AIRCRAFT CIRCULARS

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 128

WESTLAND "WESSEX" COMMERCIAL AIRPLANE (BRITISH)

A High-Wing Semicantilever Monoplane

Washington
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WESTLAND "WESSEX" COMMERCIAL AIRPLANE (BRITISH).*

A High-Wing Semicantilever Monoplane.

The "Wessex" is the outcome of the experience gained with the Westland IV. In the general design of the Westland "Wessex" there are perhaps two features which particularly distinguish this airplane from others of the same class: the mounting of the outboard engines on outriggers (Figs. 3, 4 and 5) from the fuselage, bracing the wings from the apexes of the outriggers, and the placing of the engines in such a way that not only do the propeller disks not overlap, but the tips of the outboard propellers are actually below the level of the wings, so that the slipstream does not, except possibly to a very limited extent, interfere with the air flow across the wing.

The wing section employed in the "Wessex" is that known as R.A.F. 34, which has a very small movement of the center of pressure. It is claimed that this fact, coupled with the high-wing monoplane arrangement, renders the airplane very stable at all speeds, and controllable near and even beyond the stall.

Constructional Features

The Westland "Wessex" is of mixed construction. While certain airplanes have been built in which the weight of the all-

*From Flight, October 3, 1930.

metal structure was lighter than could have been built in wood, this is by no means always the case, and examples are not lacking of airplanes which, "translated" into all-metal construction, became both heavier and more expensive as a result.

The fuselage is composed of three individual portions, of which the central or cabin part is of wood construction, the forward part is partly of wood and partly of metal, while the aft part, from cabin to tail, is of all-metal construction (square-section duralumin tubes joined by flitch plates and tubular rivets) (Fig. 5).

The wings are of wood construction, with box spars having spruce flanges and three-ply walls. The ribs are of spruce, arranged as Warren girders. The control surfaces (ailerons, elevators and rudder) are of metal construction, with duralumin tube spars and pressed-out sheet metal ribs. The covering is fabric.

A landing gear of very wide track (15 feet) supports the airplane. The landing gear on each side consists of a horizontal vee, formed by the bent axle and the radius rod, hinged to the lower longerons of the cabin, and of a telescopic leg which runs to the outboard engine structure. This is, in turn, carried on steel tube outriggers from the fuselage, and from it also the outboard wing bracing struts run. Thus the various heavy items: wings, engines and fuselage, have their loads conveyed to and converging upon the single point at the top of the telescopic

leg. The arrangement is neat and must be very rigid. Doubtless it accounts in quite a substantial degree for the relatively good ratio of gross to tare weight.

Bendix-Perrot wheels and wheel brakes are fitted on the "Wessex." The brakes are operated by a lever in the pilot's cockpit, and the system incorporates a brake compensating gear. With the fitting of wheel brakes, the need for a tail skid disappeared, and the latest "Wessex" airplanes have been fitted with a tail wheel (Fig. 6). This is swiveled and has a castor action, so that the airplane can be swung around on the ground in a very small circle, a maneuver which the wide wheel track makes quite safe. By the use of the wheel brakes the landing run is reduced, against a 5 m.p.h. wind, to 163 yards.

Power Plant Installation

The engines fitted as standard in the Westland "Wessex" are Armstrong-Siddeley "Genet-Majors," developing a normal output each of 309 b.hp at 2200 r.p.m., and a short-period maximum of 330 b.hp at 2420 r.p.m. One engine is mounted on a metal structure, in the nose of the fuselage, while the other two are carried outboard under the wings, on outriggers from the top and bottom longerons of the fuselage. A fore-and-aft tube connects the apexes of the two outrigger vees, and forms, together with two more fore-and-aft members, a horizontal tripod support for the outboard engine. Torque reaction is taken by an invert-

ed vee running to the front wing spar.

Gasoline is carried in two tanks in the wings, each of 50-gallon capacity. The height of these wing tanks is such as to give ample head for direct gravity feed. Large gasoline gauges are mounted ahead of the leading edge, one in front of each tank, and the gauges can be seen and read from the cockpit. As the three "Genet Major" engines consume approximately 18 gallons per hour, the airplane cruising at about 95 m.p.h., flies 5-1/4 miles per gallon.

Accommodation and Equipment

The internal layout of the "Wessex" will naturally depend upon the purpose for which the airplane is being used. As a freight carrier the cabin equipment will be removed, and all the available space used for freight. The cubic capacity of the main cabin is 108 cu.ft. (3.06 m^3), while the entrance and lavatory space adds another 35 cu.ft. (0.99 m^3). The volume of front and rear luggage compartments is 42 cu.ft. (1.19 m^3), giving a total available space for cargo of 185 cu.ft.

As a passenger airplane, the "Wessex" can be arranged according to requirements. For example, if the maximum comfort and convenience is wanted, there are four seats in the cabin, two on each side, with a gangway between them. In that case there is an entrance and lavatory behind the cabin. On the other hand, the available space may be utilized by doing away with the en-

trance and lavatory space, when two more seats may be installed, bringing the total up to seven (six in the cabin and one beside the pilot).

The passenger version has very comfortable seats, and large windows in the cabin walls give a good light and view. Owing to the fact that the fuselage is very low over the ground, the passengers can step straight in without using steps (Fig. 7). Behind the cabin is a luggage space with a separate door.

The pilot's cockpit, in front of the cabin, is weatherproof, and has a hinged skylight which also serves as an emergency exit in case of accident. Sliding triplex windows form a windshield, and sliding windows at the side of the cockpit give a good view, while the fact that they can be opened enables the pilot to put his head outside during landing, etc.

Considerable care and attention have been given to the lay-out of the cockpit, placing of instruments and controls, etc. The instrument board is placed at a convenient height and at an angle which facilitates the reading of the instruments. The placing of the instrument board under the large front windshield gives good lighting. On the left of the pilot are the three engine controls, the stabilizer trimming-gear lever, and the wheel-brake lever. On the pilot's right is the rudder bias lever, which enables him to set his rudder to any desired angle to counteract any yawing tendency resulting from one of the wing engines running badly or being out of action. This rudder bias

gear removes the load from the foot bar and relieves the pilot on a long flight. With everything properly adjusted the "Wessex" will, we are informed, fly itself for long periods.

The "Wessex" is particularly well equipped in the matter of instruments. For example, the following instruments (Smith's) are provided as standard: air-speed indicator, altimeter, cross level, time-of-flight clock, three revolution indicators, three oil-pressure gauges, three oil-temperature gauges. The compass fitted is a Hughes Mark P.4 and every airplane is also provided with a Schilovsky-Cooke turn indicator. At extra cost the airplane can be provided with night-flying equipment, consisting of navigation lights, Holt flares, and downward identification lamp. In the cabin are mounted, for the benefit of the passengers, an air-speed indicator, an altimeter, and a clock.

All the main data relating to the Westland "Wessex" are given at the end of this Circular. The performance figures given are confirmed by official Air Ministry tests at Martlesham for the certificate of airworthiness. The results refer to standard atmospheric conditions. Where climatic conditions differ materially from standard, the Westland Aircraft Works should be consulted as to the likely effect on performance.

Characteristics

Dimensions

Length, over-all	38 ft. 0 in.	11.55 m
Wing span	57 " 6 "	17.5 "
Wing chord	9 " 6 "	2.9 "
Height	9 " 6 "	2.9 "
Wheel track	15 " 0 "	4.56 "

Areas

Wing	490 sq.ft.	45.5 m^2
Ailerons	38.4 "	3.27 "
Stabilizer	44.5 "	4.13 "
Elevator	31.0 "	2.88 "
Fin	7.25 "	0.67 "
Rudder	21.75 "	2.02 "

Weights

Airplane	3,425 lb.	1,551 kg
Fixed equipment	74 "	34 "
Weight, empty*	3,499 "	1,585 "
Fuel and oil	875 "	397 "
Pilot	180 "	82 "
Pay load	1,196 "	542 "
Total gross weight	5,750 "	2,606 "

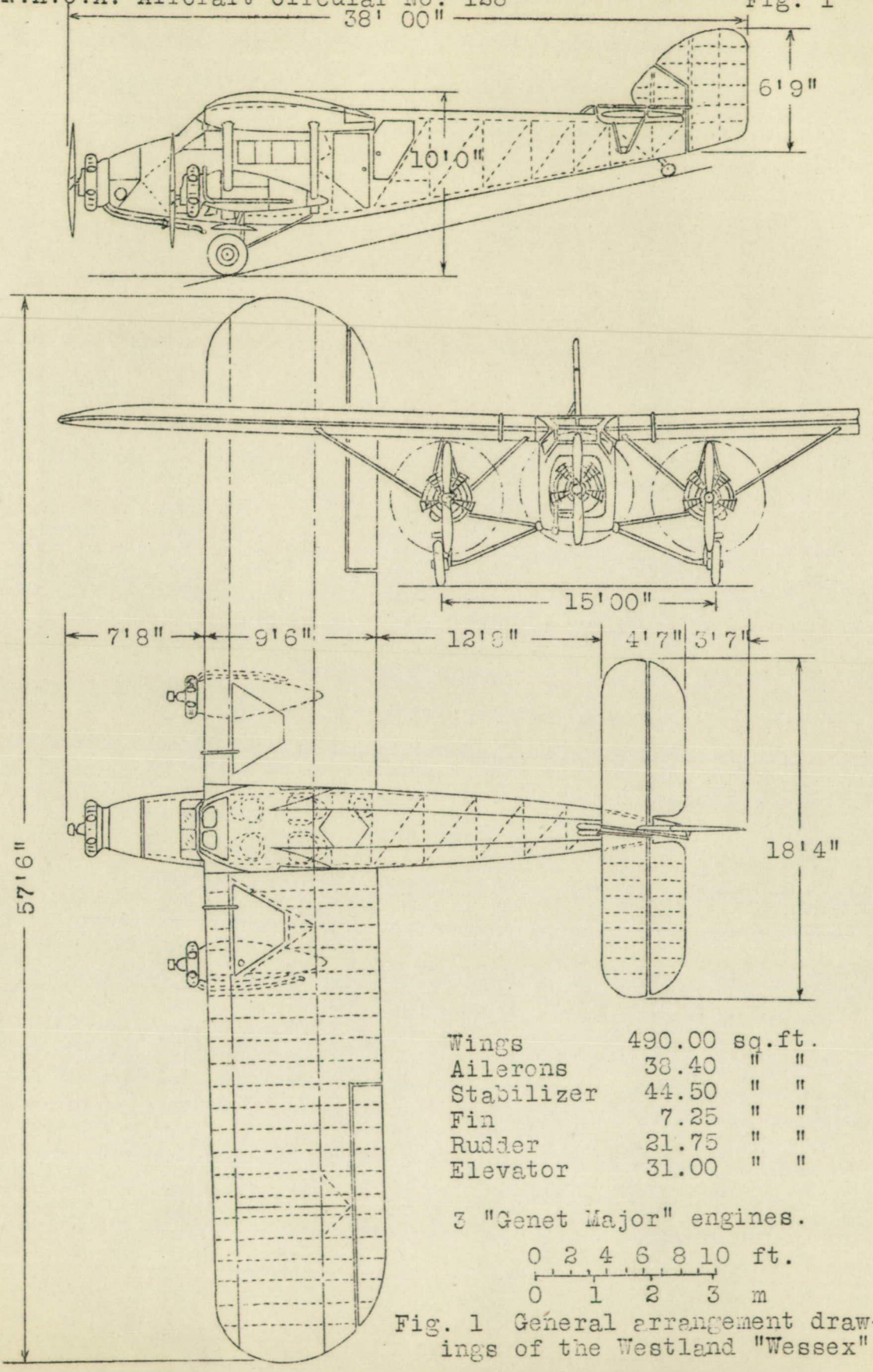
*This figure refers to the freight airplane. The movable equipment for the passenger airplane weighs 101 lb. (46 kg), giving an empty weight of 3600 lb. (1631 kg). The pay load is then 1095 lb. (496 kg). When carrying 2/3 fuel, the pay load is 1488 lb. (674 kg) for the freight airplane, and 1387 lb. (628 kg) for the passenger airplane.

Loading

Power loading on normal horsepower	18.6 lb./hp	8.44 kg/hp
Wing loading	11.7 lb./sq.ft.	57.1 kg/m^2

Performance

Maximum speed	108 m.p.h.	174 km/h
Cruising "	95 "	153 "
Stalling "	52 "	83 "
Initial rate of climb	530 ft./min.	2.7 m/s
Duration, full fuel	5-1/2 hr.	5-1/2 h
Range, full fuel	520 mi.	838 km
Duration 2/3 fuel	3-3/4 hr.	3-3/4 h
Range 2/3 fuel	350 mi.	560 km
Service ceiling	10,000 ft.	3,050 m
Absolute ceiling	12,300 "	3,750 "
Maximum height, two engines	4,000 "	1,220 "



Wings	490.00	sq.ft.
Ailerons	38.40	" "
Stabilizer	44.50	" "
Fin	7.25	" "
Rudder	21.75	" "
Elevator	31.00	" "

3 "Genet Major" engines.

0 2 4 6 8 10 ft.
0 1 2 3 m

Fig. 1 General arrangement drawings of the Westland "Wessex".

Fig.3

Mounting of the "Genet Major" engine on the starboard side.

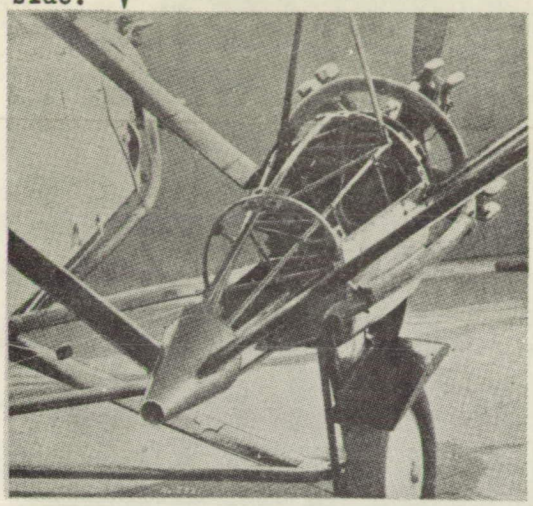


Fig.2

Three-quarter front view of the "Wessex" passenger airplane.

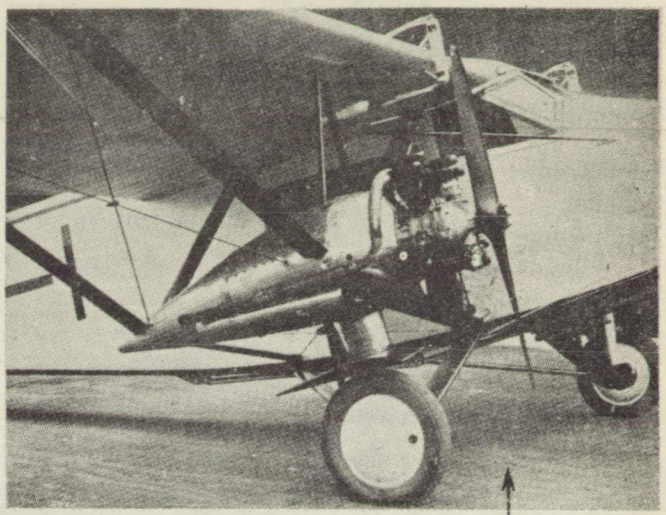


Fig.4 Cowling of engine in place. Note careful streamlining of mounting at rear.

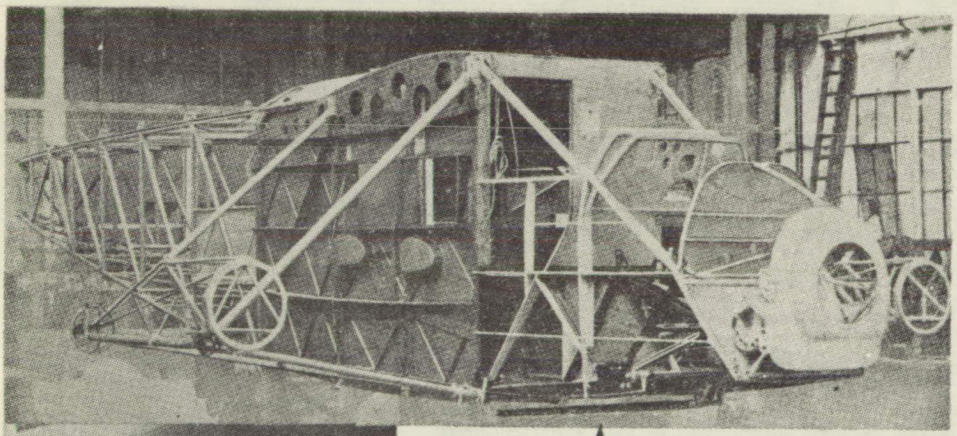


Fig.7 The door of the "Wessex" is low allowing the passengers to step straight in. Platforms or steps are unnecessary.

Fig.5 The fuselage of the "Wessex" in course of construction giving a good idea of the structure and, also showing mountings for the engines.

Fig.6 A tail wheel is used instead of the old-fashioned tail skid.