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No. 21

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THE A.N.E.C. IV "MISSEL THRUSH" LIGHT AIRPLANE

From "Flight," September 9, 1926

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Washington  
November, 1926

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

AIRCRAFT CIRCULAR NO. 21.

THE A.N.E.C. IV "MISSEL THRUSH" LIGHT AIRPLANE.\*

In the "Missel Thrush" the Air Navigation and Engineering Co., Ltd., have produced an entirely new type of light airplane, having not only high efficiency but very comfortable accommodations for pilot and passenger when making long flights. In short, it is an attempt to produce an inexpensive comfortable efficient and safe airplane, suitable for private ownership and operation.

It is a two-seater tractor fuselage biplane, with single I interplane struts and is, as may be seen from Figs. 1 and 2, an exceptionally pretty and well-proportioned airplane. While, generally speaking, the construction of the "Missel Thrush" is a perfectly straightforward job, following orthodox practice, and in consequence permitting one of the main aims of the constructors to be accomplished, viz., cheap and quantity production, its detail design is not lacking in originality. Great simplicity is the keynote everywhere.

Furthermore, this simplicity has not by any means been achieved by sacrificing strength, and this applies also in respect to the light weight obtaining throughout this airplane, another outstanding feature.

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\* From "Flight," September 9, 1926.

### Constructional Features

Turning to actual construction, it will not be possible, owing to lack of space, to describe every detail but to limit the description, briefly, to the more noteworthy features. The designer, Mr. J. Bewsher, has paid considerable attention to the matter of streamlining, with the result that the airplane is exceptionally free from all resistance-offering projections, and also wherever possible, corners, etc., have been neatly faired in.

#### The Fuselage

The fuselage undoubtedly forms the most interesting feature of this airplane, and is in every way a remarkably neat piece of work. It is of good streamline form, and has been ingeniously adopted to meet the particular requirements at various points - engine section, cockpits, and tail attachment - without interfering with this streamline form.

It is practically of monocoque construction, being built up of plywood on a light but strong skeleton framework. The latter consists of four main longitudinals and a series of transverse bulkheads comprising vertical and cross - and, in some cases, diagonal - struts reinforced with plywood.

The cross section of the fuselage is somewhat unusual; at the nose it is approximately triangular (apex up) - or, perhaps, a pentagon changing into a triangle, would describe it more accu-

rately - after which, in the vicinity of the two cockpits, it is rectangular, and then it merges into triangular again, this time apex down, at the stern. In this way the fuselage is made, first, to accommodate itself to the best possible advantage to the shape of the engine, which is an inverted Y; secondly, to afford ample room for pilot and passenger; and thirdly, to provide a suitable support for the stabilizer. It will be seen that all three requirements are carried out by this arrangement most efficiently. As will be noted from the illustrations, the mounting of the engine is both neat and efficient on account of this method.

As previously stated, the two cockpits are exceptionally roomy - which is not always the case in airplanes of this type - and also well appointed. One cockpit is located at the trailing edge of the main wings and the other comes midway between them. The space in between the two cockpits is utilized for "cargo," and it should be noted that this is of ample proportions; in fact, a medium-sized suitcase, etc., may easily be stored here. Space is also provided for carrying other smaller articles, such as tools, spares, and maps.

Both cockpits are provided with controls, of the stick and rudder bar variety. The control gear is a simple but effective affair, consisting of a sliding fore and aft shaft carried on the lower fuselage cross members, including the tubular wing-spar continuation members, between front and rear cockpits.

Each control stick is universally jointed on this shaft, and is pivoted in a fork mounted on the shaft. The rear end of the shaft is connected to one arm of a double crank, from which the elevator control cables are taken. Thus a fore and aft movement of the stick causes the shaft to slide longitudinally, and so actuate the elevators via the crank, while a lateral movement of the stick operates the ailerons through cables attached to lugs on the upper ends of the fork (at stick pivot), passing over pulleys, through the sides of the fuselage and through the lower wings. The rudder is operated in the usual way by a foot bar.

The mounting of the engine in the fuselage is another unusual feature, this being by means of a system of triangulated tie rods which radiate out from engine plate (on fuselage) to crankcase, and not, as is more general, from engine to fuselage. It is claimed that by thus making each group, or triangle, of tie rods converge on the engine plate, a better triangulation of the forces is obtained.

Behind the engine plate, which is of the fireproof variety, is located the gasoline tank. A neat metal cowling, enclosing the engine all but the cylinder heads, follows the contour of the fuselage, completing the thorough streamlining of the latter.

### The Wings

The upper and lower wings are set at a fairly pronounced dihedral angle, but are not swept back. The upper wing is

slightly larger in span and chord than the lower wing, and is also staggered forward. Ailerons are fitted to the lower wings only. The wings are made to fold back along the fuselage. This operation is easily carried out, and in such a manner that the process of folding does not interfere with the setting of the aileron control, nor the wing bracing.

The wings are hinged at the rear spars, and when folded lie snugly along the fuselage, free of all obstructions. The lower wings are mounted on short wing roots built into the fuselage, the front spar attachment being made direct to the fuselage, the wing roots, of course, being triangular. The upper wings are attached to a center section, being mounted above the fuselage by two half-I struts, braced by cables running from the top of each strut to a point on the top center of the fuselage both fore and aft.

As regards the wing construction, this follows orthodox practice - somewhat similar to the A.N.E.C. II monoplane - comprising two box spars of spruce flanges and plywood walls, with lattice type ribs. All the fittings are of simple flat metal plate type, as may be seen in Fig. 3 of the wing construction. The leading edge is formed by an aluminum tube, except at the tips of the lower wing, where steel tube is employed. From the leading edge to the front spar thin plywood covering is used, while the rest of the wing is covered with fabric.

The interplane struts are of wood construction, being built

up of laminations to streamline section. These struts are attached to the wings by simple metal U-plates - at each fore-and-aft extremity of the strut - which pass round the wing compression member at this point. The external wing bracing is taken from the center of the strut extremities, the lift wires being doubled and anchored to the front spar wing fitting.

The tail surfaces are of simple wood construction, fabric covered, and comprise a fixed one-piece horizontal stabilizing surface, a triangular vertical fin, unbalanced divided elevators and rudder. All are of ample proportions, and an unusual feature consists of the rake forward of the hinge-line of the rudder, which may be seen on referring to Fig. 1.

Both vertical and horizontal surfaces are unbraced externally, the latter being mounted direct on the top of the fuselage which, as previously mentioned, presents an ample bearing surface at this point. It is attached by means of four long bolts, which pass up through the fuselage and through sockets mounted on the front and rear spars of the stabilizer. This method of attachment - which is extremely positive - is clearly shown in Fig. 3. The fin is mounted on top of the stabilizer, being attached to lugs on the spar of the latter, and to the stern post of the fuselage.

#### Landing Gear

While the landing gear is of the V-type, its design and construction form another feature of this airplane. The landing

gear struts consist of a pair of steel tubes bent to form a narrow, curved V. Their upper extremities are attached to brackets on the lower longerons of the fuselage, while the lower ends are joined by a metal "axle-box." The tubes are connected in between by flanged plates of streamline planform, and near the bottom by a metal distance block. Each complete strut unit is then faired with plywood covering, forming neat "peg-top trousers," as shown in Fig. 3. The lower extremities of each "leg" are connected by a wood cross strut, of streamline section, in the form of a trough, in which the main axle lies. The axle passes out between the tubes of the "legs," and is secured in place by rubber cord, which is wrapped round the "axle-box" previously mentioned. The landing gear struts are, of course, cross braced with cable.

In the six-gallon gasoline tank the airplane is provided with fuel sufficient for a flight of approximately 200 miles at a top speed of 80 M.P.H., and a cruising speed of 60 M.P.H.

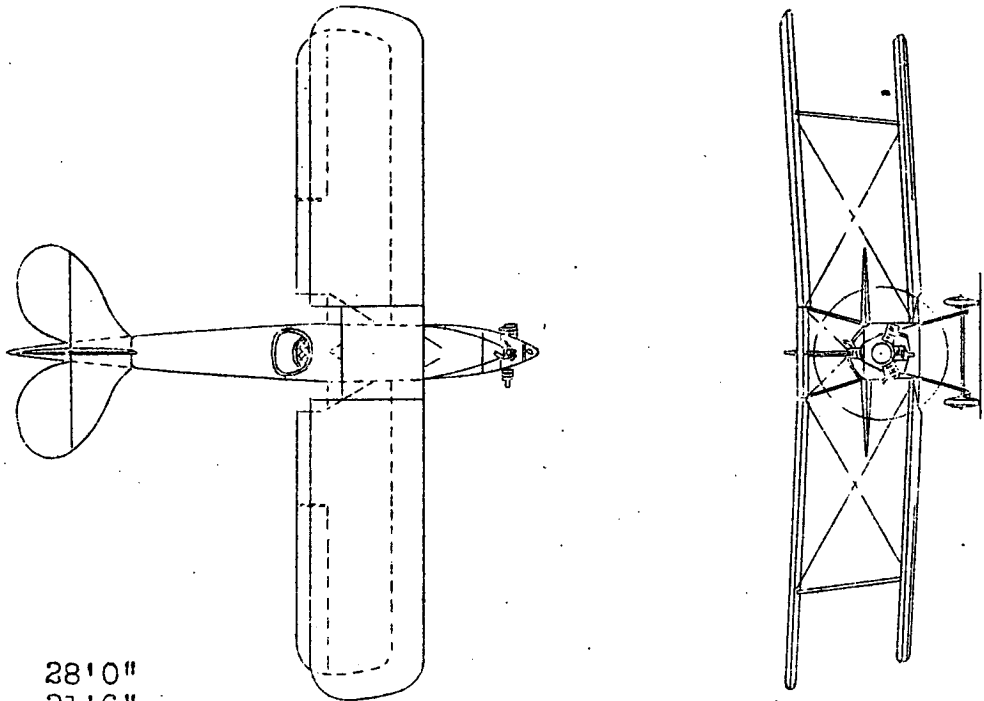
The weight of the airplane empty is about 500 pounds, while its dimensions are not too large for easy handling when on the ground.

#### Characteristics

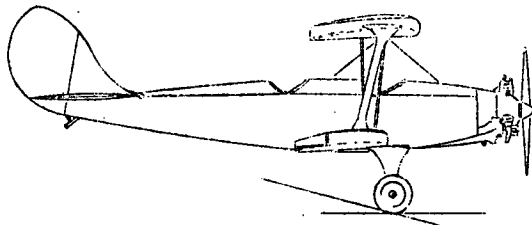
Span	28 ft.
Length	21 ft. 6 in.
Height	8 ft.
Wing area	210 sq.ft.



A Blackburne "Thrush" 3 cylinder air-cooled radial engine, of 1500 cm<sup>3</sup> (91.5 cu.in.) capacity, weighing 132 pounds, provides the power, developing 35 HP. at 2500 R.P.M., and 38 HP. at top speed of 2750 R.P.M. The weight per horsepower, based on normal power, is 3.77 lb.



Span 28'0"  
Length 21'6"  
Height 8'0"  
Wing area 210 sq.ft.



35 HP.  
Blackburne  
"Thrush"  
engine.

Fig.1 A.N.E.C.IV "Missel-thrush" airplane.



Fig. 2 A.N.E.C. IV "Missel Thrush" airplane

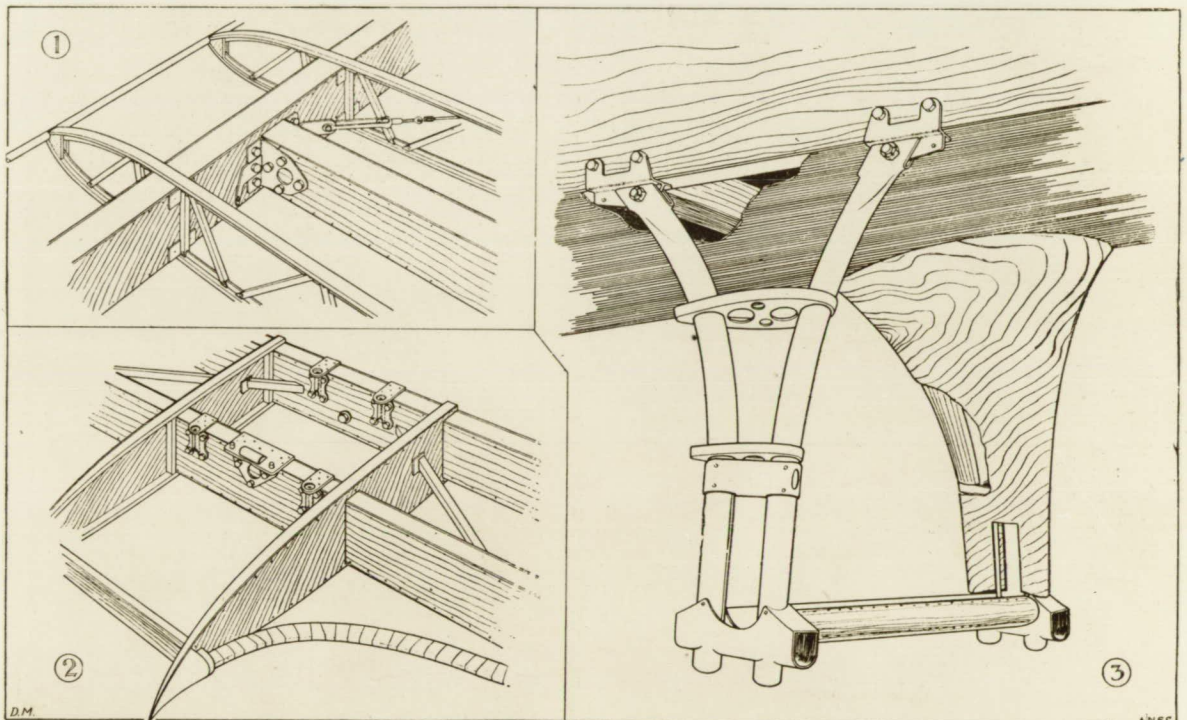


Fig. 3 Some constructional details: (1) Shows the simple wing construction at the interplane strut-compression member section; the leading edge is an aluminium tube, while the spar is of the box type, spruce and plywood. (2) Is the center of the stabilizer, which sits on the flat upper surface of the fuselage, and is held down by four long bolts passing from the latter through the fittings on the stabilizer spars. Note, on the rear spar, the neat roller for the control cables. (3) The landing gear struts, comprising steel tubes, forming a curved Vee, and connected at the ends by a streamlined trough carrying the axle, are faired as shown by plywood.