AIRCRAFT CIRCULARS

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 101

THE A.H.G. [illegible] (BRITISH)

A Single-Seat Cabin Monoplane

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THE A.B.C. "ROBIN" (BRITISH)*

A Single-Seat Cabin Monoplane

The A.B.C. MOTORS, Ltd., decided to enter the field of aircraft construction and to build airplanes to utilize the two types of engines which they were already producing: the 30-40 hp "Scorpion" and the 60-70 hp "Hornet". The services of Mr. A. A. Fletcher were secured as designer.

The A.B.C. "Robin", as the airplane is named, is of more than ordinary interest in that it is the first low-power single-seater with "conduite interieure" to be produced in this country (Fig. 1). The comfort of the pilot (who in most instances will be the owner) has been seriously studied, and in the "Robin" we have an airplane which the owner can use all the year round without having to don special flying kit. The little cabin has its floor so low above the ground that the pilot can step in without the use of any built-on steps. Large windows on each side give a good view outwards and the windows can be opened backwards during flight as well as forward while taking off and landing. In fact, as the designer himself put it,"If

*From "Flight", May 30, 1929.

he is a sufficiently bad pilot he can watch his wheels until the actual moment of touching the ground." A V-shaped windshield closes the cabin in front, and as the engine mounting is placed quite low, the view forward is also excellent. A hinged skylight forms the roof of the cabin, and can be raised to facilitate getting in and out, as well as forming an emergency exit through the roof in case of a crash. The cabin door itself is on the starboard side.

Just behind the cabin, and with a hatch in the roof of the fuselage, is a luggage compartment large enough to take two large suitcases, so that the owner of a "Robin" will be able to go on a prolonged tour.

That the "Robin" is a really useful and serviceable airplane will be realized when we state that the top speed is 105 m.p.h., while the airplane cruises very comfortably at 85 m.p.h., taking but 24 hp from the engine. The fuel consumption at cruising speed is but 2 gallons per hour or so, giving a mileage of more than 40 miles per gallon, which must be regarded as extremely economical.

Structural Design

Simplicity has been aimed at in planning the structural design of the "Robin," and wood is the material most extensively used, the employment of metal being confined to fittings and a few highly-stressed parts.

The fuselage is a wooden "box" having four spruce longerons in the corners, and top, bottom and sides covered with a thin plywood veneer (Figs. 2 and 4). Light formers are placed at intervals to retain the rectangular cross-sectional shape, these formers consisting of panels with very light spruce frames and thin plywood walls lightened by large cut-outs.

Up to the cabin the fuselage is deep and the deck forms a roof except for the skylight already referred to. In front of the cabin, however, the deck drops considerably so as to provide the forward opening of the front window or windshield. The lower longerons extend right up to the engine plate, but owing to the sudden drop in the deck in front of the cabin, the top longerons of the engine mounting are short separate lengths, stopping short at the front wall of the cabin (Fig. 2). The engine plate itself is a multi-plywood former, and is attached to the longerons by rather neat steel fittings (Figs. 2 and 3), which are simply short lengths of square-section steel tubes, split for a distance along the corners, and the free ends thus formed being turned out at right angles. In this way a flanged socket is formed without the use of welding. The diagonal bracing of the forward part of the fuselage, i.e., from cabin to engine plate, takes the form of steel tubes. The gasoline tank, with a capacity of 8 gallons, is housed in the forward deck fairing, above the pilot's legs, a position which still gives sufficient "head" to enable direct gravity feed to the engine

to be employed (Fig. 2).

The monoplane wing is built in two halves. hinged to the fuselage top corners, and braced each by a pair of struts arranged in the form of a Vee (Figs. 4 and 5). The upper ends of the wing bracing struts are attached to the wing spars by steel straps, while at the fuselage end the two tubular struts have fork ends fitting over a sheet steel fitting bolted to the fuselage. As the lift is taken from this point, a steel strap bolted to the corner fitting runs right across the bottom of the fuselage to the corresponding fitting on the opposite side, while inside the fuselage a tie rod transmits the tension. This tie rod lies along a plane just above the top of the lower longerons, and as the external steel strap is just below the lower longerons, the whole structure is so stabilized that no twisting stresses are imposed upon the lower longerons.

Across the top of the fuselage runs a duralumin tube, which terminates at each end in a sheet steel fork, between the jaws of which a duralumin block is swiveled (Figs. 4 and 6). This block, which is vertical, has a horizontal hole drilled through it for the reception, in the case of the front spar fittings, of the locking pin used in connection with the wing-folding arrangement. This pin is rather in the form of a sort of key, so that when the wing is erected and the pin pushed home and turned, it cannot accidentally come out of its socket, being held in by a coil spring and having a small projection or cam

which fits into a corresponding recess in the block.

The wing spars are of solid spruce, spindled out to an I-section (Fig. 5). This form of spar is rather cheaper to make than a box-section spar, and as there is no difficulty in obtaining good spruce in such short lengths, the spindled I-section spar was chosen. The ribs are light girders, of square-section spruce, attached to the spars by corner strips. The rib flange strips are joined to the rib tie strips by thin three-ply wood gussets (Fig. 5). The covering is doped fabric. The wing section used is a biconvex one, R.A.F. 34, which has an almost stationary center of pressure, and has been found to work excellently on full scale.

The tail surfaces are also of wood construction, and perfectly normal, both in aerodynamic and structural design (Fig. 7). The stabilizer incidence can be adjusted while the airplane is on the ground, the rear spar of the stabilizer being supported from the fuselage by two threaded bolts, lock nuts on which locate the stabilizer at the desired angle, being tightened up against a flat sheet steel fitting.

The landing gear (Fig. 2) is of the "split" type, the wheel on each side being supported on a bent axle, which is in turn retained in a fore and aft direction by a radius tube, and in a vertical direction by the telescopic "leg," the upper end of which is bolted to the side of the fuselage. Endless rubber cord rings form the shock-absorbing medium, and the correct amount of

springing is very simply determined by the number of rings employed. There is no damping device for checking bouncing. The wheel track obtained with this form of landing gear is very wide, and there should be little danger of the airplane turning over when taxying in a strong cross wind.

The main dimensions, etc., are shown on the general arrangement drawings (Fig. 1). The estimated tare weight of the "Robin" is 415 pounds. The permissible gross weight for the certificate of airworthiness is 680 pounds, which will enable a fairly heavy pilot and a considerable load of luggage to be carried, in addition to fuel for 4 hours at cruising speed, or a range of about 340 miles.

Assuming a maximum power of the "Scorpion" of 40 b.hp, the power loading is 17 lb./hp, while on normal power (35) the power loading is 19.4 lb./hp. The wing loading is 7 lb./sq.ft., which gives a landing speed of approximately 40 m.p.h.

The high placing of the wing, in conjunction with a wing section with stationary center of pressure, provides good stability. R.A.F. 34 shows no violent stalling, and the airplane should merely sink slowly when flying beyond the stall angle , and should show little tendency to go into a spin.

Dimensions, Surfaces, etc.*

Span spread	25 ft. 4 in.
Span, folded	11 " 8 "
Length	17 " 7 "
Height	5 " 9 "

Areas:

Main planes, including ailerons	97 sq.ft.
Ailerons	13 "
Stabilizer	9 "
Elevators	6 "
Fin	3.5 "
Rudder	4.5 "

W e i g h t

Empty	415 lb.	
Loaded	680 "	
Wing loading	7 lb./sq.ft.	
Power " (40 hp)	17 lb./hp	

Performance

Maximum	105 m.p.h.
Cruising	85 "
Landing	40 "
Climb (first minute)	750 ft.
Service ceiling	17,500 "
Theoretical absolute ceiling,	21,000 "

*From a leaflet published by the A.B.C. Motors, Ltd.

Fig.1

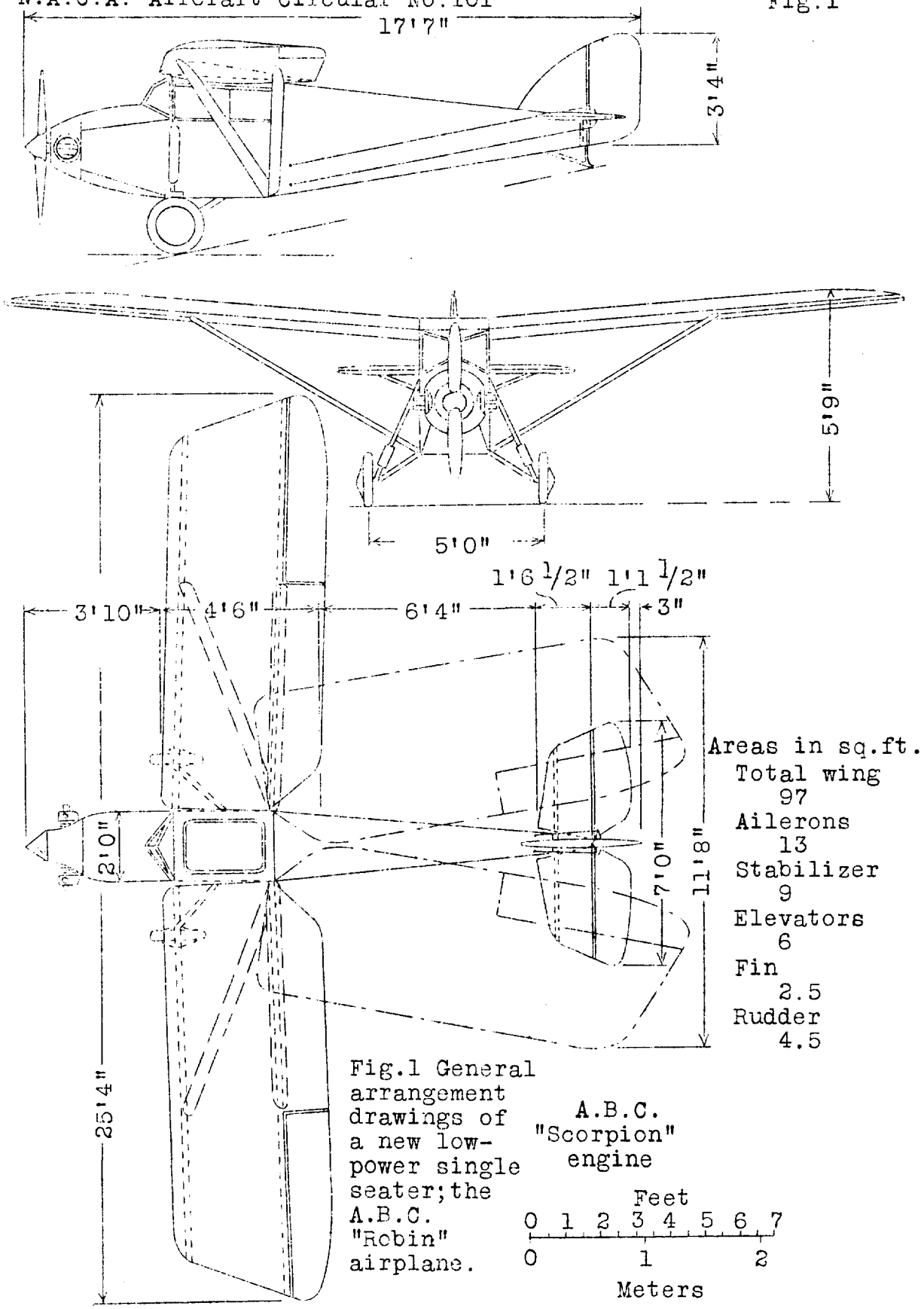


Fig.1 General arrangement drawings of a new low-power single seater; the A.B.C. "Robin" airplane.

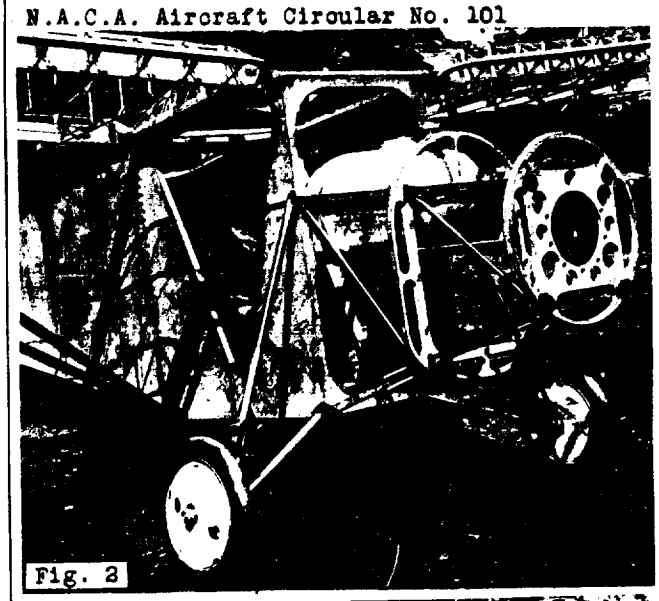
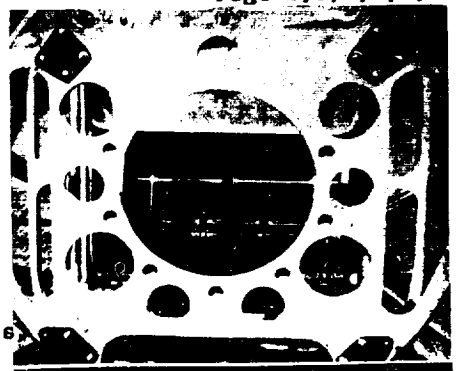


Fig. 2

Fig.3 View through an opening in the engine plate, showing the control stick, adjustable foot rests, cables, pulleys, etc.



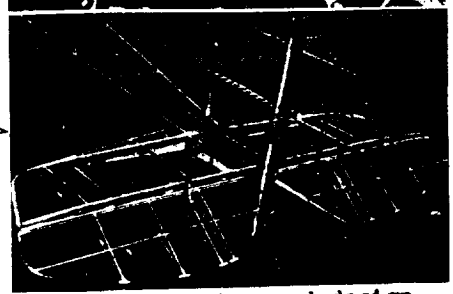


Fig.7 The tail of the "Robin" is of orthodox construction and design.

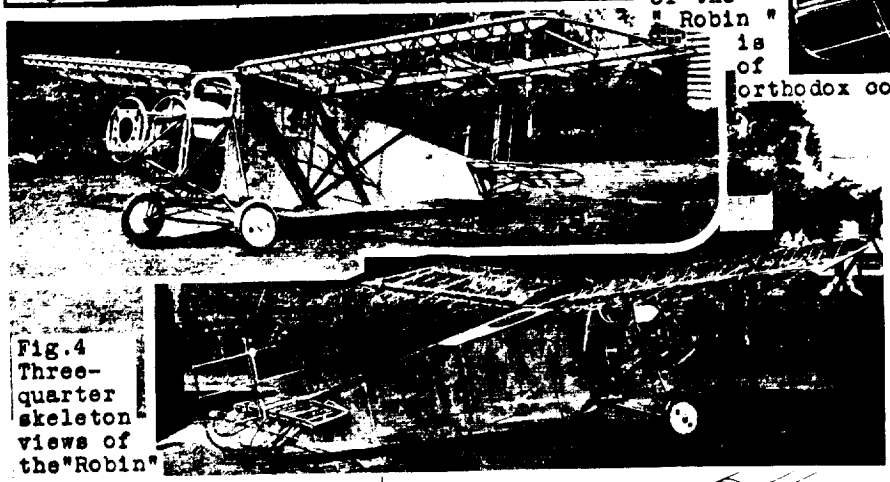


Fig.4 Three-quarter skeleton views of the "Robin"

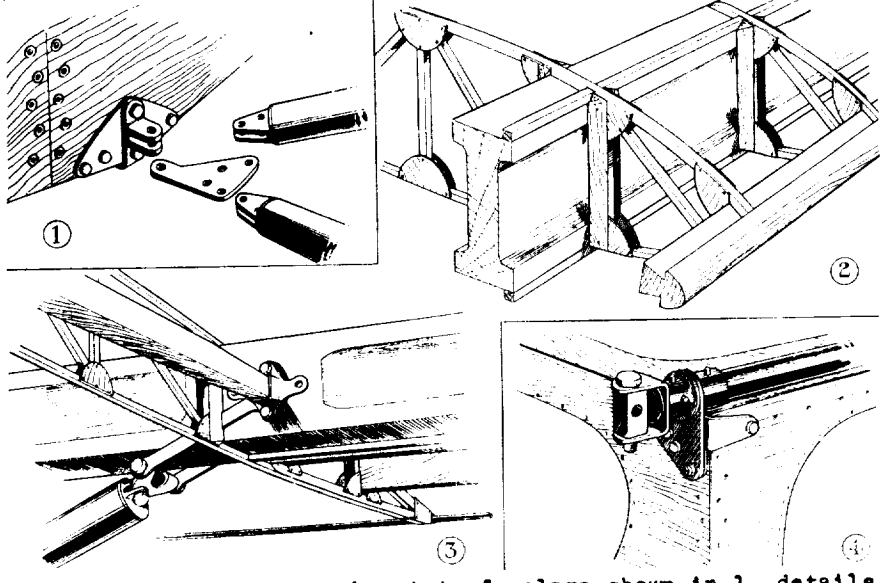


Fig.5 Left strut attachment to fuselage shown in 1, details of wing construction in 2. Attachment of lift strut to rear spar shown in 3, and duralumin tube across the top of fuselage with fork and block for wing spar attachment in 4

Views and sketches taken from "Flight", May 30, 1929

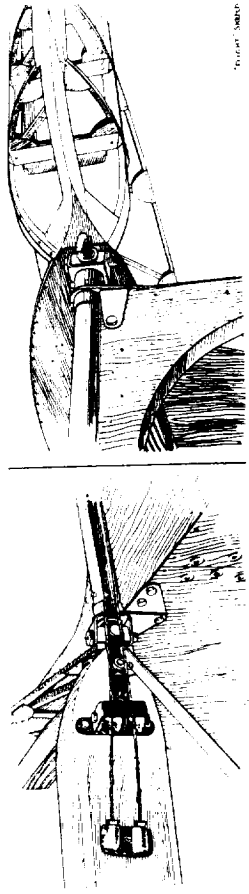


Fig.6 On the left a spar hinge, showing how aileron cables are guided. On right, a front spar fitting, with locking pin