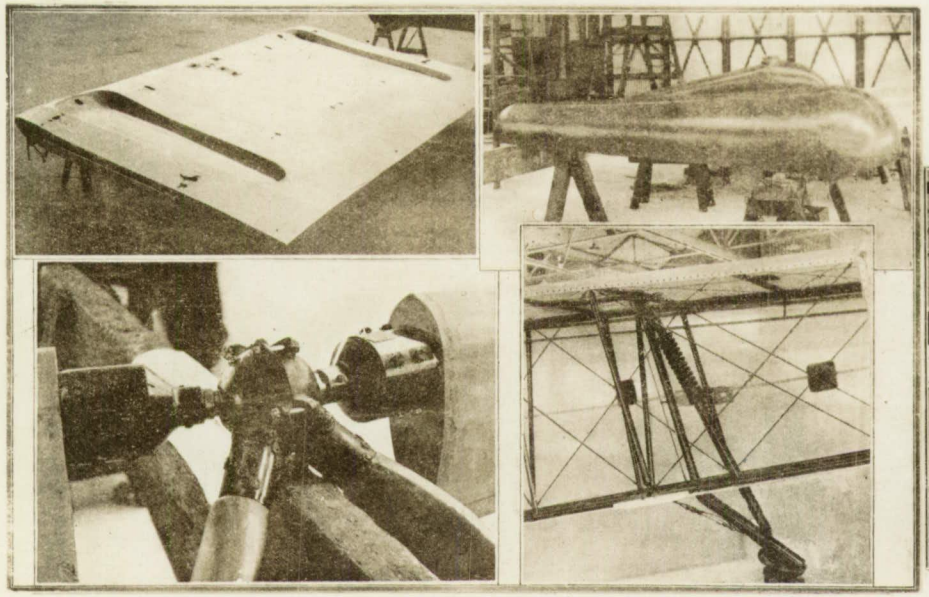


Fig. 3 Upper left corner shows top center section, lying upside down, with attachments for gravity tanks, one of which is shown on right, also upside down. Lower left, ball and socket joint of landing gear at center. Tail skid at right.

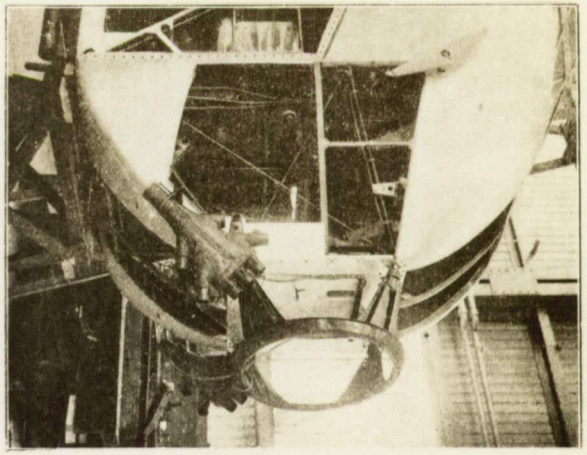


Fig. 6 A somewhat unusual mounting for central engine, being of the cantilever type which leaves ample room for access to rear of engine.

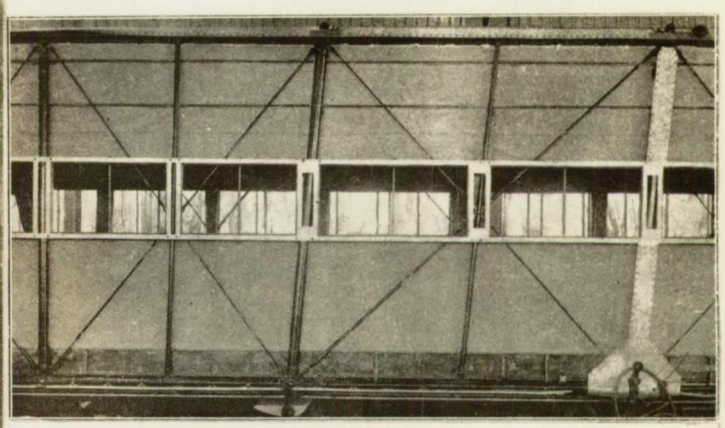


Fig. 7 View of fuselage. In the steel tubing structure the struts are spaced fairly far apart and the longerons are stffened by auxiliary struts as shown. The slope of some of the struts coincides with that of the wing stagger

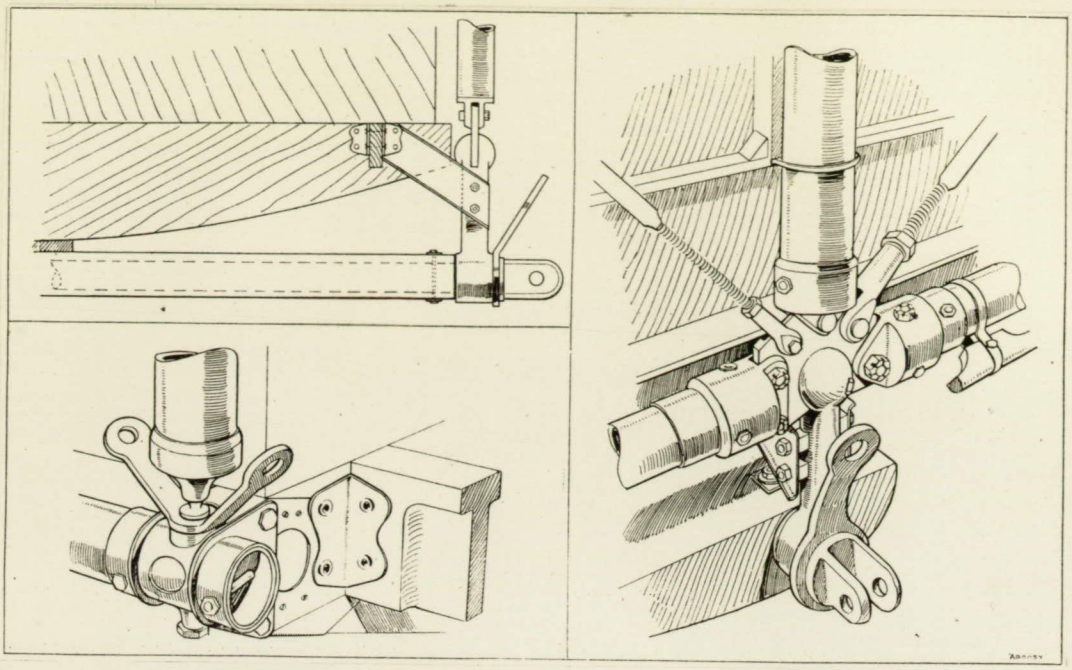


Fig.4 Constructional details. Lower left shows a typical pin-joint in the fuselage structure. At right, a fuselage joint at point where landing-gear strut and lower wing spar join lower longeron of fuselage. At top left, a section through same point showing how beams, supporting floor boards of cabin, are secured by brackets to vertical struts of main fuselage structure.

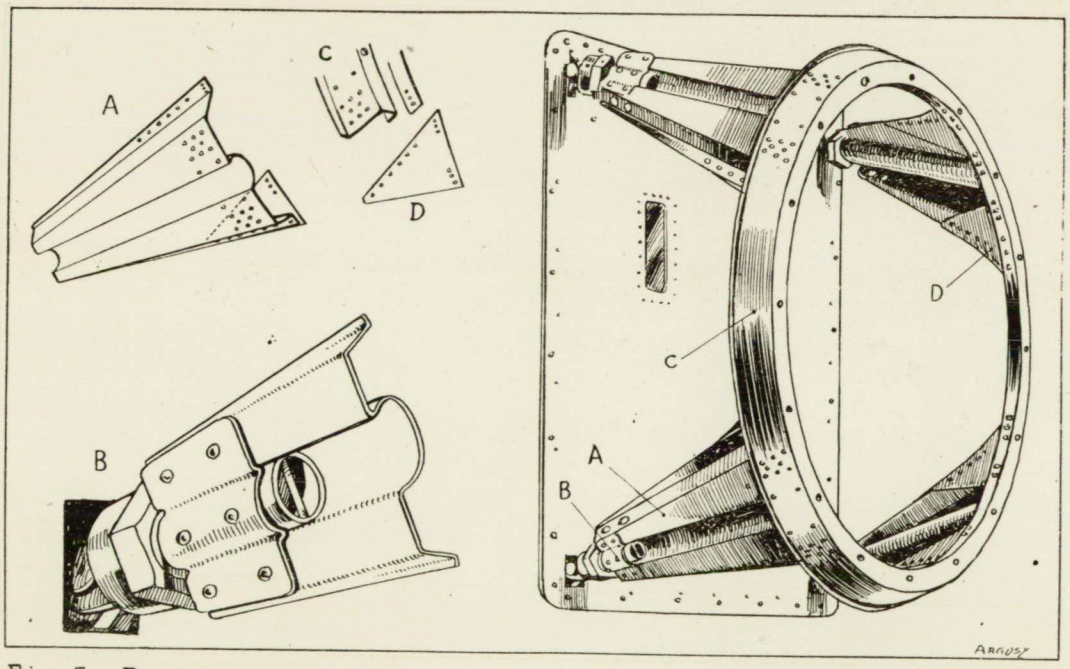


Fig.5 Engine mounting in nose of fuselage. Stiffness is provided by use of corrugated corner brackets of sheet steel. The absence of diagonal bracing greatly facilitates access to back of engine. Details are shown at left.