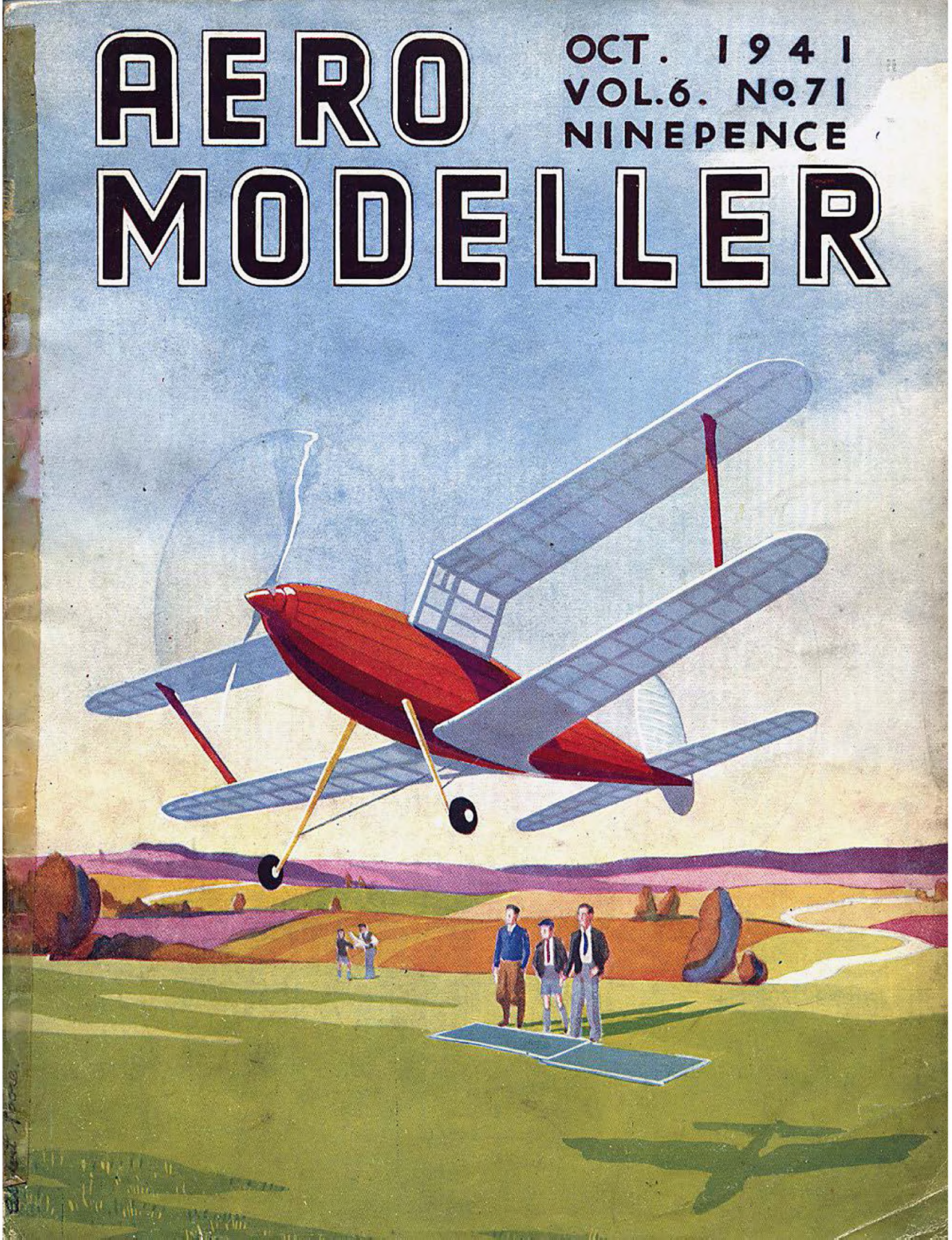
AERO MODELLER

OCT. 1941
VOL.6. No.71
NINEPENCE



Digital Edition Magazines.

This issue magazine after the initial original scanning, has been digitally processing for better results and lower capacity Pdf file from me.

The plans and the articles that exist within, you can find published at full dimensions to build a model at the following websites.

All Plans and Articles can be found here:

Hlsat Blog Free Plans and Articles.

http://www.rcgroups.com/forums/member.php?u=107085

AeroFred Gallery Free Plans.

http://aerofred.com/index.php

Hip Pocket Aeronautics Gallery Free Plans.

http://www.hippocketaeronautics.com/hpa_plans/index.php

Diligence Work by Hlsat.

A PRIVATE OWNER....

A well-known "private owner" of aircraft, Mr. J. H. P. Green, is here shown beside his "Gipsy Moth," one of the several 'planes he owns.

Mr. Green must be a wealthy man?

Oh, no! His aircraft are "models," the Gipsy is a "solid" 1-24 scale, and Mr. Green "arranged" the background, and a photograph of himself, to suit the size of the model.

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The AERO MODELLER

INCORPORATING "THE MODEL AEROPLANE CONSTRUCTOR"

OCTOBER, 1941
Vol. VI. - No. 71

ALLEN HOUSE
NEWARKE STREET
LEICESTER, ENGLAND

Tel. Leicester 65322

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D. A. Russell, *A.M.I.Mech.E.*
Editor: C. S. Rushbrooke

Editorial

THE sentence—"As certain types of wood such as bass wood, satin wood and obeechi are now becoming available, we gauge the position to be slightly improving rather than becoming worse"—in our last month's Editorial has brought several replies from people complaining that, so far as they individually are concerned, they cannot detect any improvement in the position.

We feel that these correspondents are reading more into the sentence than it was meant to convey. They overlook the fact that, owing to the continually expanding demand for flying scale and solid models for use in training for aircraft recognition, etc., etc., even if the supplies of wood were improving, the position would not become materially better so long as the demand keeps far ahead of supply.

We do know that strenuous efforts are being made on behalf of the Model Aircraft Trade to improve the supply position, and to ensure a more equitable distribution of timber throughout the Wholesale and Retail trade, but this is not a quick or easy object to achieve. Nevertheless, we believe that the next few months will see an improvement in regard to distribution, if not in regard to the total amount of timber available, which aero-modellers must understand is at all times subject to the demands of the Services.

Bound issues of "The Aero-Modeller"

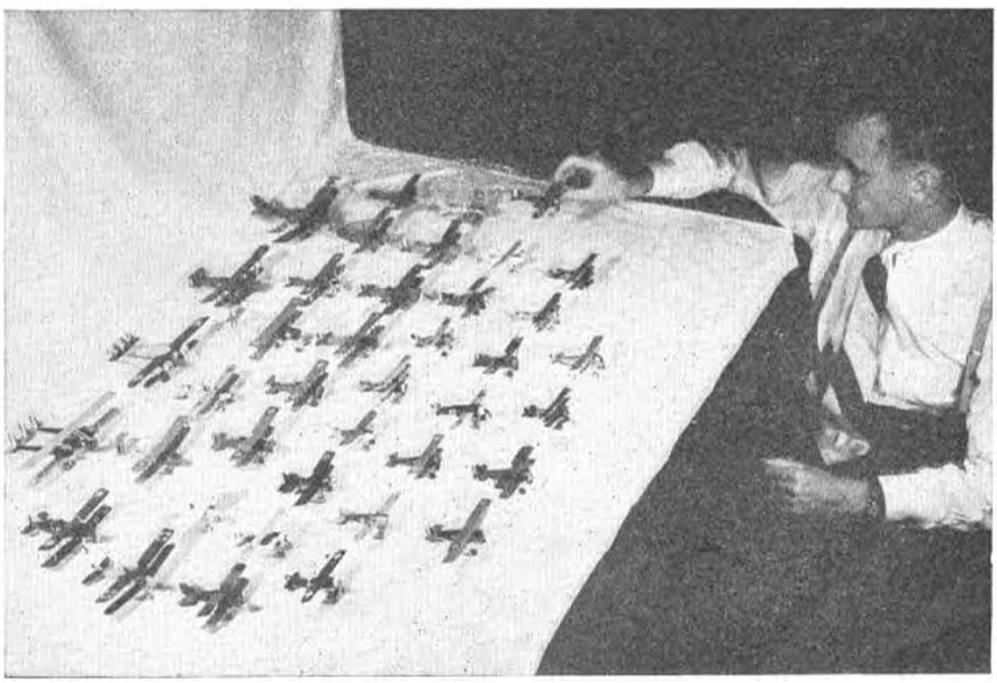
We draw attention to the advertisement on the last page of this journal, giving particulars of "Cordex" binding cases for THE AERO-MODELLER. Limited supplies of these cases are now available. Individual copies of THE AERO MODELLER may be slipped in, as they are received and held firm by means of a spring-loaded cord. For the benefit of those readers who will be wanting to get their copies bound on the publication of our next issue, which will complete volume 6, we give notice that we have a few copies of the April and May issues available at the price of 1s. each, post free. We have no other back issues for sale.

Tail Piece

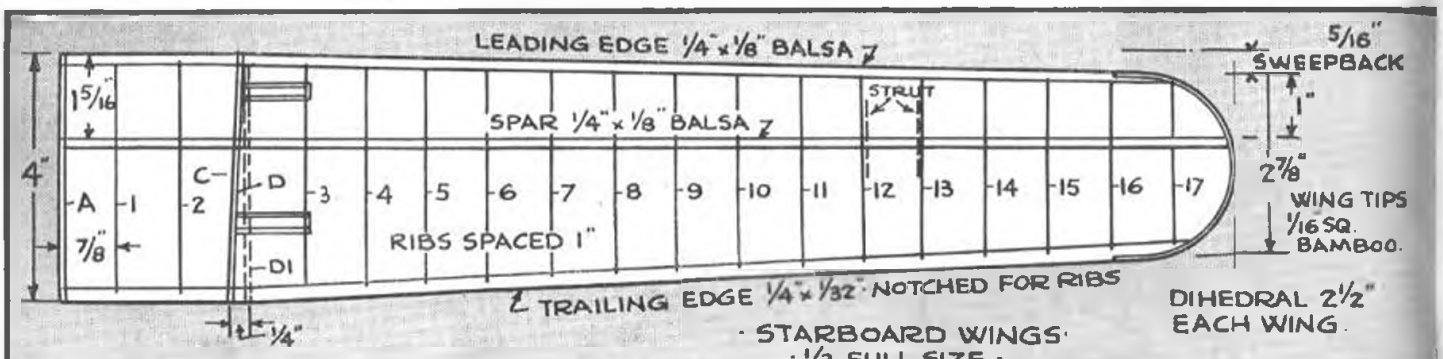
In the *Daily Mail* of August 16th, Noel Monks, that newspaper's air correspondent, cabling from the Lockheed plant in California, refers to witnessing the trial flight of the "secret" Lockheed P.38—the Lightning: "The speed and altitude are the Lightning's main points. The U.S. is keeping its armaments and range a close secret."

. . . We modestly refer readers to pages 359/60/1 of our June, 1941 issue, published about May 20th, i.e. four months ago, in which Mr. H. J. Cooper fully described the Lockheed Lightning P.38, giving full particulars of the American armament and eight items of information in regard to its performance . . .

D. A. R.



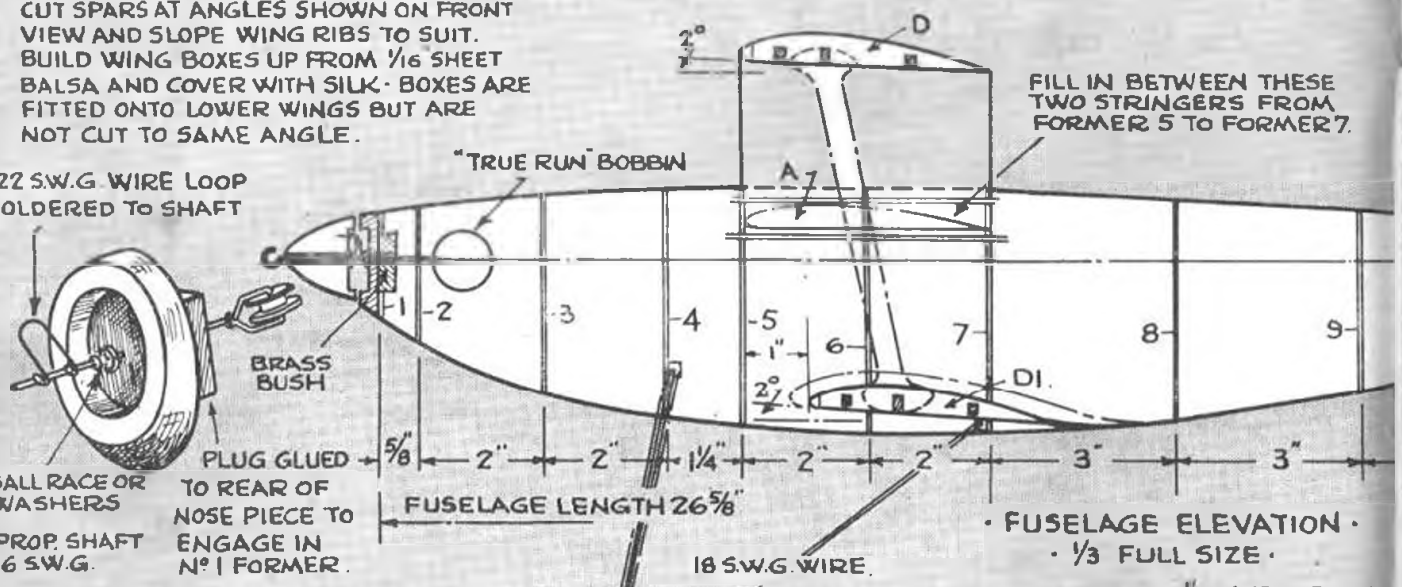
We apologise to this American enthusiast for not recording his name . . . really it's not our fault . . . he did not put his name on the photograph!



DIHEDRAL 2½" EACH WING.

· STARBOARD WINGS ·
· ⅓ FULL SIZE ·

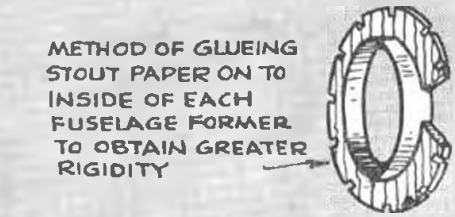
DOTTED LINES INDICATE POSITION OF ROOT RIB ON LOWER WINGS (DI). CUT SPARS AT ANGLES SHOWN ON FRONT VIEW AND SLOPE WING RIBS TO SUIT. BUILD WING BOXES UP FROM 1/16 SHEET BALSA AND COVER WITH SILK · BOXES ARE FITTED ONTO LOWER WINGS BUT ARE NOT CUT TO SAME ANGLE.

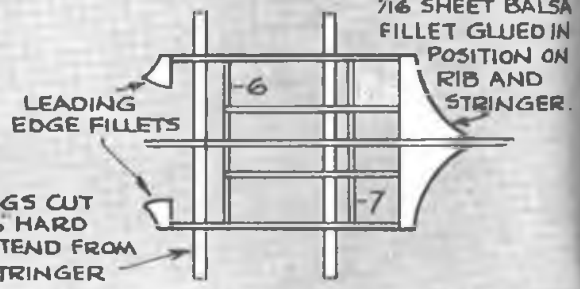


· FUSELAGE ELEVATION ·
· ⅓ FULL SIZE ·

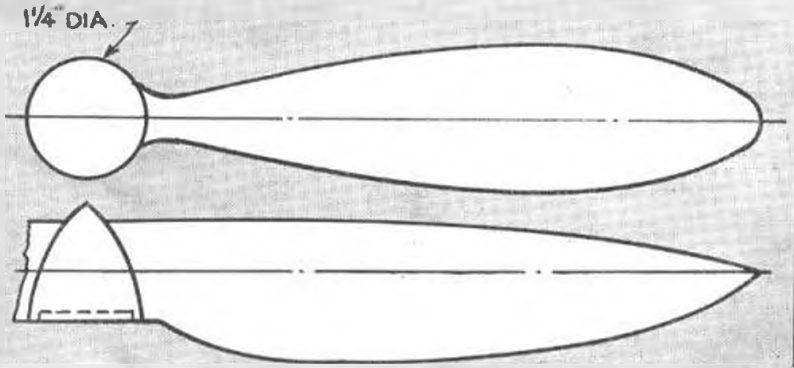
18 S.W.G. WIRE.

BUILD UP NOSE PIECE AND NOSE PLUG FROM LAMINATED BALSA.





· BOTTOM WING FILLETS ·



POWER: 14 STRANDS OF 3/16" RUBBER 30" LONG, PRE-WOUND.

The MINERVA

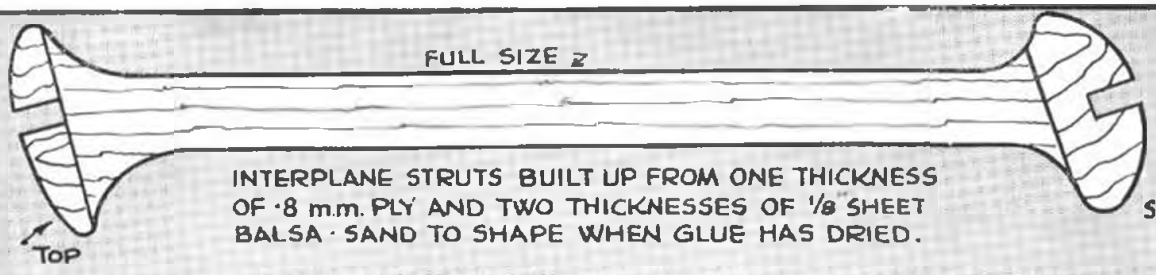
36" SPAN BIPLANE

DESIGNED BY

· J · E · FRAZER ·

LAYOUT OF PROPELLER · ½ FULL SIZE · CUT FROM BLOCK 15 x 1¾" x 1½" · CARVE & SANDPAPER TO AEROFOIL SHAPE · APPLY SEVERAL COATS OF DOPE TO OBTAIN A HIGH POLISH.

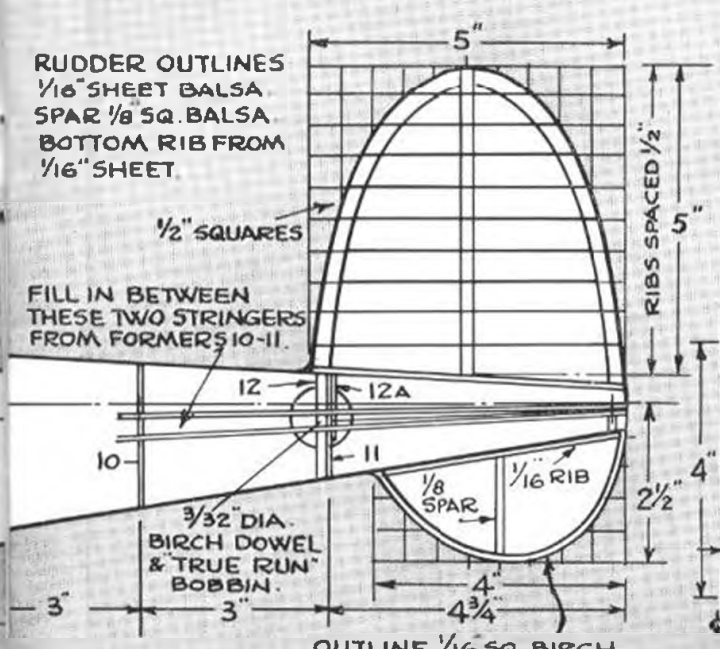
· PLATE 1 ·

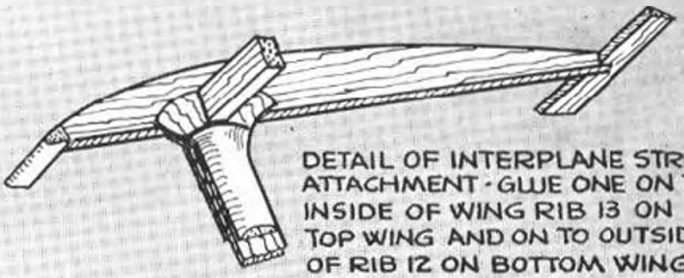


INTERPLANE STRUTS BUILT UP FROM ONE THICKNESS OF ·8 m.m. PLY AND TWO THICKNESSES OF 1/8 SHEET BALSA · SAND TO SHAPE WHEN GLUE HAS DRIED.

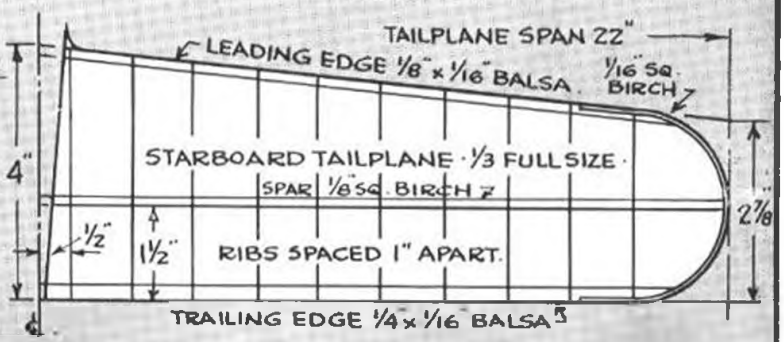
SECTION THRO' STRUT.

RUDDER OUTLINES
1/16" SHEET BALSA.
SPAR 1/8 SQ. BALSA.
BOTTOM RIB FROM
1/16" SHEET.

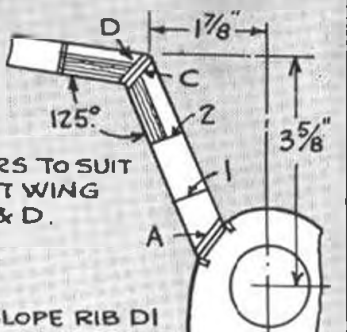




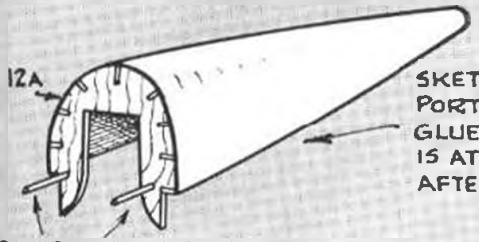
DETAIL OF INTERPLANE STRUT ATTACHMENT · GLUE ONE ON TO INSIDE OF WING RIB 13 ON TOP WING AND ON TO OUTSIDE OF RIB 12 ON BOTTOM WING. (SEE DOTTED LINES ON WING).



DETAIL OF TAIL & RUDDER RIBS · CUT 1/32 SHEET BALSA 1/4" WIDE TO SUIT LENGTHS OF RIBS · CUT OUT TO RECEIVE SPARS, LEADING & TRAILING EDGES AND SANDPAPER TO SHAPE WHEN ASSEMBLED.



CUT SPARS TO SUIT ANGLE AT WING RIBS C & D.

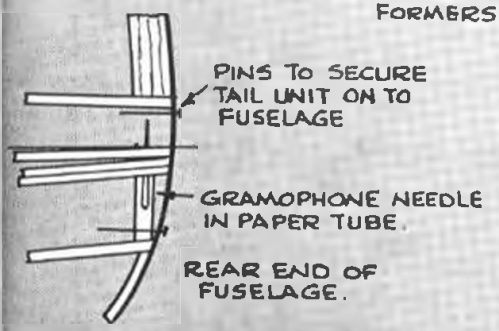


SKETCH SHOWING DETACHABLE TAIL PORTION OF FUSELAGE · RUDDER IS GLUED ON TOP STRINGER · TAILPLANE IS ATTACHED ON TO UNDERSIDE AFTER AFTER SHAPING TO SUIT SAME.

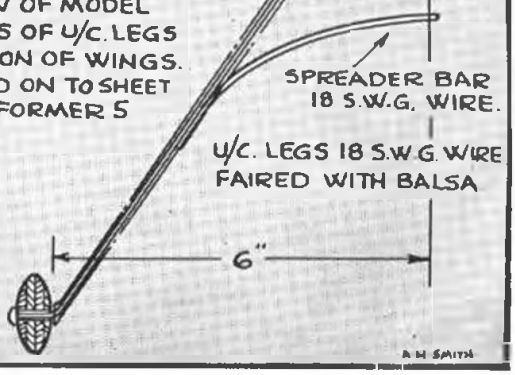
BAMBOO PEGS TO PICK UP WITH FORMER 12.

SEE PLATE 2 FOR FULL SIZE WING RIBS & FUSELAGE FORMERS.

SLOPE RIB D1 TO THIS ANGLE.

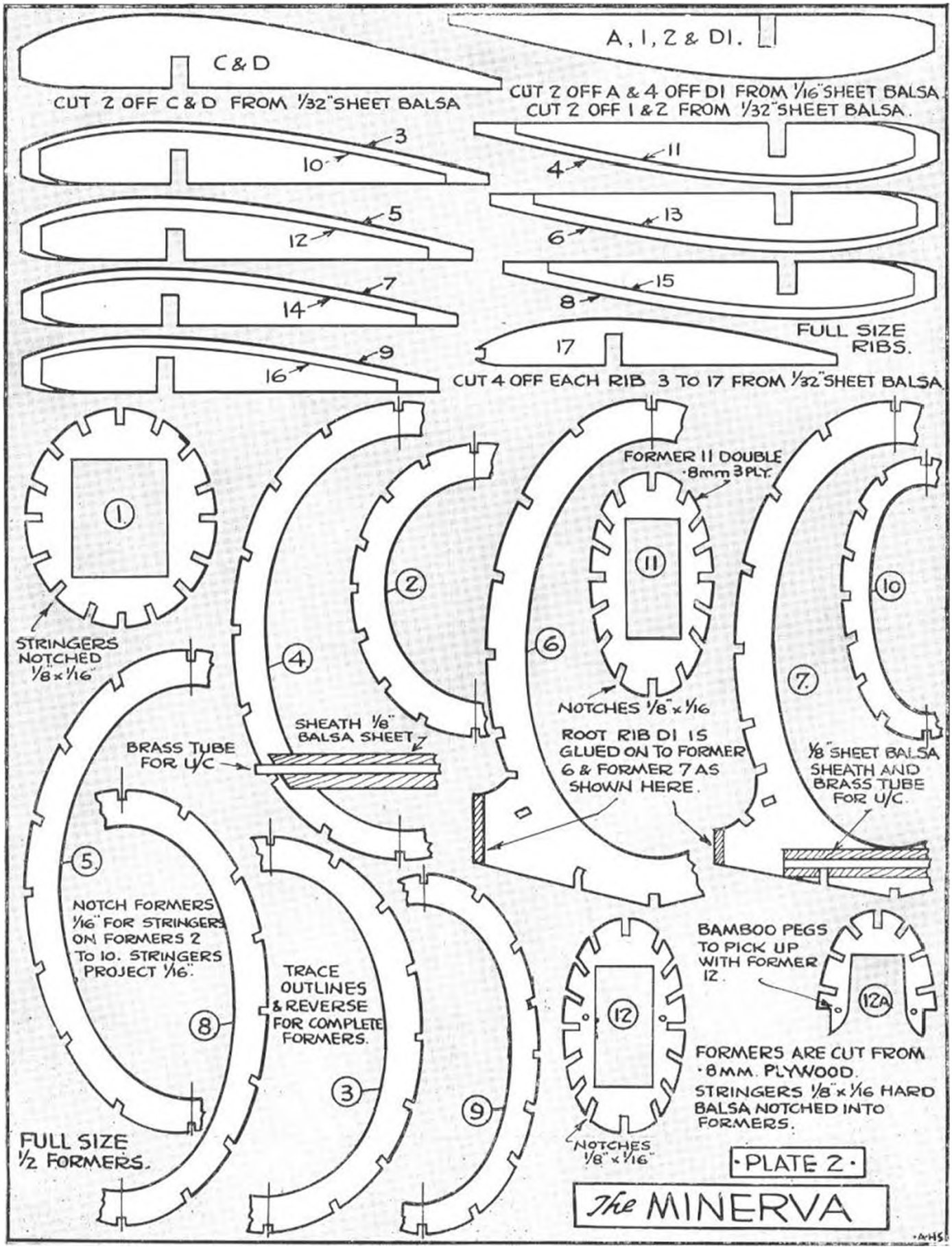


PART FRONT VIEW OF MODEL SHOWING DETAILS OF U/C. LEGS AND "GULL" PORTION OF WINGS. THESE ARE GLUED ON TO SHEET BALSA BETWEEN FORMER 5 & FORMER 7.



1 1/4" DIA. WHEELS BUILD UP FROM 4 THICKNESSES OF 1/8" BALSA & INSERT BRASS BUSH.

A.H. SMITH


A, 1, 2 & D1.
C & D
CUT 2 OFF C & D FROM 1/32" SHEET BALSA
CUT 2 OFF A & 4 OFF D1 FROM 1/16" SHEET BALSA.
CUT 2 OFF 1 & 2 FROM 1/32" SHEET BALSA.
3
10
5
12
7
14
9
16
11
4
13
6
15
8
17
FULL SIZE RIBS.
CUT 4 OFF EACH RIB 3 TO 17 FROM 1/32" SHEET BALSA
FORMER 11 DOUBLE .8mm 3 PLY.
STRINGERS NOTCHED 1/8" x 1/16"
SHEATH 1/8" BALSA SHEET
BRASS TUBE FOR U/C
NOTCHES 1/8" x 1/16"
ROOT RIB D1 IS GLUED ON TO FORMER 6 & FORMER 7 AS SHOWN HERE.
1/8" SHEET BALSA SHEATH AND BRASS TUBE FOR U/C.
NOTCH FORMERS 1/16" FOR STRINGERS ON FORMERS 2 TO 10. STRINGERS PROJECT 1/16".
TRACE OUTLINES & REVERSE FOR COMPLETE FORMERS.
FULL SIZE 1/2 FORMERS.
BAMBOO PEGS TO PICK UP WITH FORMER 12.
FORMERS ARE CUT FROM .8 MM. PLYWOOD.
STRINGERS 1/8" x 1/16 HARD BALSA NOTCHED INTO FORMERS.
NOTCHES 1/8" x 1/16"
·PLATE 2·
The MINERVA
·AHS·

THE "MINERVA"

By J. E. FRASER

Full-size plans for building this attractive gull-wing streamlined biplane, illustrated on the front cover of this issue, are available from THE AERO-MODELLER offices, price 2/6, post free.

THE best method of building the fuselage is to temporarily stick cardboard centres on to formers and cut out squares corresponding to the size of rod on which it is to be assembled (the line D.L. should be taken as the centre of rod to ensure the fuselage being correct). The portion where the fillet occurs should be very carefully built, the $\frac{1}{16}$ in. sheet rib being glued on where shown and the nose and tail of the fillets carved to fit. The two stringers which comprise the fillet should be stuck on and the whole carefully sandpapered. The nose former should be faced up with $\frac{1}{32}$ in. ply. The fuselage tissue should be applied in strips with the grain running along the fuselage.

Wings and Tail Unit.

These are constructed in the usual manner, the leading edge being carved to shape after the job is dry. The gull portion of the top wing is set at 0° incidence on the fuselage, the ribs C and D being set at an angle to ensure that the correct incidence is obtained on the top wing. The wing interplane struts are sanded to a streamline section and glued to the appropriate ribs. (I do not think it is advisable to make the wing struts detachable). The wing pegs should be a firm fit in the boxes so that no vibration will be present. Care should be taken when covering that the wings do not warp, as this is fatal.

Tail.

The fin and tail-plane are of straightforward construction, and should be covered before assembling on to the removable tail piece, the tail being set at 0° incidence. Again, great care should be taken to ensure that the tail-plane does not warp.

Nose-block and Propeller.

These are of normal construction and are detailed on the drawing. Hard balsa should be used and the utmost care taken in balancing the propeller. The original machine weighed 6 oz. and required 14 strands of rubber $\frac{1}{16}$ in. by 1/30 in. by 30 in. long.

Flying.

The model should balance slightly behind the mainspar on the top wing. First glide over long grass, and when it is o.k. (if model does not balance a small amount of Plasticine may be used as ballast) put on 100 turns and launch gently into wind. If o.k. the number of turns can be stepped up gradually until 900 turns is reached, the rubber being well lubricated and stretched while winding.

Continuing THE "KAMLET" — By M. R. KNIGHT

CUT six pieces of $\frac{1}{4}$ in. by $\frac{1}{8}$ in. balsa, 2 in. long, to form horizontal cross-struts 4, 5 and 6. Touch their ends with cement, and when dry cement them into place. Care will be needed not to dislodge the fuselage sides or jigs. Allow the structure to dry thoroughly before proceeding to the next stage of assembly.

Draw the rear ends of the sides together until they meet on the centre-line A. Cement them together, and hold them in position while drying with a paper clip, as in Fig. 5. Two drawing pins should be used to hold the longerons flat on the board at this point.

Similarly, draw the front ends together until their outer edge is $\frac{1}{2}$ in. from line A, and secure with pins. This will bring the front edge slightly to the rear of line B. Mark the exact centre of the short edge of the front bulkhead. Cement the bulkhead by its balsa face to the front edges of No. 1 uprights, also cement the marked short edge to the building-board with the mark on line A. Its sides must be flush with the outer edges of the uprights. While holding firmly in place, push one or two pins through the plywood face of the bulkhead into the uprights, so that nothing can move while the cement is drying. Also, secure the longerons to the board by means of two drawing pins just behind No. 2 uprights. Note all these points, particularly the position of the bulkhead in relation to the front uprights in Fig. 6.

In the meantime you can be cutting the series of triangular pieces of $\frac{1}{16}$ in. sheet which are to rest on the horizontal cross-struts which unite the top longerons, and support the stringer which forms the backbone of the decking. They are shown on the blue print. Note the direction of the grain of the wood.

The remainder of the horizontal cross-struts can now be made and fitted. One pair should be cemented to the rear face of the front bulkhead. At position No. 9 the longerons must be carefully pulled apart to take a cross-strut $\frac{1}{8}$ in. in length. All other cross-struts can be cut to fit the space available. At position No. 10 the strut is omitted between the top longerons, as it would hinder access to the motor.

When you have time to complete the assembly of the fuselage, remove all the drawing pins, cut away the assembly jigs, and separate the fuselage from the building-board at all points where the cement may be holding it, by careful use of a razor blade. The stringer supports can now be cemented to their respective cross-struts. Remember that the fuselage was inverted while on the building-board, and should now be turned over, and the supports affixed to the flat top. For the stringer steam to shape a 16 in. piece of $\frac{1}{8}$ in. by $\frac{1}{8}$ in. balsa, cement it into the slots at the top of the supports, and cut it flush with the front of the bulkhead and with No. 9 support.

If preferred on the score of simplicity, the stringer can be left continuous, and the cockpit shown on the blue print omitted. But it is easily constructed, and serves to impart a realistic appearance to the model. When the two shaped pieces of balsa sheet are cemented between the outer edges

(*Continued on page 550*).

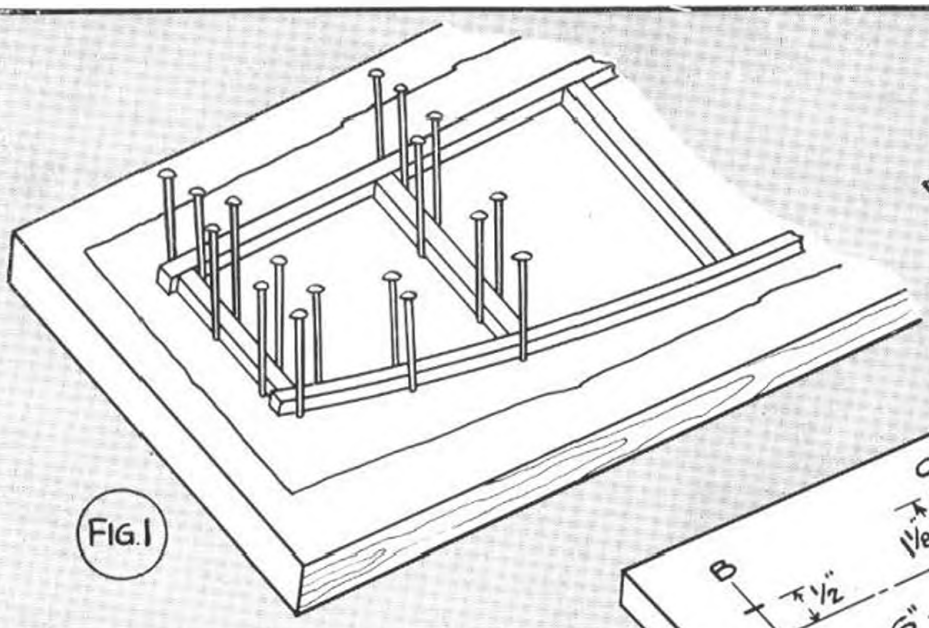


FIG.1

FIG.2

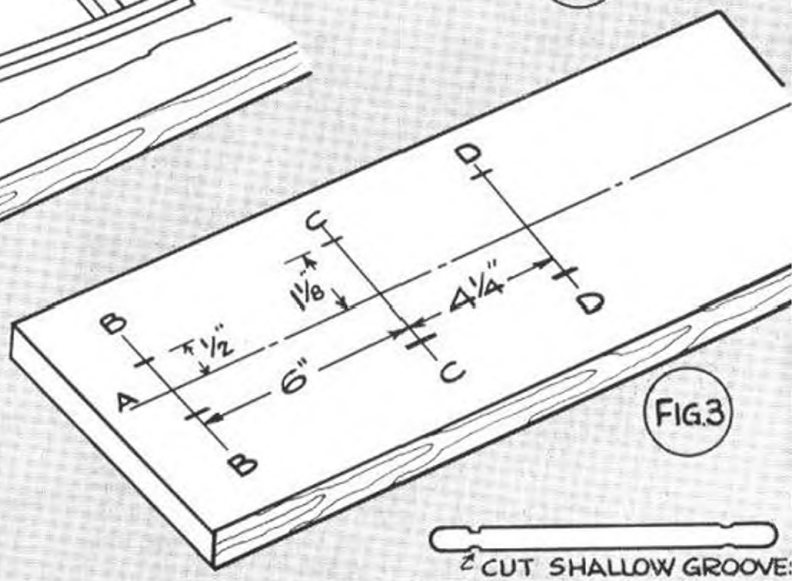
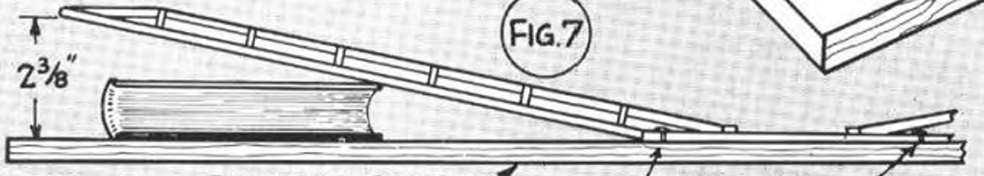


FIG.3

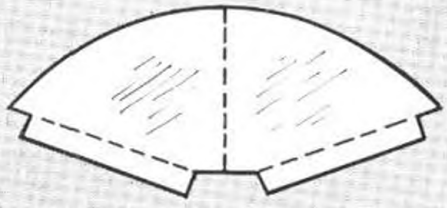
2 CUT SHALLOW GROOVES
⅛ DIA. BIRCH MOTOR PEG

FIG.7

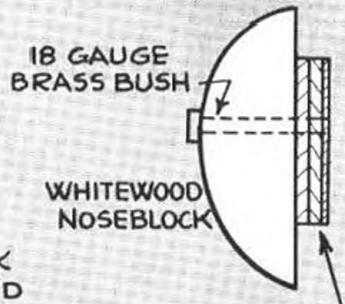


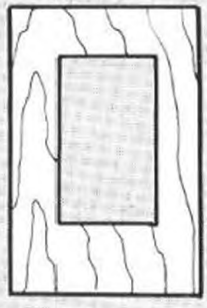
BUILDING BOARD

DRAWING PINS



WINDSCREEN - CUT FROM THICK CELLULOID, BEND ALONG DOTTED LINES, INSERT "FEET" IN SLOTS IN PIECES (K) AND CEMENT.

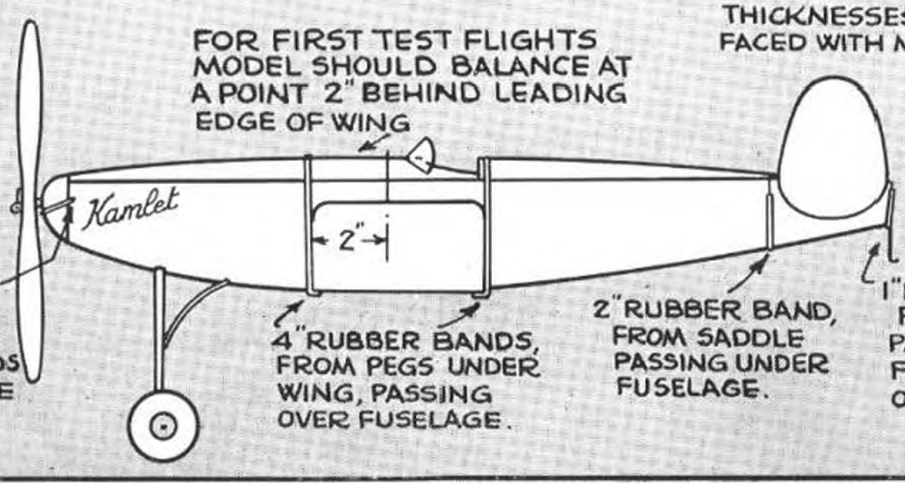




FRONT BULKHEA
1/16" BALSA SHEE
FACED WITH
MILLIMETRE PLY

"ADAPTOR", WHICH FITS INTO BULKHEAD, TWO THICKNESSES OF 1/16 SHEET FACED WITH MILLIMETRE PLY.

FOR FIRST TEST FLIGHTS MODEL SHOULD BALANCE AT A POINT 2" BEHIND LEADING EDGE OF WING



BAMBOO PEG

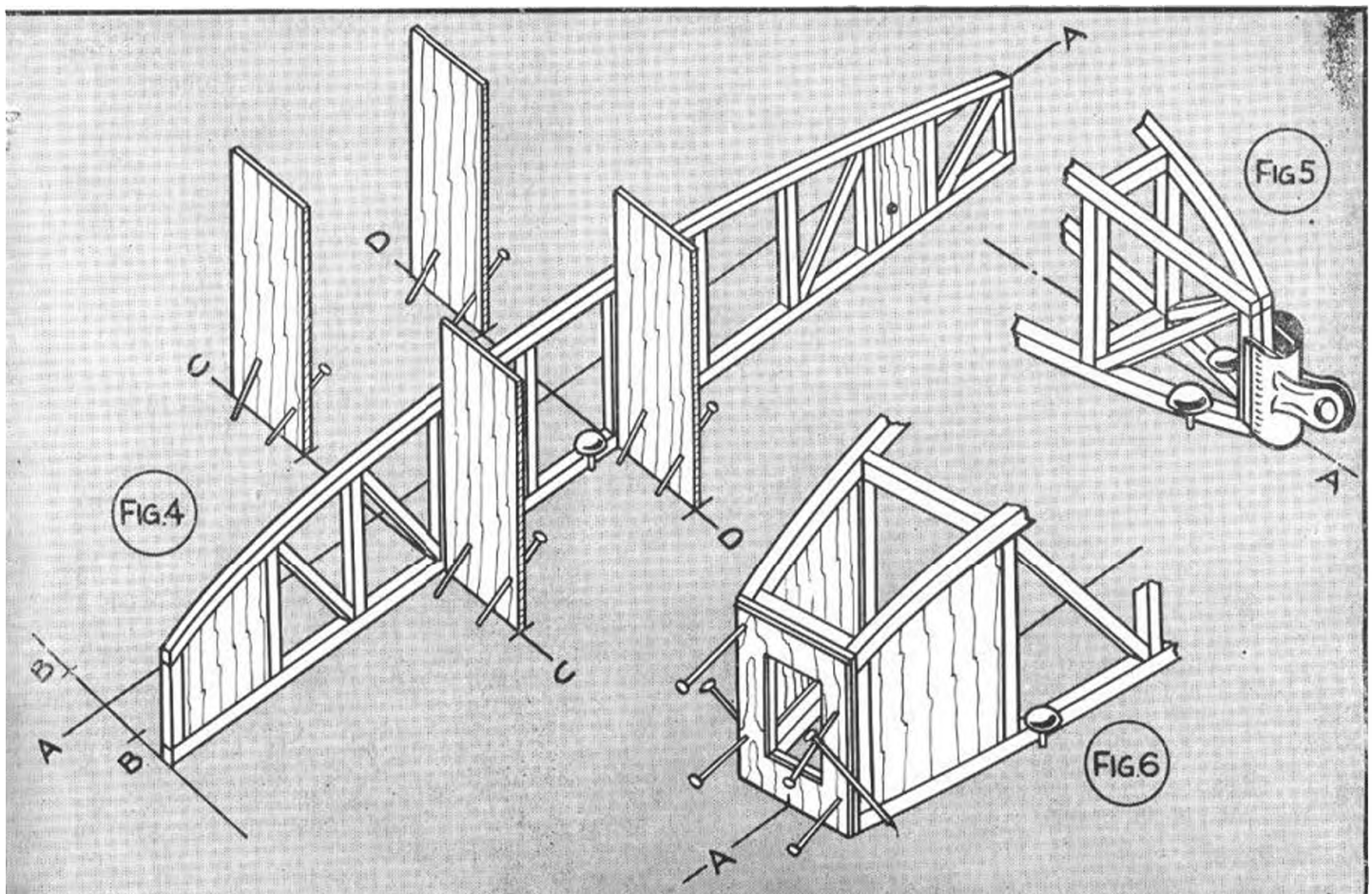
1" RUBBER BAND HOLDS NOSE PIECE FIRM.

4" RUBBER BANDS, FROM PEGS UNDER WING, PASSING OVER FUSELAGE.

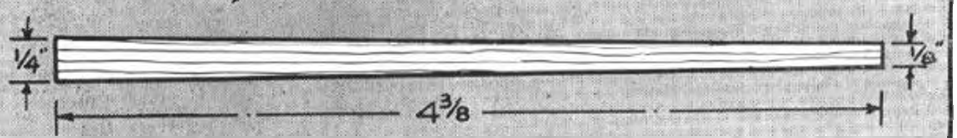
2" RUBBER BAND, FROM SADDLE PASSING UNDER FUSELAGE.

1" RUBBER BAND FROM SADDLE PASSING UNDER FUSELAGE AHEAD OF TAIL-SKID.

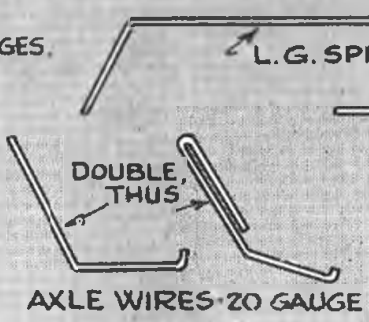
PLATE 2

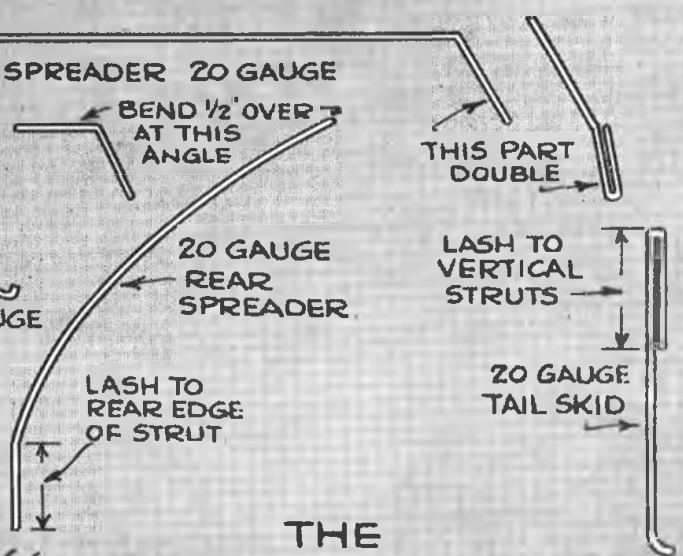


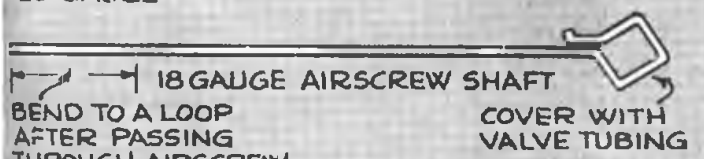
FULL SIZE REINFORCERS (L) MAKE 2 FROM MILLIMETRE PLY, GLUE TO INNER EDGE OF LEADING & TRAILING EDGES.

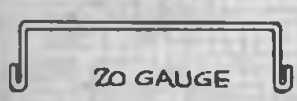


BAMBOO L.G. STRUTS · 1/16" THICK.









66 THE KAMLET 99

· FULL SIZE DETAILS ·

AHS

of the top longerons and the stringer, they can be sanded down, and the slots cut. The windscreen is cut exactly to the size and shape shown on the blue print, and bent along the dotted lines. The projecting " feet " are then coated with cement, and slipped through the slots prepared for them. When dry, the stringer can be cut away in the region of the cockpit.

Provision now has to be made for the attachment of the undercarriage. Two pieces of 20 gauge brass tube are needed, one corresponding to the width of the fuselage at No. 2 cross-strut, and the other conforming to the width at No. 3. They can be cut from the length by filing and then breaking. Small holes are now drilled through the bottom of No. 2 uprights, so that the front tube can be slipped through, and rest on the lower longerons and the adjacent cross-strut. Cut small nicks in the front bottom edge of each No. 3 upright, so that the rear tube can also rest on the longerons and cross-strut. Each tube should be scored with a file before slipping into place. It can then be secured to the lower cross strut by glued cotton, and will not pull out when the undercarriage is fitted or withdrawn. Finally, fit the small triangular gussets of $\frac{1}{16}$ in. balsa sheet to reinforce the longerons at position No. 3.

A reinforcing piece of sheet, $\frac{3}{4}$ in. from front to back, can now be cemented behind No. 1 horizontal cross-strut, as shown in the plan view on the blue print. Now form the tail-skid from 20 gauge wire, lashing the doubled end to the inner face of the end uprights. It may be necessary to cut away the inner edges of the lower longerons to accommodate the skid without forcing.

The Nose-Piece.

Take the piece of plywood which you cut out of the front bulkhead, and with Durofix or glue attach it to two thicknesses of $\frac{1}{16}$ in. sheet. When dry, the sheet can be cut to correspond with the plywood, and the adapter thus formed glued to the centre of a block of whitewood $1\frac{3}{4}$ in. by 1 in. by $\frac{1}{2}$ in. The plywood face of the adapter should be outwards. When dry, slip the adapter into the front bulkhead, and if there is much movement glue thin pieces of card to its edges until it is a firm fit. Then, with it in position, pencil on the rear face of the nose-block itself the outline of the bulkhead . Next, mark on the adapter the position of the hole for the propeller shaft, which should be $\frac{1}{4}$ in. from its top edge (see blue print), and equi-distant from each side. With the aid of a set square carry a horizontal line around the block from the point you have marked to a corresponding position on the front.

For a reason which will be explained later on, we want the propeller shaft to point slightly to the left, as viewed from the front of the model. Therefore, transfer the mark on the face of the nose-block just under $\frac{1}{16}$ in. to the left. With a bradawl bore rearwards from this point, and forwards from the mark on the adapter, until there is a hole right through. Great care should be taken with the drilling, so that when the brass bush is in place, the propeller shaft which passes through it shall be held at exactly the right angle. It must not point too far to the left, neither must is point upwards or downwards, but be parallel with the top longerons. Test it with a short straight length of wire. If incorrect, plug the hole with whitewood, and drill it with greater accuracy.

Before cementing the bush into position, carve the nose-block to shape with a sharp knife (or a razor blade, provided that you can manipulate this fearsome instrument without the opposite edge carving into the fingers!) It should be rounded off so that it carries on the lines of the fuselage. Check this by occasionally slipping it into the bulkhead, and when you are satisfied finish off with medium and then fine glasspaper.

It is a good plan to cut a $\frac{1}{2}$ in. circle of plywood, and drill a hole large enough to slip over the brass bush, the object being to prevent the latter being pulled into the face of the block by the rubber motor. Slip it over the bush, and then slip the latter partly into position. Give the sides of the bush, and the rear face of the plywood ring a good coat of glue, and carefully push the bush right home.

The Propeller Shaft.

The propeller shaft is formed from a piece of 18 gauge wire $4\frac{1}{2}$ in. long. It can be cut with cutting pliers, or broken off by gripping it firmly with flat-nosed pliers, and bending it backwards and forwards. With a small pair of flat-nosed pliers, form the diamond hook, beginning with the $\frac{1}{16}$ in. turned-over end. The hooked shaft should lie flat on the board. If the hook is out of alignment with the straight part, the propeller will vibrate, and the model will not fly properly. Do not hesitate, therefore, to scrap it and try again if necessary. It is well worth the cost of the wire, even in these times, and soon you will be sufficiently competent to fashion it correctly at the first attempt.

Slip the straight part of the shaft through the hole in the adapter, thread on a cup washer, and then slip the propeller on to the shaft, with the flat (or possibly hollow) sides of the blades towards the nose-block. Slip over the shaft another cup washer, and with round-nosed pliers form the loop in the front of the shaft. Study the blue print in connection with all these points.

The next job is to make the free-wheel pawl from a piece of 20 gauge wire. You will find it easier if you bend a 3 in. piece of wire around another piece of 20 gauge, and after continuing the loop, cut away the surplus. Fasten the loop of the pawl to the face of the propeller exactly $\frac{7}{16}$ in. from the shaft, by means of a thin $\frac{1}{2}$ in. tack. The pawl must be free to swivel, and the size and position should be exactly as shown on the blue print to ensure that the propeller shall free-wheel when the rubber motor is unwound. The object is to reduce resistance, and so flatten and therefore prolong the glide.

The Undercarriage.

Cut two pieces of bamboo, $4\frac{3}{8}$ in. by $\frac{1}{4}$ in. by $\frac{1}{16}$ in., to form the undercarriage struts. Narrow them down until one end is just over $\frac{1}{8}$ in. wide, and smooth the sharp edges with glasspaper. The fittings at the $\frac{1}{4}$ in. (top) end are of 20 gauge wire, and are lashed into place with glued cotton. Those which hold the wheels are also of 20 gauge. Begin them by bending $\frac{1}{8}$ in. at right angles, slip on a wheel, and gripping the wire close to the wheel with small pliers, bend to the angle of the strut, as shown on the blue print. The part which is lashed to the strut is doubled.

Connecting the struts is a 20 gauge wire, the ends of which are doubled, and bent over for $\frac{1}{2}$ in. at an angle corresponding with that of the struts. Lastly, the two curved wires which act as shock absorbers are also formed from 20 gauge. The turned-over ends slip into the rear brass tube in the fuselage, and the fittings at the top of the bamboo struts slip into the front tube. Make sure that the wheels turn freely, and that they are not turned inwards or outwards, or the model will swing and probably overturn when rise-off-ground flights are attempted.

(*Continued in our next issue*).

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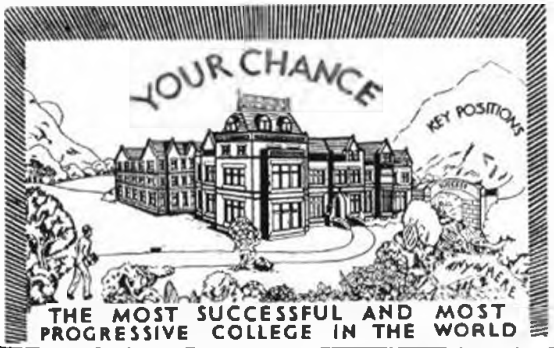

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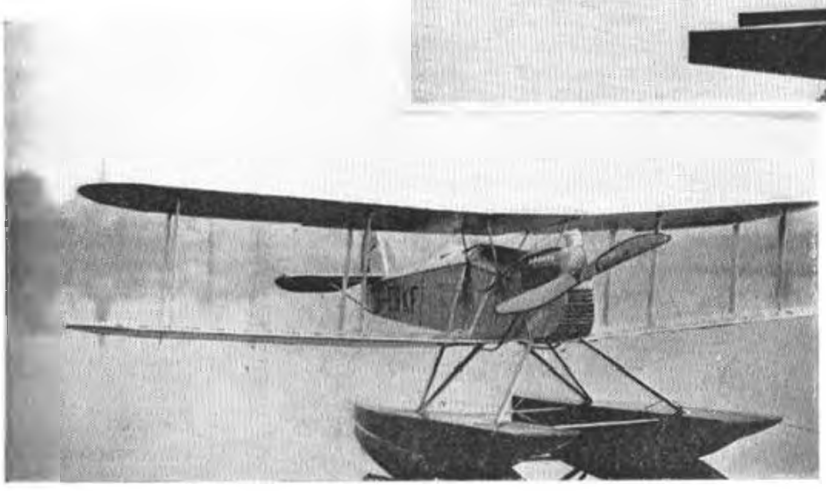
THE BLACKBURN "DART" SEAPLANE

By E. J. RIDING

SHORTLY after the last war the Blackburn Aircraft Co. Ltd. designed and built a single-engined torpedo-carrying aeroplane for use with the Fleet Air Arm. The "Swift," as it was called, was of unusual design. In the first case it was of composite construction. The forward part of the fuselage was made from steel tube, and the rear portion, together with the wings and tail surfaces, were of wooden construction.

Within a year or so the type was improved upon, the new version being called the "Dart." The Blackburn "Dart" was ordered in large quantities for Fleet Air Arm use and remained in service until 1928. It appeared both as a single- and two-seater, and was used by No. 460 Flight (H.M.S. "Eagle") and Nos. 461 and 462 Flights (H.M.S. "Furious"). Early in 1925 a further version the "Dart" seaplane, which is the subject of this month's article—was produced to serve the duties of a dual control machine for seaplane training. Comparison of the two photographs of the actual aircraft will show that all the characteristics of the original "Dart" were retained; in fact, the fuselage and wing construction embodied were practically the same as those used years before on the "Swift."

Once again the skill of Mr. Riding is demonstrated by these three photographs of his model. "Scale effect" is maintained to the extent of the model floating at the correct angle.



These photographs, taken by Mr. Riding, are a further example of how realistically model aircraft may be photographed, provided care is taken to correctly position them in relation to the background.

The machine was a single-seater, with folding wings to enable it to be stowed away aboard an aircraft carrier. It had a Napier "Lion" engine of 450 h.p., giving the aircraft a top speed of about 110 m.p.h. An 18 in. torpedo was mounted between the legs of its wide track split undercarriage, an arrangement which was then only in its infancy. Previously the firm had been conducting experiments with a machine which dropped its landing wheels with the torpedo and alighted upon a pair of skids.

As will be seen, the pilot had an excellent view in a forward, upward and downward direction on account of the downward slope of the fuselage decking and the position of the top centre section, which was placed on a level with the pilot's eyes, qualities which are essential in a deck landing aeroplane and just as important in a seaplane. The floats were made from mahogany and each was equipped with a sprung steel skid to take the place of a tail skid when the machine was brought ashore.

Photo, courtesy, "Flight."

The engine was the same old 450 h.p. Napier "Lion" and the top speed was about 100 m.p.h. Fuel was carried in a large cylindrical tank in the forward part of the fuselage, and a gravity tank was embodied in the top centre section. The wings folded and the inter-plane struts were wooden-faired steel tubes. All controls were standard, with the exception that the ailerons were actuated by a hand wheel mounted on the control column. Ailerons were fitted to both top and bottom wings.

The machine in the photograph, G-EBKF, started its career as a seaplane, but was seen by the writer as a land 'plane flying over Flamborough Head in 1929. It was owned by the North Sea Aerial and General Transport Co. Ltd., of Brough, East Yorkshire, who in those days controlled one of the four R.A.F. Reserve Training Schools. The school operated about nine of these machines, some of them "Darts" and the rest "Velos," a further development of the "Dart," the main difference being that it had a gunner's cockpit and could be adapted for dual control. These machines were ultimately superseded round about 1933 by the Blackburn B.2 trainer. Strangely enough, remains of several of the firm's "Darts" were still to be seen prior to the outbreak of the present war distributed around the Yorkshire countryside and car breakers' yards.

There used to be two at Leeds, one at Bentley and another at Stainforth, near Doncaster. Others were bought by private owners who, when the first novelty of possessing a £15 aeroplane of 150 h.p. had worn off, began to realise that they were not exactly a paying proposition, except perhaps for the petroleum companies.

A certain "Dart" owner from Hooton, near Birkenhead, flew down to the second Civil Air Display at Brooklands in 1933; his petrol consumption for the trip from Hooton to Brooklands was just on 63 gallons.

INSTRUCTIONS FOR BUILDING THE MODEL

The model illustrated was built about two years ago to a scale of 1 in. to 1 ft., and will appeal to the ever-increasing ranks of solid and semi-solid model builders as something out of the ordinary. The following building notes are of necessity very brief, and it will be obvious that a detailed description would occupy many pages. However, as the majority of scale modellers work on the solid principle, it is hoped that the accompanying sketches and plans will answer their requirements. The fuselage was built in three separate parts and assembled together at a later stage. The complete fuselage less engine bearers is shown in skeleton in Fig. 1. Following closely upon the lines of the full-size aeroplane, the front half of the fuselage was built up from lengths of $\frac{3}{32}$ in. dia. aluminium tubing to represent the steel tubular structure and the rear portion made from 1/12 in. square section birch strip. The skeleton framework is also shown on the general arrangement drawing in dotted lines. Eight $\frac{1}{16}$ in. by $\frac{1}{32}$ in. birch stringers were supported on ·5 mm. plywood formers down the back of the fuselage.

The rear portion from behind the second cockpit to the sternpost was covered with superfine jap tissue, and the remainder, up to the engine bearers, with thin white card.

The two photographs on this page are of the full-size aircraft.

Photo, courtesy, "Flight"

Photo, courtesy, "Flight."

The whole was given two coats of clear and two coats of silver dope. The registration letters, G-EBKF were black outlined in white and the fabric lacing, footholes, etc., drawn in with Indian ink. All controls worked from the cockpit and a suggested lay-out is shown in Fig. 7, and can be arranged inside the fuselage to the modeller's own requirements. Note that the elevator control levers are external, their position in relation to the cockpits being shown in the G.A. drawing.

The framework of the bottom centre-section, being integral with the fuselage, only required end-ribs and a covering of thin white card to complete it. The top centre-section was drawn out on paper and the $\frac{1}{16}$ in. sheet balsa ribs, $\frac{3}{8}$ in. by $\frac{1}{2}$ in. spruce spars, leading and trailing edges pinned into position over the drawing and cemented together. When dry it was mounted on four $\frac{1}{8}$ in. dia. aluminium wire struts and attached to the fuselage at the points shown in Fig. 1. 26 s.w.g. piano wire was used throughout for bracing, a typical strut and wire joint being illustrated in Fig. 5. The sockets and bracing lugs were made from 24 s.w.g. aluminium sheet. The chassis struts were made from $\frac{1}{8}$ in. dia. aluminium wire with balsa fairings bound into position by strips of jap tissue (Fig. 8).

The floats, since they were intended to support the whole weight of the model on water, were made from $\frac{1}{16}$ in. sheet balsa (Fig. 9), the sides and top each being in one piece with formers to take the keel, as shown. The bottom planking was put on in eleven sections after the three sides, formers and keel had been assembled. With a certain amount of care a very pleasing pair of floats can be made in this fashion. The finished floats were given several coats of clear dope on top of a covering of jap tissue, sanding to a smooth finish; finally both floats were given two coats of brown cellulose to resemble a natural mahogany colour. Incidentally, since the floats must be water tight, it is advisable to build up fillets of glue along all internal joints and seams. If it is desired a land undercarriage can be fitted —the general lay-out is shown in Fig. 2 and in dotted line on the G.A. In this case the shock legs are attached to the outboard ends of the bottom front centre-section spar, and the radius rods and other members to fittings on the outboard end of the rear spar and at the point of intersection with the bottom longerons.

The tail skid is shown on the G.A. in dotted line.

The wings and tail surfaces were built up in the same manner as the top centre-section, using $\frac{3}{8}$ in. by $\frac{1}{8}$ in. spruce spars, 3 64 in. or $\frac{1}{16}$ in. sheet balsa ribs, $\frac{1}{8}$ in. dia. birch leading edge and $\frac{1}{8}$ in. by $\frac{1}{16}$ in. birch trailing edge. Strut sockets and wing root attachment fittings were added before covering with superfine jap tissue. Control hinges were made as shown in Fig. 6, black carpet thread representing control cables.

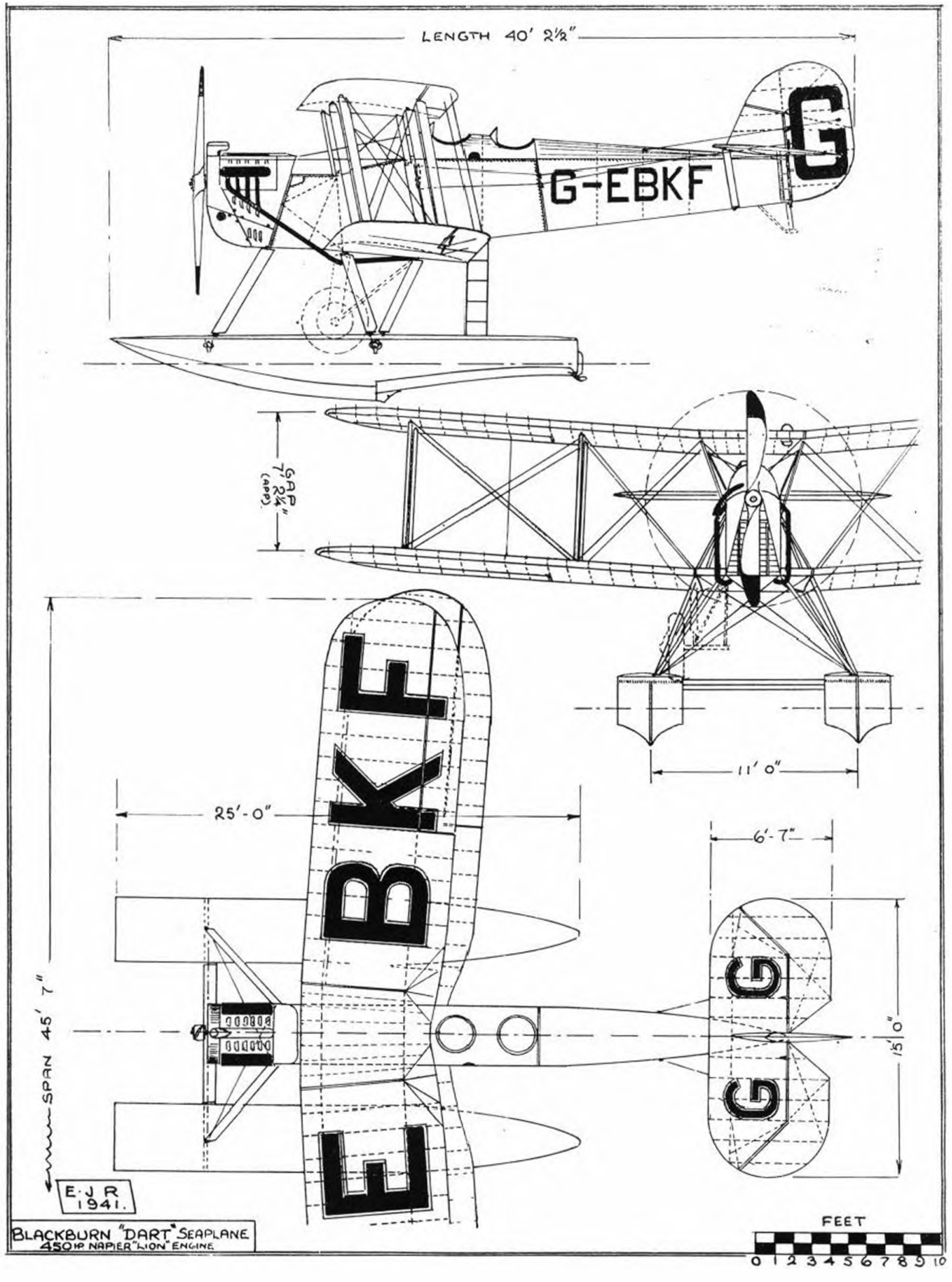
All flying surfaces were given two coats of clear and two coats of silver dope, and the registration letters painted as shown in the G.A. in black outlined in white.

In rigging the model it is advisable to box the wings together first, with all the struts in position, and offer them up to the root-end fittings on the two centre-sections. Stretch a length of thread from wing tip to wing tip, and adjust the dihedral of the 'planes until the distance from the thread to the top surface of the top centre-section is approximately 1¼ in. on a 1/12 scale model, then add the flying and landing wires (Fig. 4). The sweep-back is approximately 1¼ in. at the wing tips.

The engine cowling was made from thin white card and glued to the front end of the fuselage and engine bearers, apertures being cut out for dummy cylinder banks and cooling louvres. The radiator shutters shown in the front view were made from ·5 mm. ply and glued into position.

The finished cowling was painted silver to match the rest of the machine, all joints, turnbuttons, etc., being drawn in with Indian ink.

Final details such as dummy exhaust pipes, of which there are three, water header tank on top of the radiator, windscreens, airscrew, ladder from the port float to the fuselage and tail plane struts will complete the model.



BLACKBURN "DART" SEAPLANE.
450 HP NAPIER "LION" ENGINE.

A. B. C :- UNDERCARRIAGE ATTACHMENT POINTS

D, E :- CENTRE-SECTION ATTACHMENT POINTS

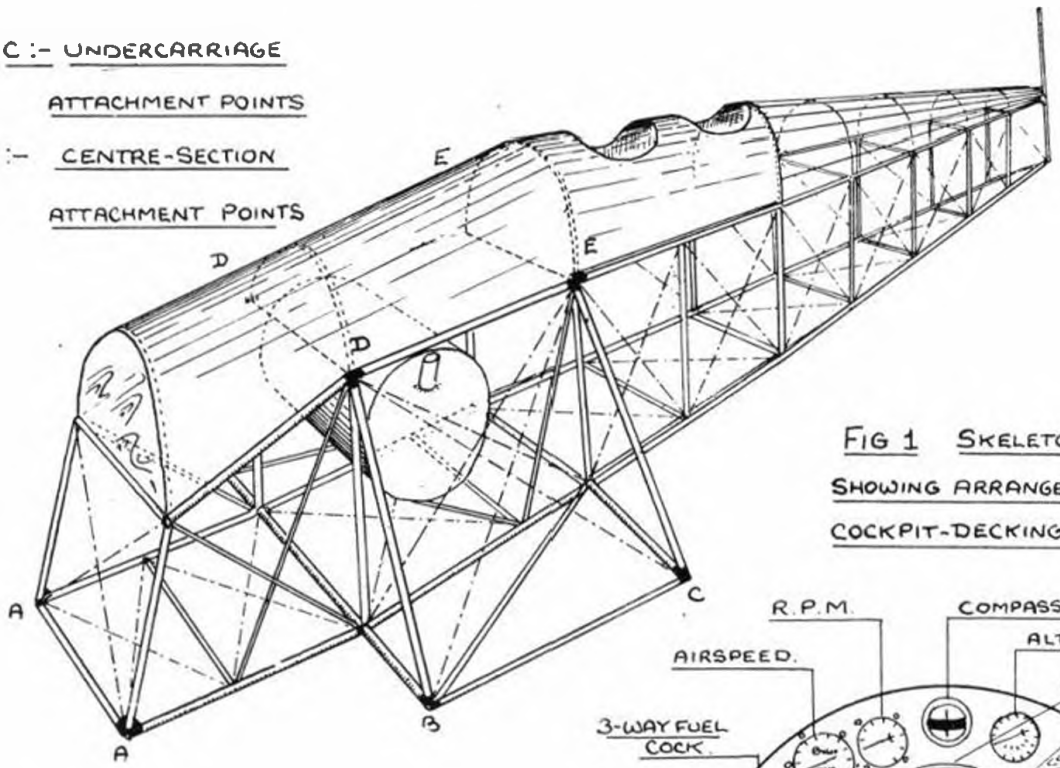


FIG 1 SKELETON FUSELAGE - SHOWING ARRANGEMENT OF COCKPIT-DECKING & FUEL TANK.

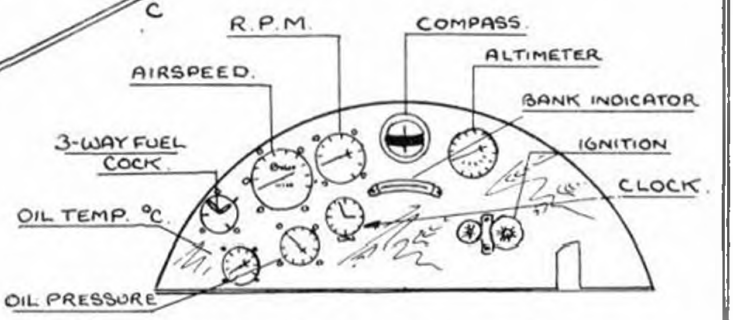


FIG. 3:- INSTRUMENT PANEL

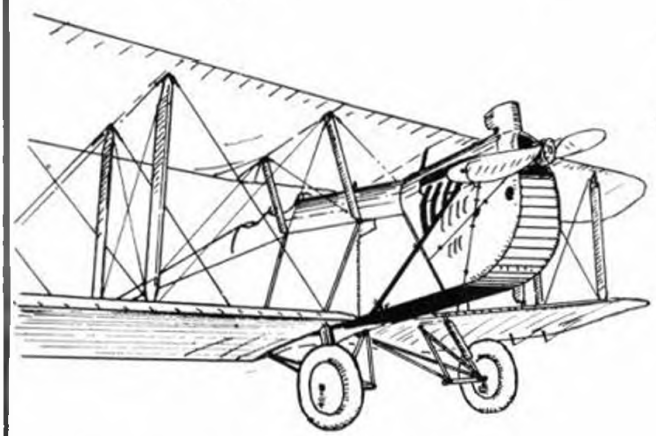


FIG. 2.:- LAND-PLANE VERSION OF BLACKBURN "DART" SHOWING ATTACHMENT POINTS OF CHASSIS.

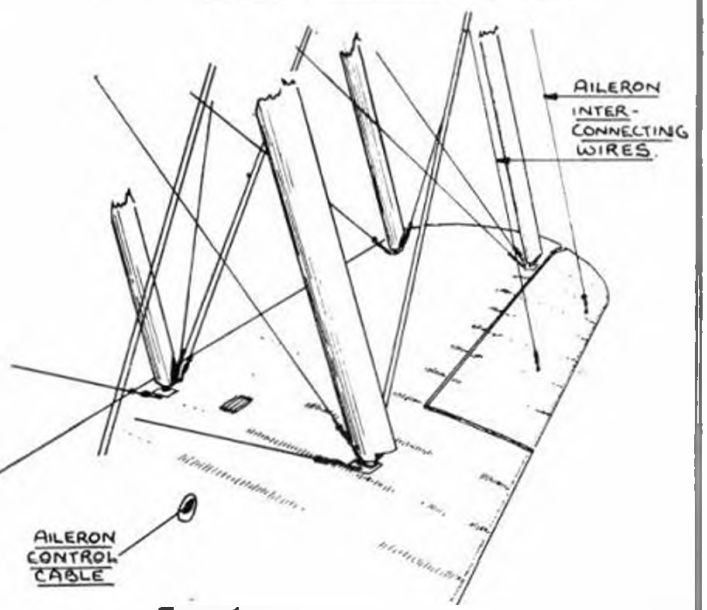


FIG. 4:- ARRANGEMENT OF INTERPLANE STRUTS & RIGGING., EMPLOYING DOUBLE FLYING & SINGLE LANDING WIRES.

E.J.R 1941

BLACKBURN "DART".

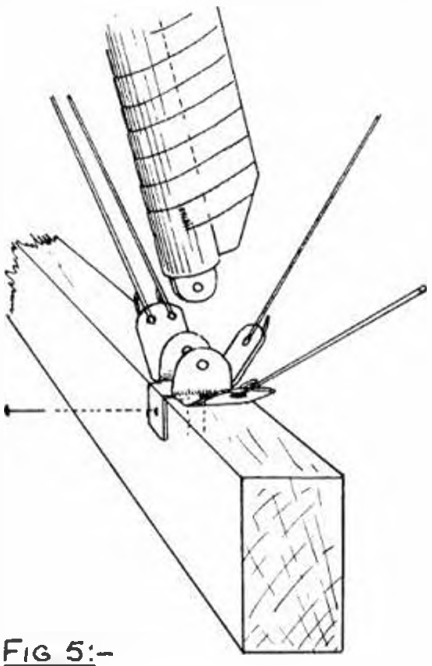


FIG 5:-

ATTACHMENT OF INTER-PLANE STRUT & BRACING LUGS TO WING SPAR (STARBOARD, INNER FRONT STRU.)

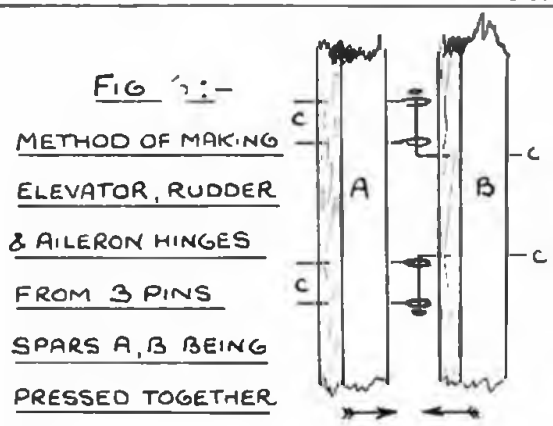


FIG :-

METHOD OF MAKING ELEVATOR, RUDDER & AILERON HINGES FROM 3 PINS SPARS A, B BEING PRESSED TOGETHER & PIN ENDS C, C CLINCHED OVER

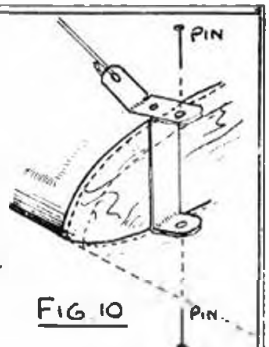


FIG 10

COMBINED BRACING LUG & WING ROOT ATTACHMENT AT CENTRE SECTION

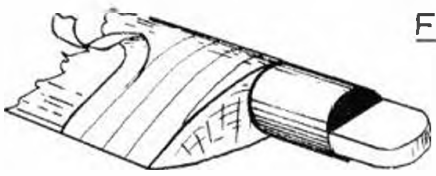


FIG. 8 - INTERPLANE AND CHASSIS STRUTS MADE FROM ALUM. WIRE FLATTENED AT ONE END & FAIRED WITH BALSA WOUND WITH JAP TISSUE STRIPS.

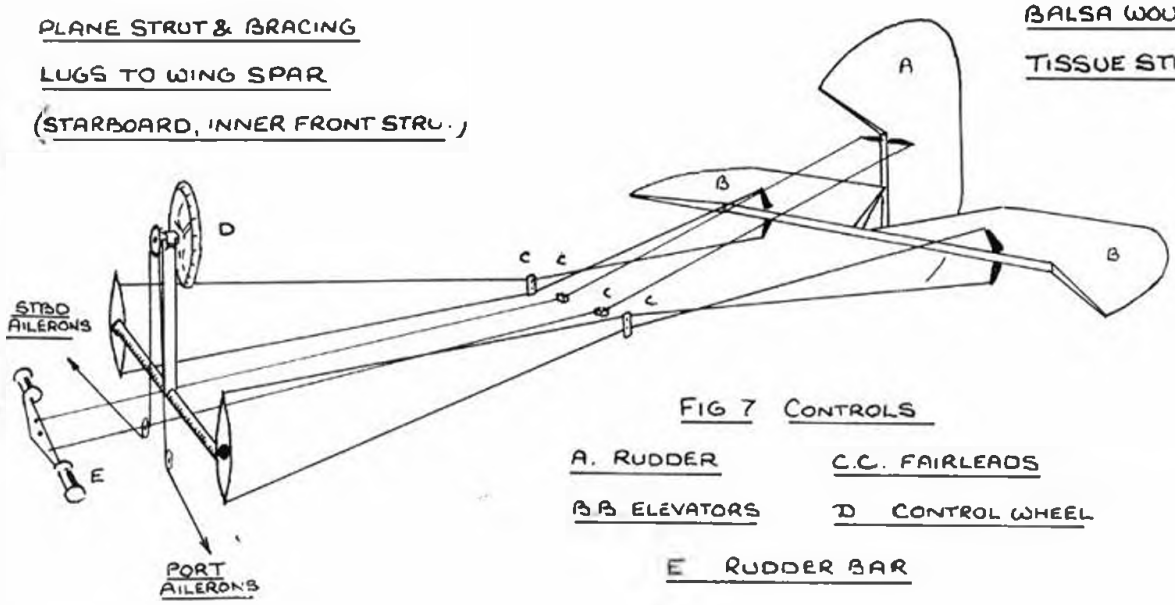


FIG 7 CONTROLS

A. RUDDER — C.C. FAIRLEADS

B B ELEVATORS — D CONTROL WHEEL

E RUDDER BAR

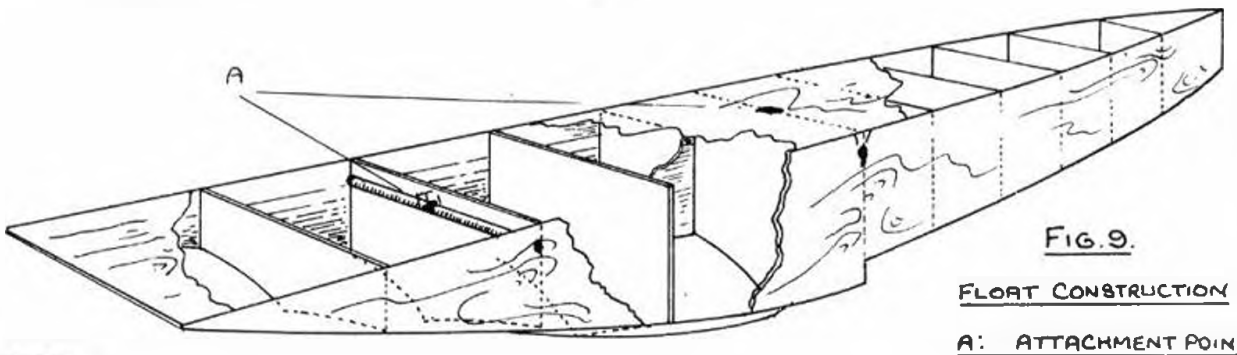


FIG. 9.

FLOAT CONSTRUCTION

A: ATTACHMENT POINTS OF CHASSIS LEGS.

E.J.R 1941.

BLACKBURN "DART"

QUESTIONS AND ANSWERS

CONDUCTED By the EDITOR

Q. *Can you tell me how the front part of the "Lysander" cabin slides, and the position of the wireless aerial? Does the "Blackburn Shark" cabin cover slide, and has it any bracing wires; also is a three-bladed propeller and spinner fitted?*—(P. L., Sheffield).

A. The pilot's cockpit in the "Lysander" has sliding doors either side, which move vertically. There is also a sliding panel in the roof.

The observer's cockpit has a cover which slides backwards over the fuselage.

The wireless aerial is fixed between the slanting mast above the cabin and the top of the fin.

The "Blackburn Shark" is not fitted with a cockpit cover.

The wings and tail-unit are wire braced.

Both two-bladed and three-bladed airscrews have been fitted, the latter being most commonly used. A spinner is not usually carried.

Q. *Can you give me details of the types of 'planes and colourings used in the Swiss Air Force?*—(R. J. D., Selsdon).

A. Aircraft include "Dewoitine D.26," "Dewoitine D.27," and "D.H.5" Trainers, "Fokker C.V.e" and "Potez 25" general purpose biplanes, "Dornier Do.24" flying boats, and "Bucker Jungmann" 2-seat initial trainers.

It appears that most Swiss aircraft are coloured silver. The national marking consists of a white plain cross on a red square, and is painted at each wing-tip and on the rudder. Sometimes the whole of the rudder is painted red with the cross in the centre.

Q. *Could you please give general details of the* 1918 *"Fokker" triplane?*—(R. H. R., Golders Green).

A. The dimensions of the "Fokker Dr.I" Triplane of 1918 are as follows:—Span (top plane), 23 ft. 7 in.; span (lower plane), 18 ft. 9 in.; span (centre plane), 20 ft. 6 in.; length, 19 ft. 0 in.; height, 9 ft. 1 in.; stagger, 9 in. (each wing); span of tail-plane, 9 ft. 10 in.

Q. *Can you give me details of the machines and their colourings of the Russian, Turkish, and Yugoslavian Air Forces?*—(F. O., Southend-on-Sea).

A. I am afraid there is little information available on Russian aircraft, but it appears that the "Z.K.B.19" is the latest known fighter. This aeroplane looks like a combination of the "Spitfire" and the "Hurricane."

The Turkish Air Service has a number of "Curtiss Hawk 75" monoplanes in service; also some Polish "P.Z.L.P.24" fighters. You will find information on these two types in "Aircraft of the Fighting Powers."

Turkish aeroplanes are camouflaged on top and are silver underneath. The national marking is a red square outlined in white carried above and below the wing-tips. The rudder is painted red and bears a white crescent moon and a five-pointed star.

Yugoslavian aircraft were formerly coloured all silver but is probable that some form of camouflage similar to our own has now been adopted. Markings consist of red, white and pale blue concentric circles, over which is a white Maltest cross edged with dark blue. Rudder markings are pale blue, white and red horizontal stripes, the blue at the top.

At the moment we have very little information on the "Ikarus IK 2," and "Rogojarsky IK-3" aeroplanes, but we hope to include the former in the "Fighting Aircraft of the Present War" series in a future issue of THE AERO MODELLER.

"Hawker Hurricanes" and special "Hawker Furies" are also in service with the Yugoslav. Air Force.

Q. *What is the difference between an autogyro and a helicopter?*—(A. J. K., London).

A. A helicopter is an aircraft on which the rotors are driven continually by the motor. An example is the "Focke-Wulf" helicopter. An autogyro is generally similar in appearance, but the rotors are started only by the motor, and are then revolved by the slipstream. The motor is used for forward speed, driving a normal airscrew.

Q. *Has the "Brewster Bermuda" a turret?*—(P. A. M., Surbiton).

A. The "Brewster Bermuda" as supplied to the R.A.F. will have a rear turret. In service in America this aeroplane is known as the 138 and is not fitted with a turret.

Q. *Has the "Vultee Vanguard" ever been fitted with an inline engine?* (A. B., Manchester).

A. The "Vultee Vanguard" has been produced in two forms—the "Vanguard 61" with a Pratt and Whitney "Twin Wasp" motor, and the "Vanguard 48C," also with a "Twin Wasp." The former has an experimental motor, and this is cowled in so that it looks like an inline engine.

Q. *Can you give me details of the Vengeance, Yale, Ventura, Kittihawk, Fieseler Fi* 167, *Arado Ar* 196, *MacGregor Fighter and Snargasher?*—(B. K., Coventry).

A. Plans to 1/72 scale of the following types will be given in the 1941 edition of "Aircraft of the Fighting Powers," which is now being prepared:

Vengeance, Yale, Ventura, Kittihawk, Fieseler Fi 167, Arado Ar 196.

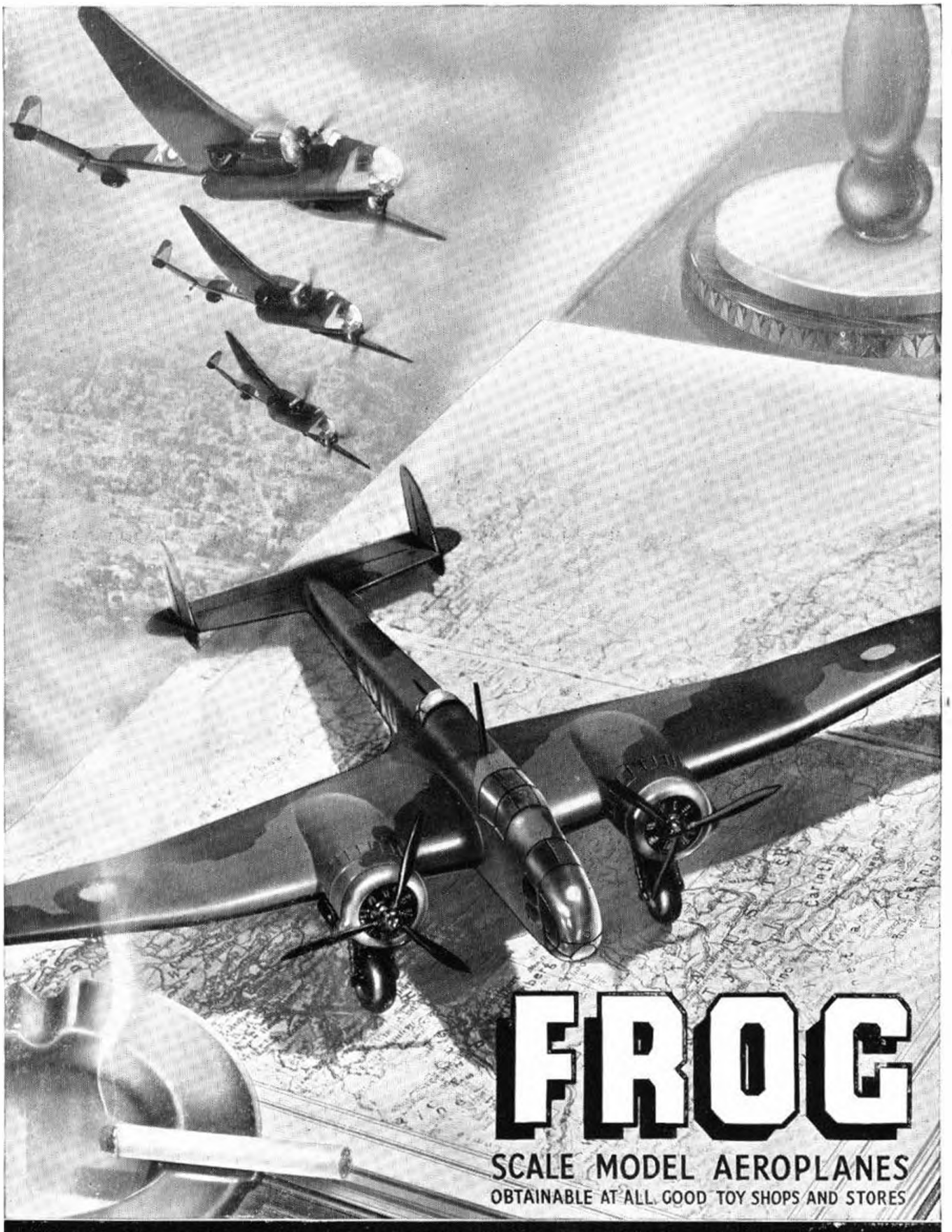
Of the other types you mention, the "MacGregor Fighter" and the Reid and Sigrist "Snargasher" are contained in the 1940 edition of Leonard Bridgeman's "Aircraft of the British Empire."

Q. *Which machine was called the "Hotspur"?*—(J. M., Cardiff).

A. It was intended to call the original "Hawker Monoplane" (now known as the "Hurricane"), the "Hotspur," but actually this name was never associated with it. The name "Hotspur" was later given to a two-seater monoplane similar to the "Henley." It was not put into production.

Q. *Can you give me details of the "Fairey Gordon" day bomber?*—(J. A. B., Betchworth).

A. One Armstrong-Siddeley "Panther" IIa 14 cylinder radial motor of 525 h.p. Span, 45 ft. 4 in.; length, 33 ft. 3 in.; height, 12 ft. 6 in.; wing area, 445 sq. ft.; maximum speed, 145 m.p.h.; armament, one Vickers gun firing forward and a movable Lewis gun over the rear cockpit. You may be able to obtain a general arrangement drawing of the "Gordon" to 1/72 scale if you apply to Messrs. A. J. Holladay and Co. Ltd. (makers of Skybirds), of 3 Aldermanbury Avenue, London, E.C.1.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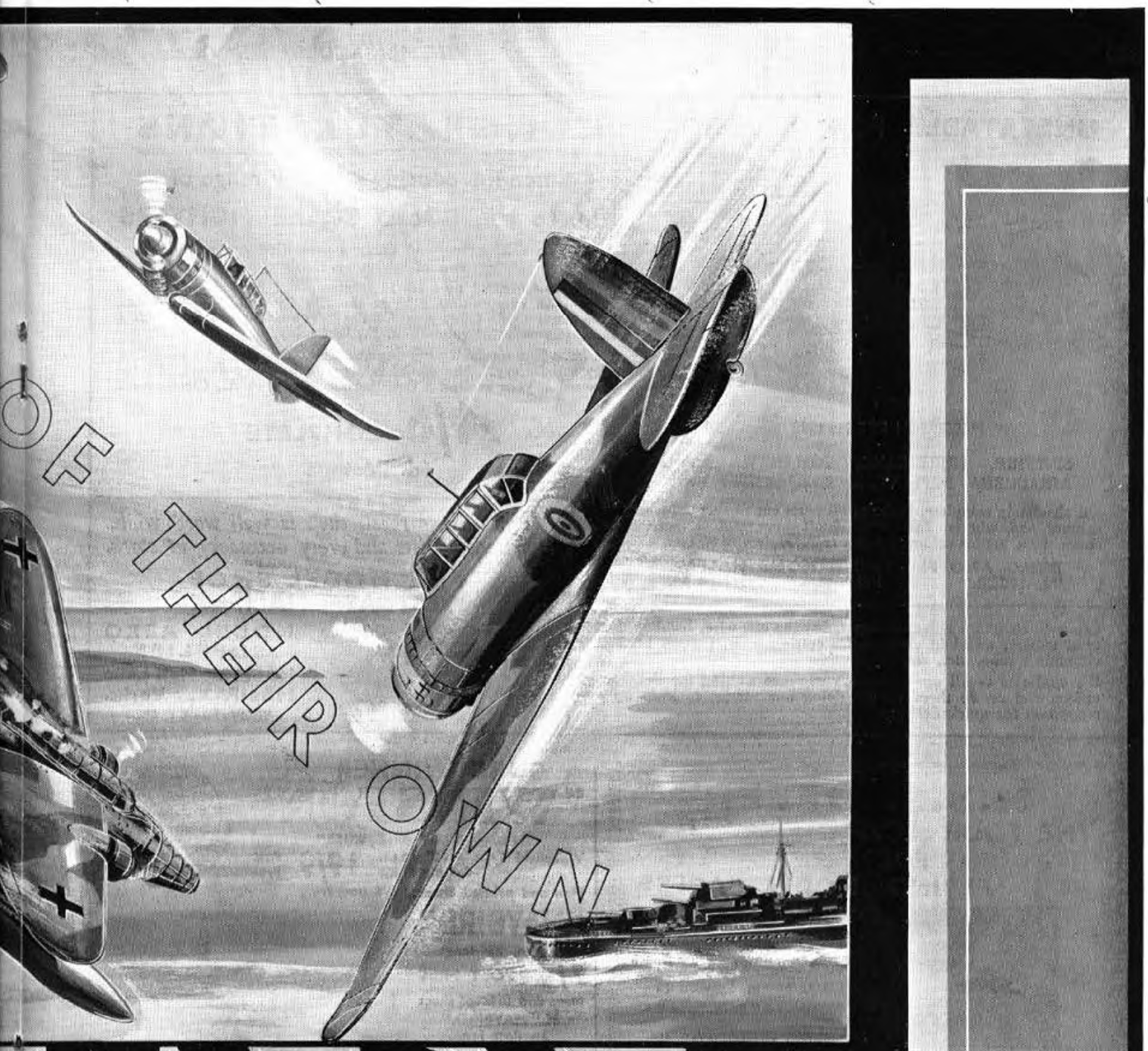

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GADGET REVIEW

CONDUCTED BY M·R·KNIGHT · ILLUSTRATED BY C·RUPERT·MOORE.

LAST month the Gadget Review dealt principally with undercarriages, the sameness of this mental diet being justified by the scanty attention paid by so many to this Cinderella among the aeroplane parts. This time we will indulge in aeronautical mixed grill.

First of all, an appetiser from Corpl. C. F. Hedges, R.A.F., who writes to express misgivings regarding the two-speed gear described in the August Review. He fears that the unmeshing of the gears might strip their edges, that the gears might become jammed, and that while the clutch was coming into operation the motor would unwind without turning the airscrew. One could suggest other unpleasant possibilities, but instead will offer the motto from my last Christmas cracker, "Cheer up; it may never happen." At any rate, the sender of the idea has worked upon it for nine months without his heart breaking. But perhaps he is blessed with the convenient variety that bends but doesn't break.

Corpl. Hedges, however, is no armchair critic. He is proposing to tackle this type of gear, and to use, albeit with misgivings as to weight, case-hardened gears and clutch. At present he is working in another way on this same problem of spreading more evenly over the flight the varying power output of the rubber motor. His idea is a kind of constant speed airscrew, with regard to which he invites criticism. Mounted on the airscrew-shaft (see Fig. 1) is a governor control, operating a spring-loaded arm which bears on a plate covered with friction material. The plate being conical provides a larger friction surface while airscrew-shaft rotation is at its fiercest, thus lessening the speed of the airscrew. The brass arm has so far shown some disinclination to withstand the considerable strain imposed upon it.

A simple, but exceptionally sturdy undercarriage used by Mr. L. Bird, of East Croydon, is shown in Fig. 2. Fitted with 1¾ in. wheels, and set well forward on a 30 in. duration model, it has been responsible for a very high percentage of three-point landings. The only disadvantage is that it is not detachable from the fuselage. The idea centres in the 18 gauge wire coils which, when a lathe is not available, can be formed in the following manner. A length of the wire, together with a piece of stout tubing or metal rod of suitable diameter, is gripped about 2 in. from the end in a strong vice. The wire is then wrapped several times around the rod, close winding being desirable. It is then cut to the required size, and securely bound to the lower longerons and vertical struts.

It is commonly supposed that hinged airscrew blades will automatically fold when the power cases. As a matter of fact, centrifugal force tends to hold them outstretched, and to enable them to be folded by the airflow it is customary to stop airscrew rotation by means of a motor trip. Mr. R. New, of Nottingham, employs a different procedure, his idea being depicted in Fig. 3. It will be seen that a taut rubber band links the two blades at the rear. This is prevented from functioning during power flight by the tension of the motor compressing a spring against an aluminium plate, the edges of which engage in a recess in the rear face of the blades, thus keeping them outstretched. When the power ceases, the spring extends, pushing the airscrew away from the plate, allowing the rubber band to collapse the blades.

The device is suggested for models with streamlined fuselages, and the angled hingeing of the blades secures a snug fit against the curving sides.

A method of enlarging ribs and shaped bulkheads, which has the merit of securing greater precision than is obtainable with many such devices, is shown in Fig. 4. It is by Mr. S. P. J. Ellis, of Ealing, and consists of a cardboard or wooden box, one end of which is replaced by a sheet of glass, and with a bulb-holder fitted at the other end. A bar, to which is attached a light bracket projecting into the box between the bulb and the glass, is secured to the sides of the box by a loop of rubber passed around it.

The rib or bulkhead to be enlarged is lightly cemented on top of the bracket, and the overall dimensions of the required enlargement are marked on a piece of tracing paper, which is laid over the glass. The bracket holder is moved up or down the sides of the box, until the shadow cast on the paper reaches the points indicated, when the outline can be pencilled. A 2-volt spotlight bulb will cast a clear shadow, if the enlarger is used in a darkened corner of the room.

One of the awkward features attending the use of a folding airscrew is the change of balance consequent upon the rearward movement of several inches of blade. This is lessened, of course, with a single-bladed airscrew, and Mr. H. Sutcliffe, of Rishton, near Blackburn, sends an ingenious idea, in which a forward movement of the balance weight and its supporting arm compensates for the rearward travel of the blade. (See Fig. 5). Blade and counter weight support are linked by a wire bracket, which is hinged at the centre. The folding of the blade thereby pulls the weight forward, the hingeing preventing the wire from resisting the process instead of facilitating it.

An incorrigible "anti-gadgeteer" like the reviewer cannot resist pointing out that a simpler solution of the problem would be to trim the model for the glide with the blade folded, and to lower the thrust line to overcome nose-heaviness with the blade extended.

Fig. 6 depicts an automatic tail control designed to eliminate stalls and dives. It is sent by Mr. A. J. Woods, of Newstead, near Stamford, and works by the pressure of the air against a small flat plate, on the lines of the strut-type air-speed indicator fitted to De Havilland Gipsy Moths. Extensions of the tail plane ribs support hinged elevators, from the front edge of which depends a vertical member (the sender trustingly suggests balsa, but the reviewer cynically prefers bamboo), which carries the flat plate. The idea is that normally the air-pressure against the plate will hold the elevators level, in a dive the increased pressure will raise them, and so bring the model out of the dive, while an incipient stall should be checked by the elevators dropping through their own weight.

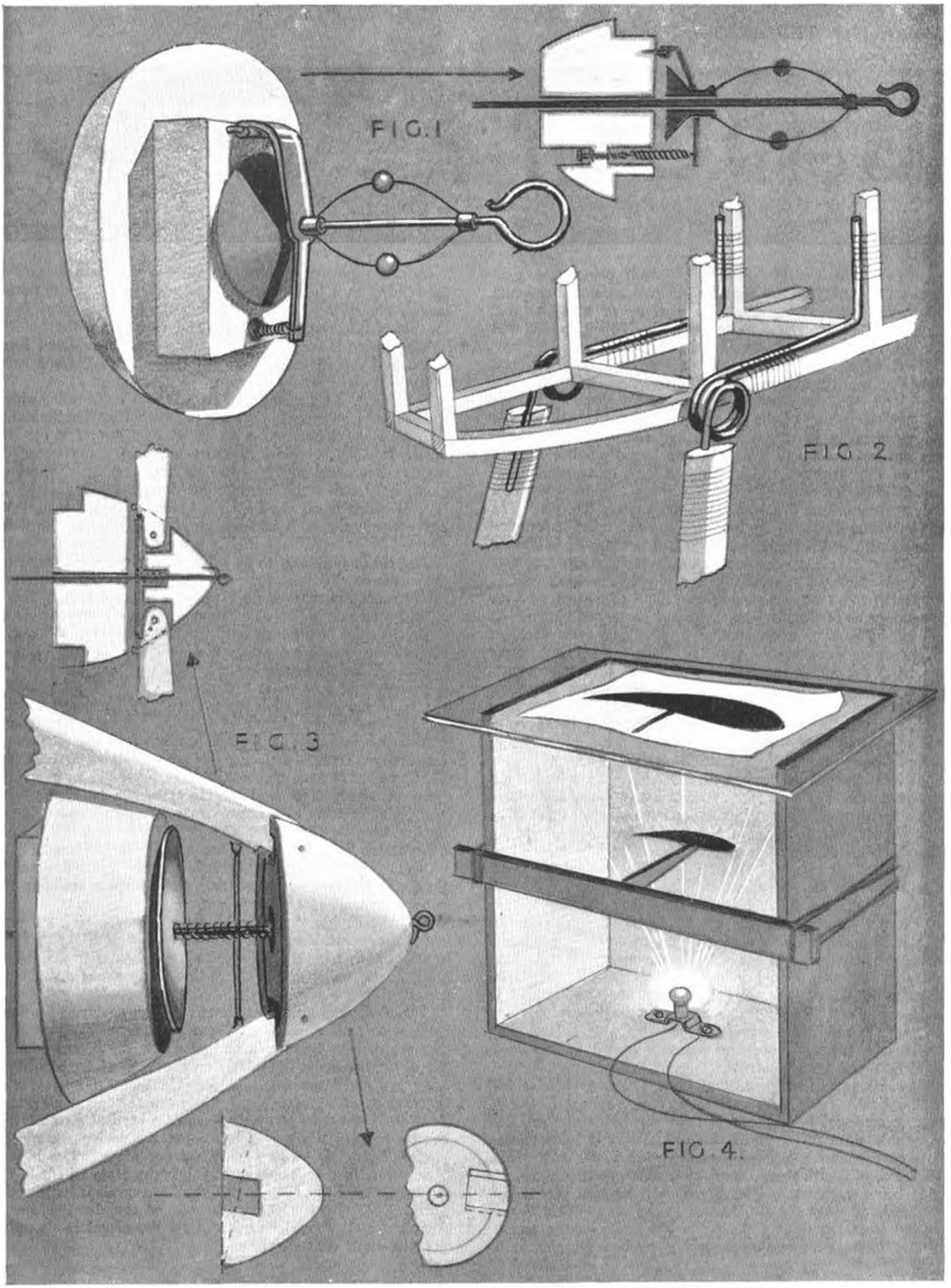
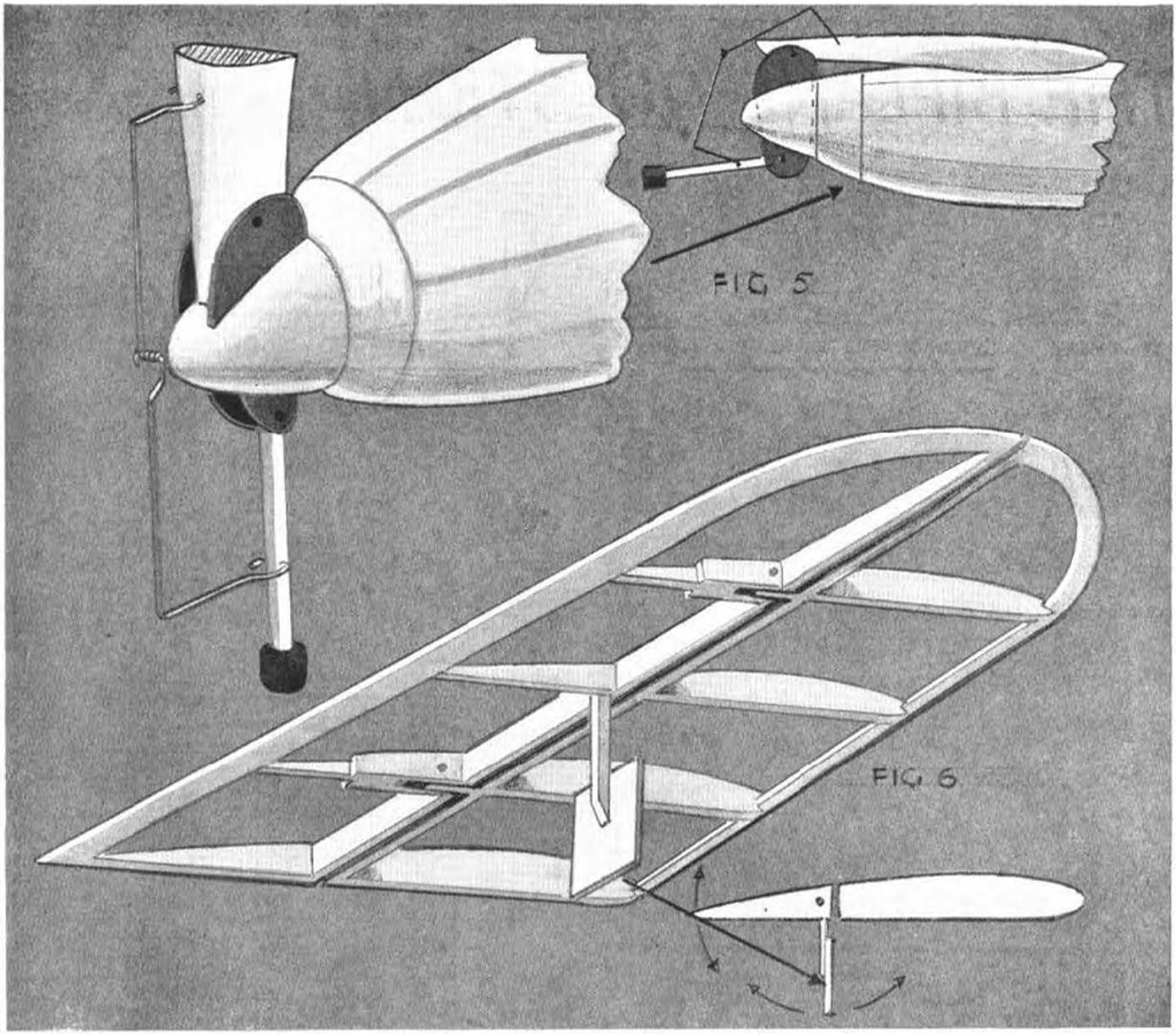


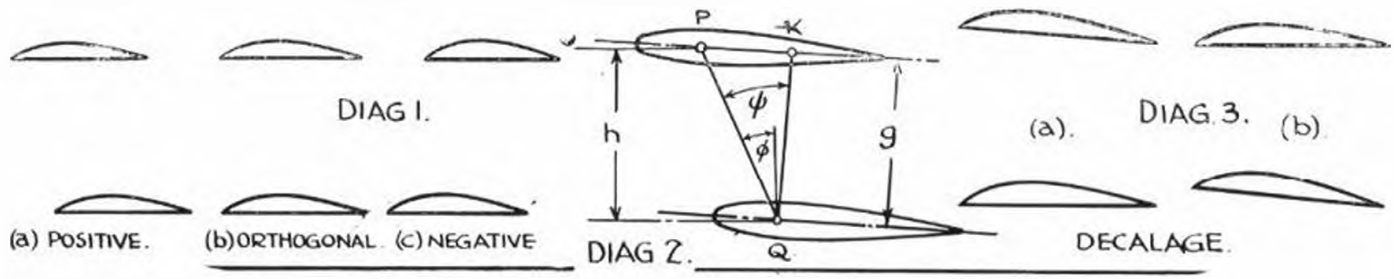
FIG. 1
FIG. 2
FIG. 3
FIG. 4.



In the writer's view the elevators would need to be spring loaded to give them a downward inclination, against which the air pressure against the plate would fight. Alternatively the trailing edge of the elevators would require weighting, which in model work is inconvenient, since the problem of keeping the rear end light without flimsiness is none too simple. Further experiments should prove interesting, particularly as such automatic tail control as the reviewer has encountered has tended to overact and cause undulating flight.

From two readers, independently of one another, has come a suggestion for using soap in place of greaseproof paper or tracing paper for protecting blue prints from cement while model parts are in process of construction thereon. Paper does tend to cockle with damp, thus obscuring detail, and preventing small parts from laying flat. And, of course, soap is a commoner commodity in most households than is waxed paper. Mr. E. C. Lucking, of Guildford, and Master A. L. Faucett, of Wellington College, Berks, suggest that soap damped, gently rubbed on the plans, and left to dry, will prevent adhesion of the cement.

THE BIPLANE QUESTION—By R. H. WARRING

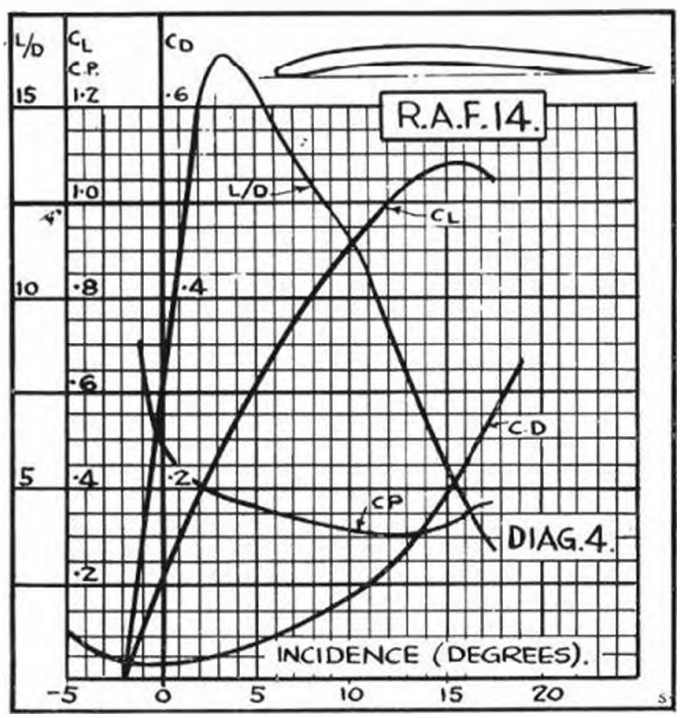


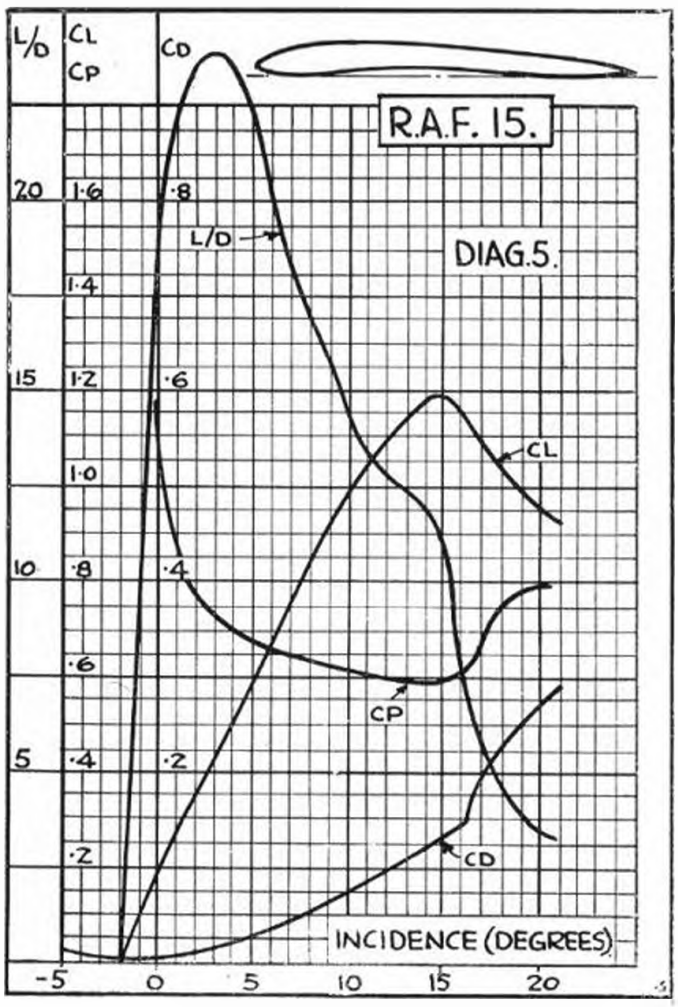
THE recent articles by Mr. Wathew and others on biplanes have opened a very interesting discussion on what is usually a neglected subject. Designing a biplane does not merely consist of putting another wing on to an existing monoplane and hoping for the best. It goes far deeper than that, and the purpose of this article is to set out the various characteristics and forms of biplane design, with their advantages and disadvantages. Anyone applying such knowledge should be able to design a biplane of maximum efficiency and not just build a "'plane with two wings."

First of all, let us deal with some definitions. Diagram 1 shows the three possible arrangements of the wings of a true biplane: (*a*) positive stagger, (*b*) neutral stagger, (*c*) negative stagger. If in (*b*) the two wings have the same dimensions and angle of inclination the arrangement is said to be *orthogonal*.

From Diagram 2 we get the various measurements of gap and stagger. Positive stagger is shown, but the same principle applies to negative stagger. *The geometric gap*, g, is the shortest distance between the geometric chord lines of the airfoils. In the case of an undercambered section the chord line may be taken as the line drawn through the trailing edge tangential to the lowest surface of the airfoil. The stagger is expressed as an angle. If P and Q are fixed points, one quarter of the chords from the leading edge, the angle which the line PQ makes with the normal to the geometric chord at Q is called the *geometric stagger*. If, however, P and Q are the centres of pressure of the two airfoils, the angle which the line PQ makes with the normal to the *airflow* is called the *aerodynamic stagger*. The *aerodynamic gap* in this case is equal to the perpendicular distance between the centres of pressure P and Q, i.e. h.

Finally, decalage. If the top wing is set at a greater angle of incidence than the lower, the system is said to have *positive decalage* (*Diagram* 3 (*a*)), or, if the lower wing is set at a greater angle, *negative decalage* (3 (*b*)).

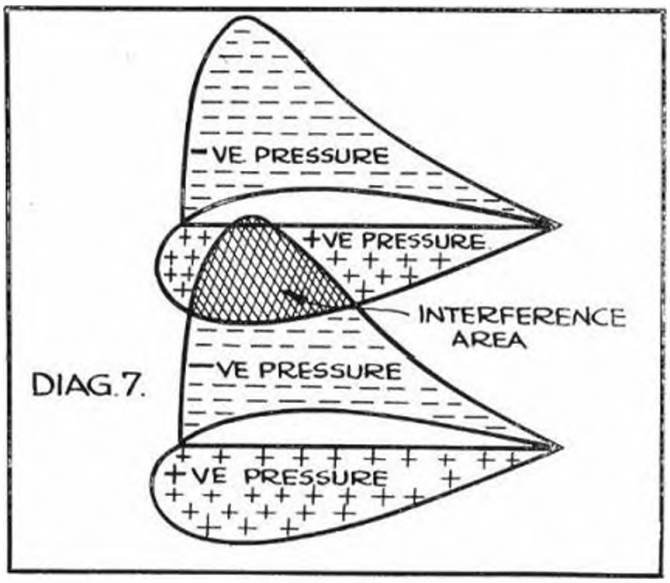




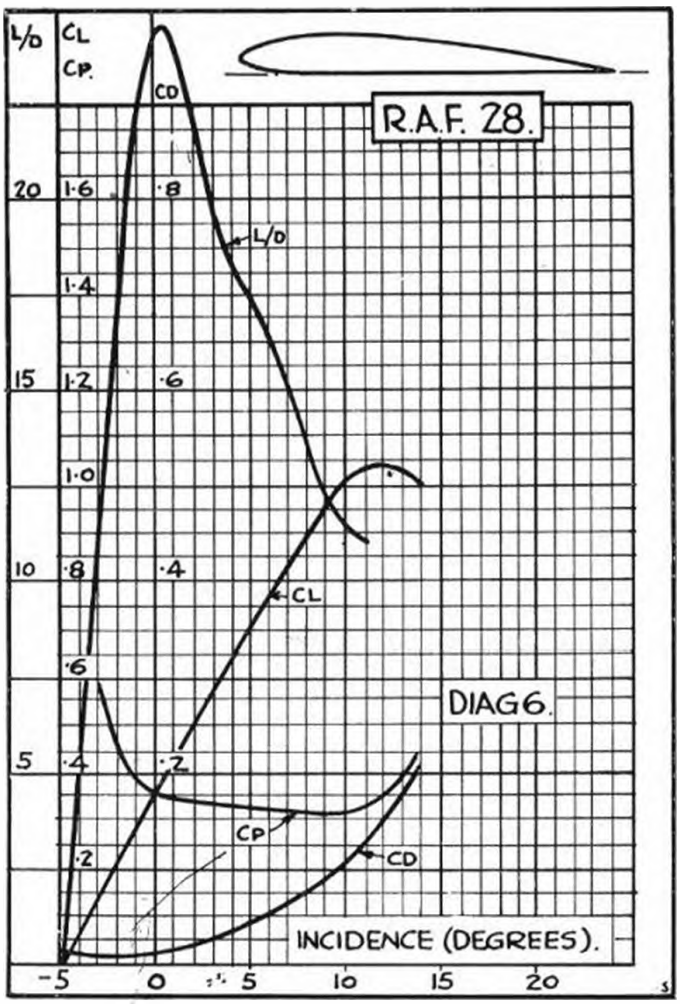
A true *biplane* is one in which both the upper and lower wings have the same dimensions; if the lower plane is smaller it is called a *sesquiplane*, but unless this latter reduction is considerable it is usual to refer to all two winged craft as biplanes (see end of article). This, of course, omits freak types, such as tandem monoplanes, in which the tail plane has grown to such enormous proportions and becomes in reality another wing. The " Flying Flea " is a bit of a problem in this respect. I prefer to call it a tandem monoplane, but some people still refer to the arrangement as " biplane," although there is then no tail surface. It is hardly a tailless biplane; that seems an unfair comparison with J. W. Dunne's " stable flying machine " of the 1909 era, but that is really beside the point.

One of the main advantages of a biplane combination is that it allows the use of thinner wing sections, and consequently smaller spar sizes and less constructional weight. On a model we can do away with inter-plane struts and bracing wires, and thus eliminate a great source of parasitic drag, although, of course, we must make the wing structure more rigid in compensation. As all model wings are built with an extremely high strength/weight ratio, this suits our purpose admirably.

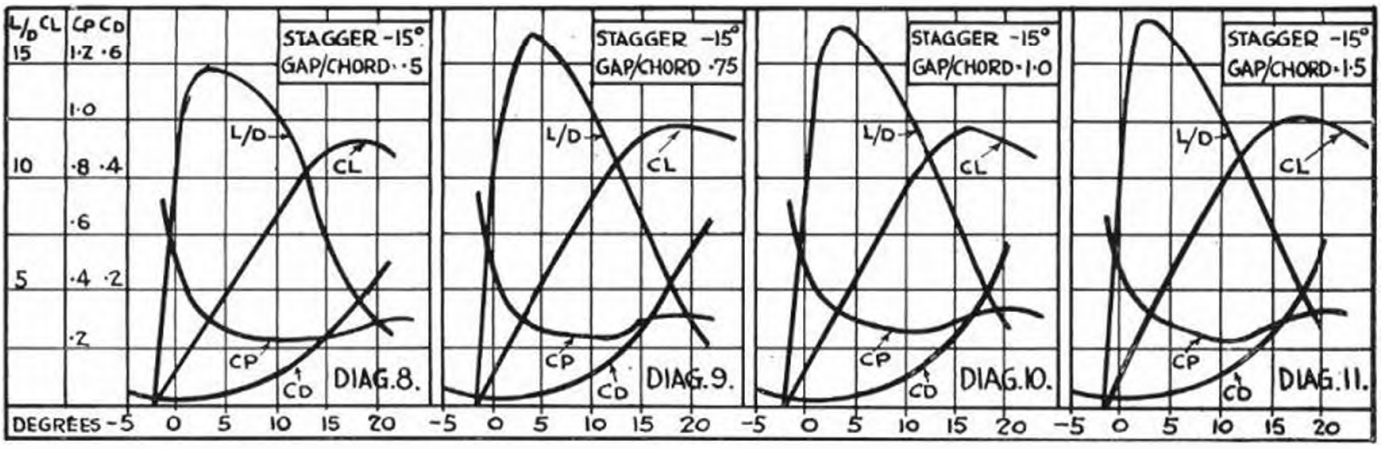
Too few people seem to realise that there are special biplane sections which they could quite well adopt for their purpose; using R.A.F. 32 section every time because " all the others do " shows a lack of constructive thought. Three sections given in Diagrams 4, 5 and 6 might well be considered by prospective biplane designers. R.A.F. 14 is a very thin section with a good L/D ratio and a reasonably large C_L maximum. R.A.F. 15 is a considerable improvement on this, with a L/D maximum of 24·4 occurring at a *positive angle of incidence of just over* 3°, and this could be used to considerable advantage. R.A.F. 28 is a general-purpose biplane section which has been thickened up to allow for larger spar sizes, but has no undercamber and is not so good as R.A.F. 15. You will notice from the graphs that the centre of pressure travel of the last two sections is reasonably stable. By studying Diagrams 4, 5 and 6 it would seem that R.A.F. 15 is a very useful section, and we shall deal with it again later on. Clark YH. Clark Y and the other model sections are a little too thick for our purpose; the resultant drag of such a biplane combination would probably be excessive.



DIAG. 7.



Now, it is a well-known fact that the wings of a biplane interfere with one another in various ways, and, even if of the same dimensions, have different lifts. Referring to Diagram 7, we see that the area of high pressure under the top wing in an orthogonal arrangement interferes with, in fact tends to neutralise, the area of low pressure over the top surface of the lower wing, resulting in a lowering of efficiency of both. The smaller the gap the greater the interference, and so a large gap seems to be our first requirement. We are limited by structural considerations, however. A large gap may mean increase in efficiency, but the resulting structure necessary may add more than enough drag to cancel this out. We must compromise again! This we can do by moving one wing forward out of the " interference zone " of the other, i.e. employ stagger. If we move the top wing forward we are reducing the " zone " considerably and gaining in efficiency. If we move the top wing back we are reducing the interference again, but not so much this time. The low-pressure area over the lower wing still has a chance to get " tangled up " with the high-pressure area under the top wing, now behind it, and so forward stagger or *positive stagger* is the most beneficial. Thus stagger and gap can be employed to get maximum efficiency in a biplane combination. We must not be guided by full-size practice in this, however, for there are so many other things the designer of such types has to consider. Visibility is all-important, especially in military machines, and efficiency may be sacrificed to this end. The well-known Beechcraft



'planes employ negative stagger, and, although the exact reason is not known to the author, I feel sure that it is not entirely with maximum efficiency (i.e. aerodynamic) in view.

For orthogonal and positive stagger arrangements the upper plane contributes the greater proportion of the lift. This is fairly obvious from Diagram 7. The major part of the lift is derived from the top surface of the airfoil, which is undisturbed on the top wing but not so on the lower. As the angle of incidence increases the undersurfaces contribute more lift and the difference is reduced somewhat. The maximum lift coefficient of the lower plane occurs at a higher incidence than the latter, i.e. the stall is delayed. Bear this in mind, as we shall use this again in the stability section. Whichever combination is used, the forward wing is the most efficient and, at zero stagger, the upper plane is more efficient than the lower.

The next set of diagrams (8—23) are drawn up from Reports and Memoranda issued by the Aeronautical Research Committee, and show at a glance the efficiency of various biplane combinations over a wide range of stagger and gap/chord ratios. A study of these is very instructive, and the serious aero-modeller is well recommended to spend some time over them before finally deciding on his biplane design. Use them in conjunction with the various other details to be considered, structural (with an eye on interference drag) and stability problems.

All the graphs are drawn to the same scale for ease of comparison, and R.A.F. 15 is the airfoil section, and results as given are for an aspect ratio of 6 and Reynolds Number of 190,000. This latter value corresponds roughly to a 6 in. chord wing at 60 feet/sec., which is high for model work, and so the various values will be somewhat greater than those obtained in model practice, although these will be proportionally the same. Notice that maximum lift and also L/D maximum is obtained at high positive stagger and large gap/chord ratio.

As in the case of the monoplane, minimum drag occurs for a given lift when both wings are elliptically loaded. We now come to an important theorem known as *Munk's Stagger Theorem*, whereby it is possible, for theoretical investigation, to replace a staggered biplane combination by an equivalent unstaggered system. The theorem states that if stagger is introduced into an orthogonal system so that the distribution of lift remains unchanged (N.B.—this necessitates modification of the incidences of the wings), the total induced drag is unchanged. Thus we are able to reduce any combination to an unstaggered system, when we can apply the following formula for induced drag.

(i) $Di = Di_T + Di_B + Di_{Tb} + Di_{Bt}$

where the suffixes T and B denote top and bottom wings and the effect on the top wing by the bottom Tb and the effect on the bottom wing by the top Bt.

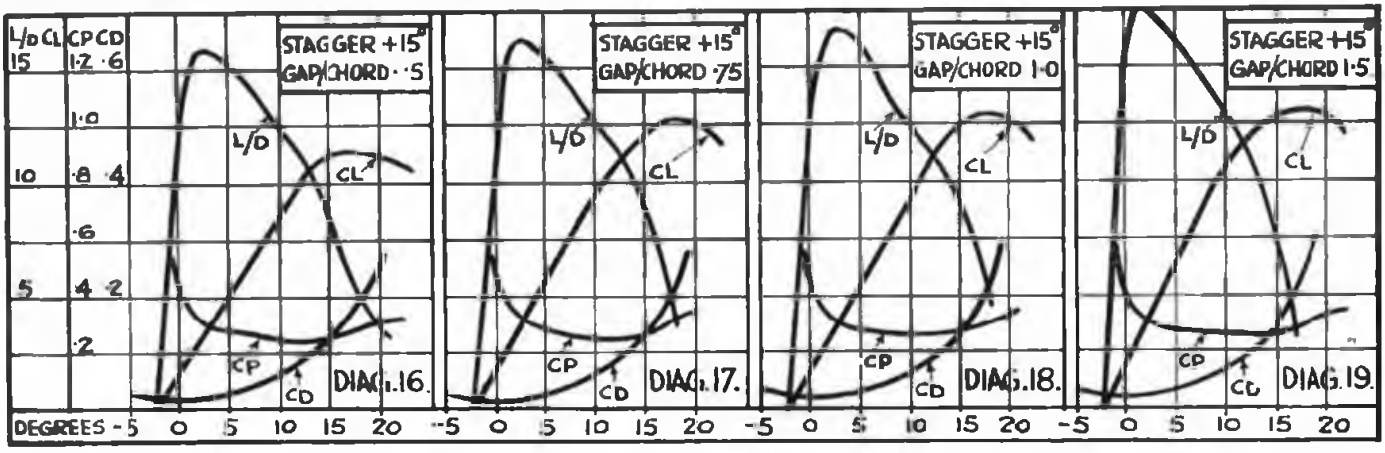
It can also be shown that $Di_{Tb} = Di_{Bt}$, and thus the equation becomes

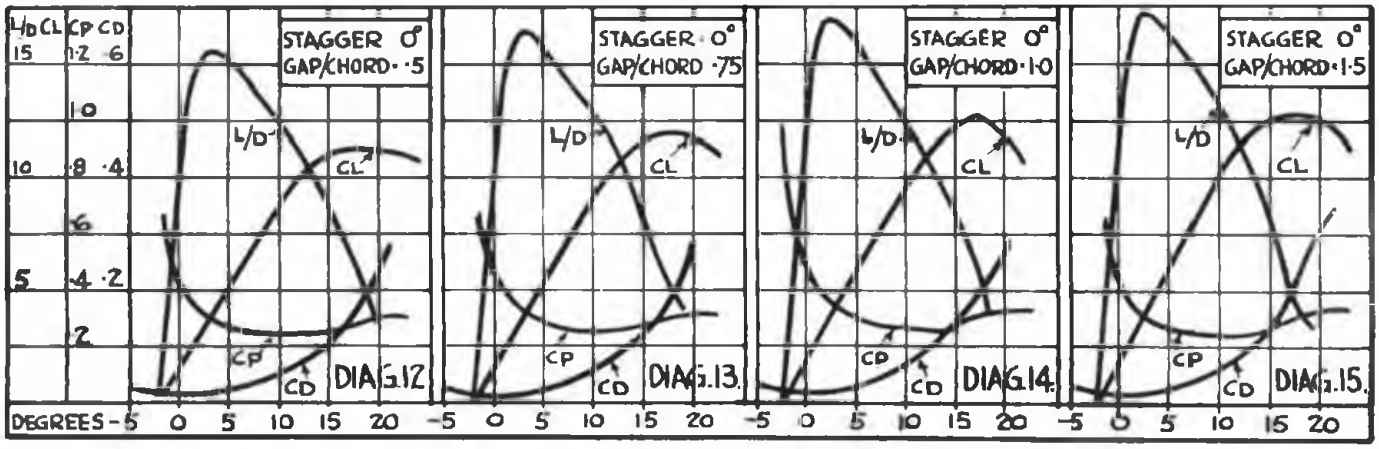
(i) $Di = Di_T + Di_B + 2\,Di_{Tb}$

By a formula by Prandtl:

$$Di_{Tb} = \frac{L_T L_B}{2\pi\rho V^2 S_T S_B}\,\sigma$$

where σ depends upon S_T / S_B (semi-spans) and the ratio of gap to average span. Diagram 24 gives values of σ for various span ratios, and the required value can be obtained from this. The formula (ii) above can be simplified, however.





$$Di = \frac{2L_T^2}{\pi\rho V^2 S_T^2} + \frac{2L_B^2}{\pi\rho V^2 S_B^2} + \frac{L_T L_B}{\pi\rho V^2 S_T S_B} \cdot \sigma$$

$$= \frac{2}{\pi\rho V^2}\left(\left(\frac{L_T}{S_T}\right)^2 + \left(\frac{L_B}{S_B}\right)^2 + \frac{L_T L_B}{2 S_T S_B}\sigma\right)$$

Denoting L_T / S_0 by λ_T and L_B / S_B by λ_B

$$\text{(iii)}\quad Di = \frac{2}{\pi\rho V^2}\left(\lambda_T^2 + \lambda_B^2 + \frac{\lambda_T \lambda_B \sigma}{2}\right)$$

an awful formula to conjure with, but there it is!

This becomes a minimum when $S_T = S_B$ and $\lambda_T = \lambda_B$ (i.e. equal lifts and spans), and the induced drag then becomes

$$\text{(iv)}\quad Di = \frac{\lambda^2}{\pi\rho V^2}(1 + \sigma)$$

where λ = *total* lift per unit span of the biplane.

Prandtl also gives us an approximate method of finding σ, namely

$$\sigma = \frac{1 - \cdot 33\ (h/s)}{1{\cdot}055 + 1{\cdot}85\ (h/s)}$$

where h = gap, s = semi span. This is only true for equal span biplanes. In the form we require it for equation (iv)

$$1 + \sigma = \frac{2{\cdot}055 + 1{\cdot}02\ (h/s)}{1{\cdot}055 + 1{\cdot}85\ (h/s)}$$

Expressed in terms of the aspect ratio, A, the coefficient of induced drag of an unstaggered biplane.

$$C_{Di} = \frac{C_L^2}{2\pi A}(1 + \sigma)$$

The drag of a monoplane giving the same lift at the same lift coefficient and same aspect ratio is less—the ratio being 1 : (1 + 5).

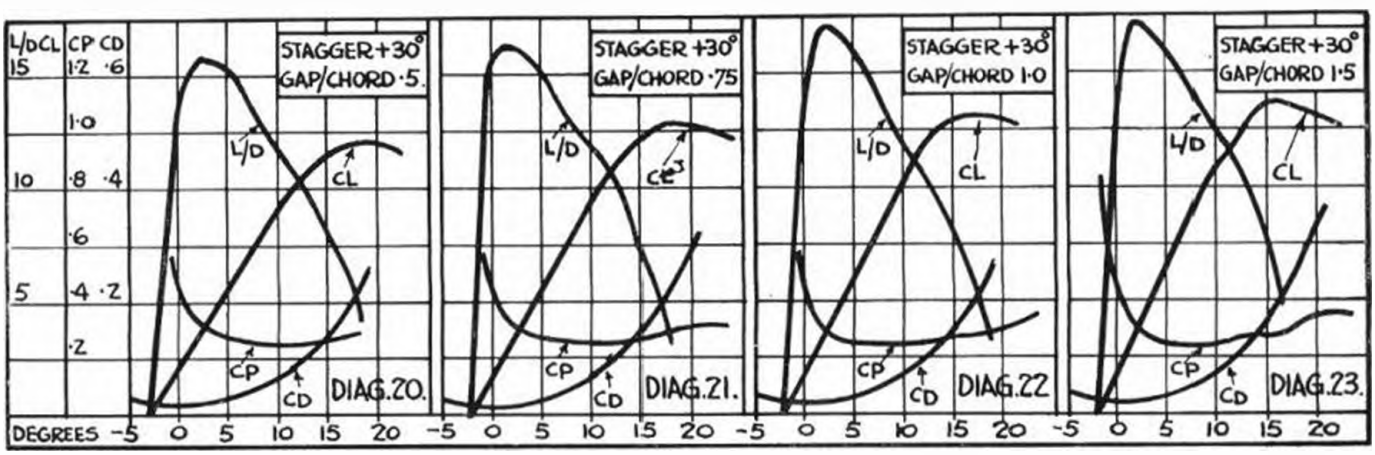
Actually in flight conditions biplanes have to fly at a slightly higher angle of incidence for a given lift coefficient than a corresponding monoplane. This statement may seem rather "Irish," but it really means that in flight the effective angle of incidence is lowered by the vortex streams from the wings, and this effect is greater on a biplane than on a monoplane.

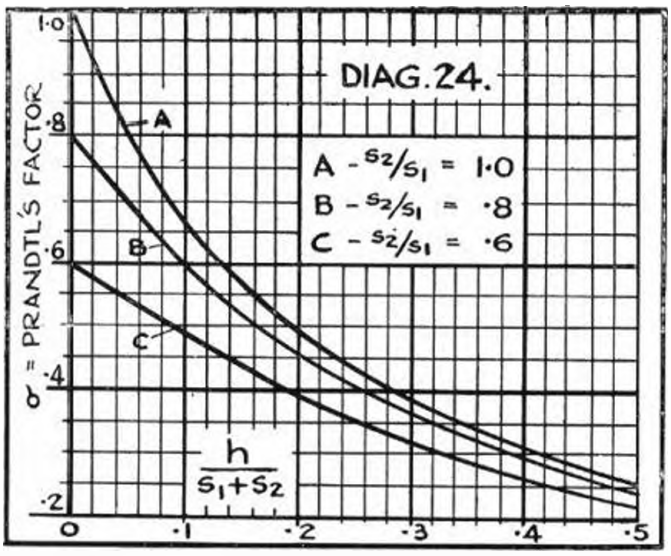
For aerodynamic reasons it would seem that the forward wing with positive stagger should have less incidence, but in practice this is seldom the case. More often than not stability problems require preferential treatment and greater incidence on the forward plane of a staggered combination is usual.

We will now leave the question of drag for a while and pass on to stability, but let me repeat one of the important results we have found above, viz.—the biplane is most efficient when $S_T / S_B = 1$, i.e. equal span wings, and $L_T / L_B = 1$, equal lift.

As regards longitudinal stability, we have already learned that *the lower wing of a biplane combination stalls last*. If, then, we employ positive stagger, we shall get, when approaching the stall, the top wing commencing to stall with the lower and rearmost wing still several degrees below it. Thus the lower wing is exerting a correcting force and tending to smooth out the stall. We can still further use this effect by increasing the angle of incidence of the top plane above that of the lower and get a *still greater* anti-stalling moment. Thus a biplane should be easier to control longitudinally than a monoplane, *if the biplane has positive stagger*.

It will be noticed on comparing the graphs that the lift curve of biplane combinations, although not reaching so high a maximum value as the airfoil itself, have a much flatter peak, which is a great aid to stability, and this natural characteristic should be made use of in your design. Notice, too, that the centre of pressure movement of the combination is more stable than for the monoplane wing. A biplane may





lose in C_L maximum and L/D maximum, but it gains in stability as a result.

As regards lateral stability, and especially safety in spinning, the unstaggered biplane is not too well off, especially if the wings are at all heavily constructed. Stagger in the main helps spiral stability, but this cannot be quoted as a general rule. However, if a powerful rudder is employed there need be no great danger of an incipient spin, especially if the tail moment arm is sufficiently large.

Up to now we have only considered the wings of a biplane combination, except in the last paragraph, but the disposition and shape of the other surfaces, fuselage, etc., is also extremely important.

A reasonably large gap/chord ratio means a narrow, deep fuselage, or the wings carried on struts above and below the fuselage. Such an arrangement is not to be desired, both on account of the increased parasitic drag and also the problem of vulnerability. Most model designers prefer to sacrifice a little efficiency in order to set their wings on top and below the fuselage. This is by far the easiest method, and has much to recommend it, as well as being simple. For finesse, though, I should like to see the wings faired into the fuselage, both top and bottom.

This fairing is important. We have four vortex streams from the wings, one for each wing half, i.e. two on each side of the fuselage, and to prevent " jamming " near the fuselage a good fairing is essential. It is impossible to give the exact size of the fairing required; in any case, this depends upon the airspeed and the general design, but a " trial and error " method should show a substantial reduction in drag.

To accommodate the wings in this position, I suggest an elliptical fuselage, height twice the width, changing to nearly circular at nose and tail. Plug in the wings so that the top one can be faired in flush with the top of the fuselage and the bottom one approximately level with the bottom. Thus, combined with a 30° positive stagger and a positive decalage of 2°—3° (i.e. top wing at 4°—5°, lower at 2°) should give a reasonably efficient combination with a minimum of interference drag.

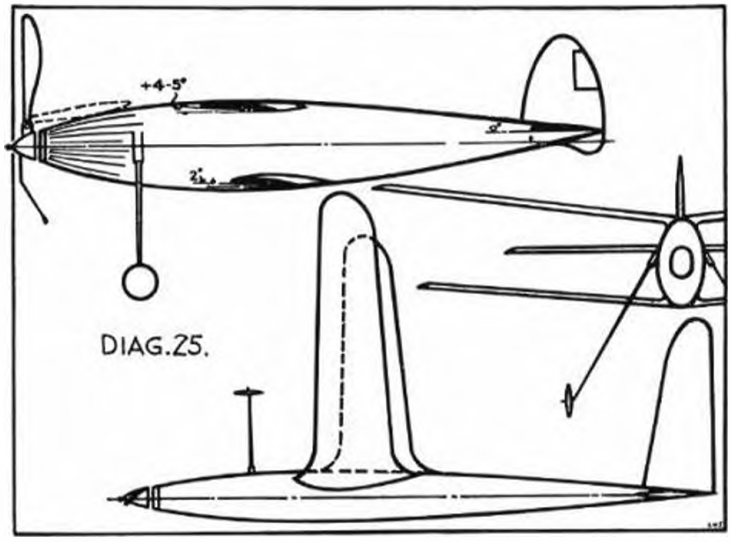
The tail-plane is a bit of a problem. We want it relatively free from the down-wash of the wings and on a reasonably long moment arm. The two vortex streams on either side are rolling along slightly below the centre-line of the fuselage, and so, if we set it on top of the fuselage, it should be all right and in an easy position to fix. We must try to fair it in, though, so it must come a little below this position. I suggest an area of about 40 per cent of the *top plane area* and a fairly high aspect ratio.

The fin is difficult to deal with, and no hard and fast rules can be evolved as to its size. It will have to be slightly larger than for a monoplane of corresponding area, however, and should be carried round under the fuselage. I have found by experience that a fixed fin is essential for consistent flying, and a small trimming tab should be incorporated for final adjustment.

As to the wings themselves—that's a bit of a problem. I quite agree with Mr. Wathew that small models are pretty useless, and suggest a minimum (total) area of 200 square inches. How are we going to divide this up amongst our two wings? Equal span, or smaller lower plane? I have tried both, but have not reached any conclusive opinion. For the general outline biplane shown in Diagram 25 I have suggested a sesquiplane arrangement to get sufficient span to provide an efficient torque control. The length of the model is 34 in. and the top plane span 37 in., which should accommodate a 16 in. diameter propeller quite comfortably. This means a fairly high aspect ratio, to keep the area down to 250 square inches, but I think it has achieved its purpose. Such a model should, I think, give excellent results, and, due to the low wing loading, should be a good " thermal catcher."

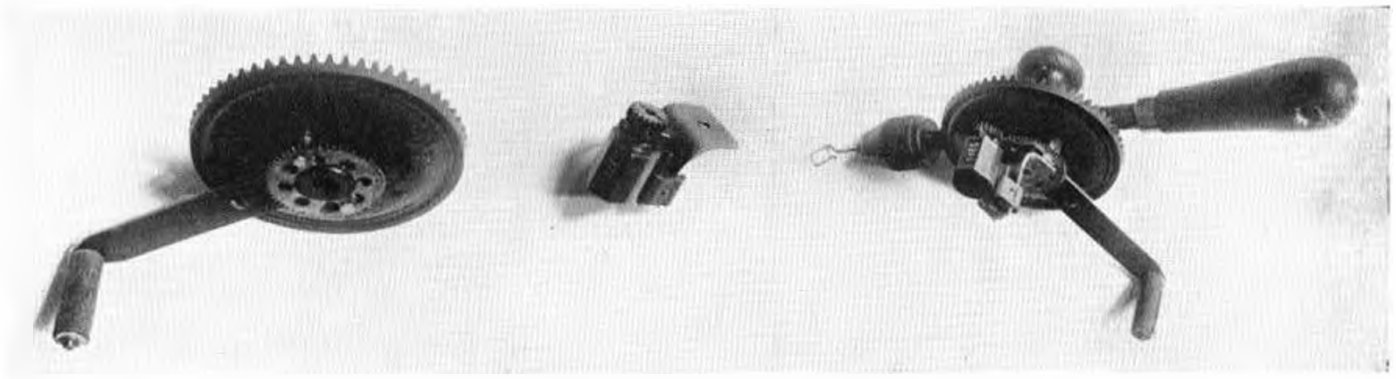
Do not think from this article, however, that I am just another of those people who sit down and write about models all the time. I can assure you I am a very ardent " flying " fan, but unfortunately opportunities for building and flying are not present now (in my case at least!). I have had experience with only three biplanes, though, one a sesquiplane, one a true biplane and another a model which was hurriedly modified for a local biplane competition. This " modification " consisted of slapping on another wing, set at its angle of minimum drag, and a larger tail-plane. The resulting combination flew, but ever since that day I have had the urge to sit down and produce a " real " biplane. Unfortunately, in those days, Wakefields claimed most of my spare time, and now, in war-time, well, I don't even get a chance for my Wakefields!

NOTE.—The term *sesquiplane* is now employed for biplanes in which the smaller wing is less than *half* the area of the larger wing, although it is still loosely used for any unequal span biplane.



"CAREFREE COUNTING"

Described by J. H. MAXWELL
(A Glasgow M.A.C. Article)



YKNOW we disliked having to mutter cuss-words at people who asked us "how many turns we were putting in," and we just hated having to scowl nastily at photographers who wished to record our titanic struggles with the winder, but you know how it is, fellows: we simply dare not lose count. However, that is all changed since we made a little gadget to do the counting for us, and you can easily make one like it.

The original model was made in only two hours, and it works perfectly.

Our drill is the type in which the big wheel is held on by a screw and washer, but if yours is different you may be able to adapt the idea to suit. The other main requirements as a "cyclometer" and two Meccano gear wheels.

Cut out the centre of the larger gear wheel so that it fits over the boss on the big wheel, and fix it in position with a couple of rivets, using collars filed to the required thickness as distance pieces (Fig. 1).

Saw a slice $\frac{1}{8}$ in. wide off the smaller gear wheel and fix this to the sprocket on the cyclometer. We used three $\frac{1}{16}$ in. diameter rivets for this job (Fig. 2).

Drill a hole in the cyclometer bracket to take the screw which holds on the big wheel. You may have to make up a special bracket, as we did, but, in any case, see that the gears mesh perfectly. Fig. 3 shows the completed job.

If you find that the counter catches your fingers while winding, you had better make a longer handle. This has the additional advantage of giving more leverage for dealing with heavy motors.

Probably you will find that each unit on the counter represents an awkward number of turns ($21\frac{1}{2}$ on ours, so we can judge to the nearest five or so), which makes mental calculations on the flying ground somewhat troublesome: so the best way is to work out a few examples and plot a graph (it will be a straight line) of "turns on motor" against "increase in number on counter." From this the number on the counter corresponding to any desired number of turns may be read off at a glance, and you can then go ahead, packing in full turns, with an easy mind.

STOP PRESS COMPETITION RESULTS

K. and M.A.A. Biplane Cup. August 24th, 1941.

		Aggregate.	Plugge Pts.
1.	Piggott, D., Blackheath	1364·4	25
2.	Searle, D. M., Thames Valley	695·0	24
3.	Wilkins, C. S., Bristol	540·8	23
4.	Hayes, N., Ashton	533·3	22
5.	Lee, A. H., Bristol	511·0	21
6.	Jeffrys, R., Northern Heights	352·0	20
7.	Ward, H., Ashton	350·2	19
8.	Carter, S. E., Bristol	328·9	18
9.	Brown, E., Ashton	327·4	17
10.	Smith, C. E. P., Bristol	241·3	16
11.	Taylor, A. T., Bushey Park	234·4	15
12.	Morgan, B., Cardiff	225·0	14
13.	Clarke, C. R., Northern Heights	222·0	13
14.	Taylor, A. H., Bushey Park	217·9	12
15.	Bushell, W. H., Birmingham	217·1	11
16.	Taylor, S. A., Bushey Park	210·3	10
17.	Jennings, C. T., Bath	207·0	9
18.	Sheen, E., Cardiff	163·0	8
19.	Baines, H. C., Blackheath	152·25	7
20.	Trussler, J., Blackheath	147·55	6
21.	Doughty, C., Birmingham	143·2	5
22.	Ferrier, G., Cardiff	141·0	4
23.	Harris, W. H., Bristol	134·6	3
24	Thomas, A. C., Blackheath	117·75	2
25.	Hill, R., Ashton	94·0	1

Individual Championship Points up to August 24th.

A.	T. Taylor, Bushey	235
N.	Hayes, Ashton	227
S.	Carter, Bristol	217
D.	Piggott, Blackheath	211
P.	(? R.) Calvert, Huddersfield	210
R.	Bardsley, Ashton	209
A.	J. Courtney, Oxford	199
B.	Morgan, Cardiff	192
E.	Brown, Ashton	191

Plugge Totals, including K.M.A.A. Competition.

1.	Ashton	704	18.	Wirral	272
2.	Bristol	629	19.	Luton	270
3.	Bushey Park	571	20.	Batley	252
4.	Northern Heights	554		Leicester	252
5.	Blackheath	549	21.	Huddersfield	232
6.	Bath	545	22.	Brighton	207
7.	Halifax	474	23.	Igranic	200
8.	Chingford	463	24.	Peterborough	196
9.	Oxford	411	25.	Ilkley	193
10.	Cardiff	410	26.	Halstead	152
11.	Fife	403	27.	Aldersbrook	138
12.	Walton	395	28.	Chester	127
13.	Harrow	389	29.	Yeovil	115
14.	Cheam	376	30.	Edham	89
15.	Thames Valley	361	31.	Pharos	64
16	Birmingham	359	32.	Bradford	20
17.	Croydon	321			

The Bedfordshire M.A. Silver Challenge Cup.

		Aggregate.
1.	Swindon M.A.C.	2131·40
2.	Hayes and District M.A.C.	1904·50
3.	Halifax M.A.C.	1742·00
4.	Oxford M.A.C.	1575·70
5.	Bushey Park M.A.C.	1471·70
6.	Luton and District "B" Team	1325·50
7.	Walthamstow M.A.C. "A" Team	1089·60
8.	Igranic, Bedford M.A.C.	992·60
9.	Mountain Ash M.A.C.	970·60
10.	Luton and District "C" Team	958·50
11.	Hitchin M.F.C.	895·20
12.	Luton and District "A" Team	798·00
13.	East Birmingham M.A.C. "B" Team	547·70
14.	St. Helens M.A.C. "A" Team	430·00
15.	Walthamstow M.A.C. "B" Team	383·00

FIGHTING AIRCRAFT OF THE PRESENT WAR—IX

BY H. J. COOPER

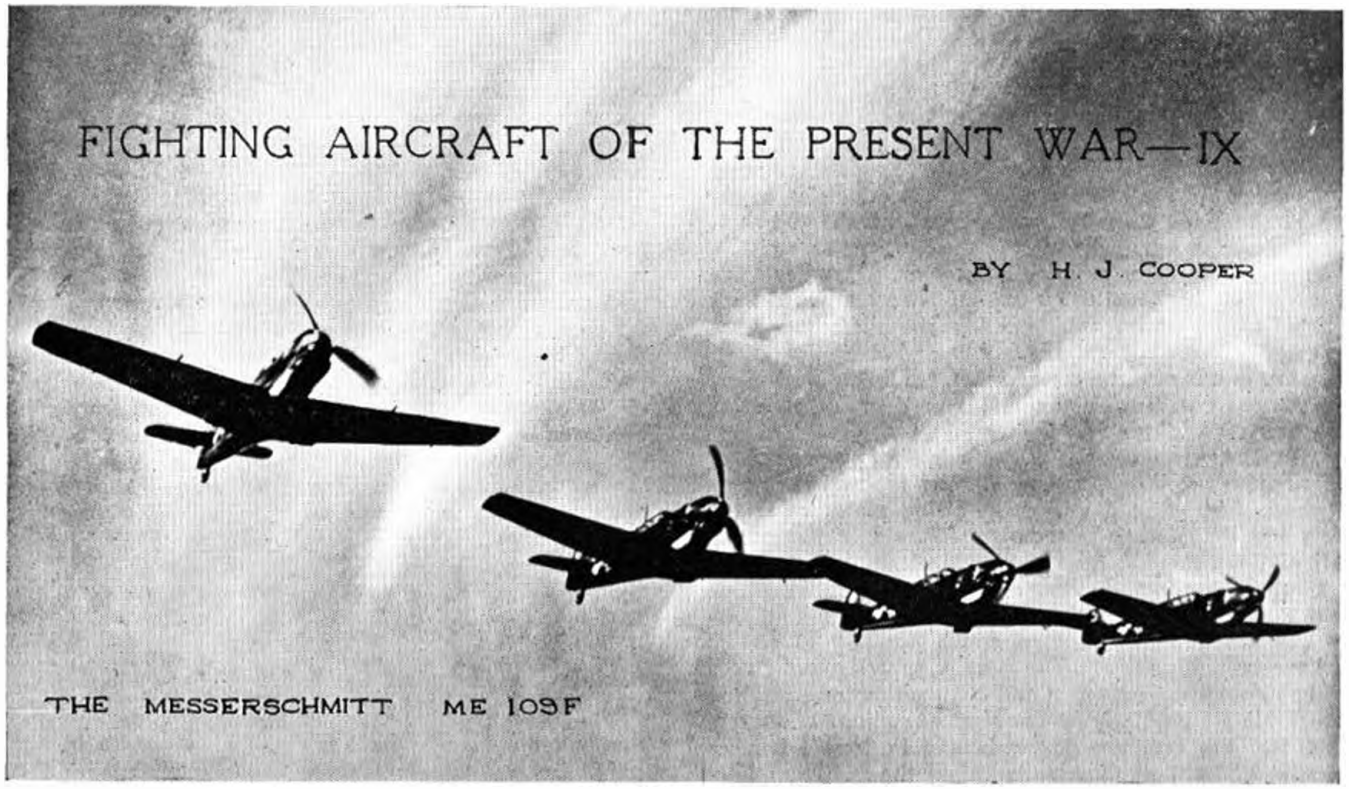


Photo by courtesy of Topical Press.

The photograph above shows a formation of Messerschmitt Me 109E fighters of the Luftwaffe with square-tipped wings. The Me 109F differs in this view in having rounded wing-tips.

PROFESSOR WILLI MESSERSCHMITT'S aeroplanes have always been good. When on July 10th of this year an example of his latest design, the Me 109F, was forced down practically undamaged in Kent it was learnt that they are still good.

The Me 109F has quite a considerable advance in performance over the well-known Me 109E, but fortunately our new Hurricane II and Spitfire V fighters, and, of course, the Tornado and Typhoon, are still well ahead of the Me 109F. But the Me 109F is nevertheless a good aeroplane, because an aeroplane can still be a good one and not nearly approach the performance and quality of the Hurricane and Spitfire, which are so far ahead of any other types.

During the last few weeks a considerable number of Me 109F's have been destroyed in the offensive sweeps (not David Langdon's variety!) of the Royal Air Force over France, but only recently did our Ministry of Aircraft Production have an opportunity of examining one almost intact.

Inspection has revealed a number of new points, the most remarkable of which is the installation of a new aircraft cannon by Mauser which fires through the airscrew hub at the phenomenal rate of 900 rounds per minute. Although this cannon is more advanced than any other type in use in the world to-day, the entire armament of the machine has in fact been decreased, and now consists of this cannon and two machine-guns fixed above the motor in the cowling. The Messerschmitt Me 109E carries a cannon and four machine-guns.

The Me 109F is fitted with a highly-boosted Daimler-Benz DB.601N twelve-cylinder in-line liquid-cooled motor developing 1,150 h.p. at 2,600 r.p.m. for take-off and 1,050 h.p. at 16,500 ft. A three-bladed, constant speed, controllable-pitch airscrew is fitted.

The wing of the new machine is similar to the Me 109E's, but the proportions of ailerons and flaps suggest that it has in fact been redesigned—the square tips of the 109E have not merely been replaced by rounded tips. The wing span has been increased from 32 ft. 6 in. to 33 ft., and the wing area increased to 186 sq. ft.

The reason for the introduction of the rounded tips seems to be the idea of confusion rather than increased performance, as the wing in its present form looks dangerously like that of a Hurricane, and of some of our newer fighters.

Other modifications are the cantilever tail-plane in place of the strut braced type, a slightly larger and rounded spinner, a new rudder and new type radiators. The tail-wheel has now been made almost completely retractable.

The Me 109, then known as the Bf 109, was first produced in 1936, and during the next year very large numbers were issued to the newly-formed *Luftwaffe*, of which it was the star-turn with a speed of around 330 m.p.h. It had a 600 h.p. Junkers Jumo 210B motor and was an attractive-looking machine and reputed to be nice to fly.

In 1940 the Me 109E was issued to the *jagdstaffeln*. Externally it was almost exactly similar to the earlier version, but had a modified radiator under the nose and a 1,150 h.p. Daimler-Benz DB.601a motor. In spite of excited Press reporters, the Me 109 does not fall to pieces when dived, nor is it in any way anything other than a good aeroplane—but, fortunately, not quite up to British standard, though everyone knows and admires the thoroughness which marks anything German.

In April, 1939, a specially prepared version known as the Me 109-R, with clipped wings and a Daimler-Benz motor developing 1,660 h.p., attained a speed of almost 470 m.p.h. and established a new world's speed record. This is the last speed record accepted by the *Federation Aeronautique Internationale*, and still stands.

In lay-out the Me 109F is a low-winged single-seat fighter monoplane of all-metal construction with stressed skin covering. The fuselage is an oval monocoque with stressed skin, flush riveted.

The wing is built on a single metal spar. Handley-Page automatic slots are fitted to the leading edge. Divided flaps are fitted to the trailing edge between the ailerons and the fuselage.

The tail-unit is of metal construction, the fin and tail-plane being covered with stressed skin and the rudder and elevators with fabric.

The undercarriage consists of two single legs which retract outwards into the wings, turning slightly backwards so that the wheels lie flat in the wing. Fairing plates cover the wheels and struts when retracted.

All of these modifications to the Me 109E indicate that the Germans are endeavouring to produce a fighter which can operate at a great height, so as to intercept our new two- and four-motored bombers which are now in service and have been in action. The heavily supercharged motor and the decrease in armament and ammunition have resulted in the Me 109F attaining a service ceiling of nearly 40,000 ft. For comparison, the Boeing Fortress I bomber (which is still almost universally called the "Flying Fortress" because of the regrettable influence of the daily Press), has a service ceiling of 36,000 ft.

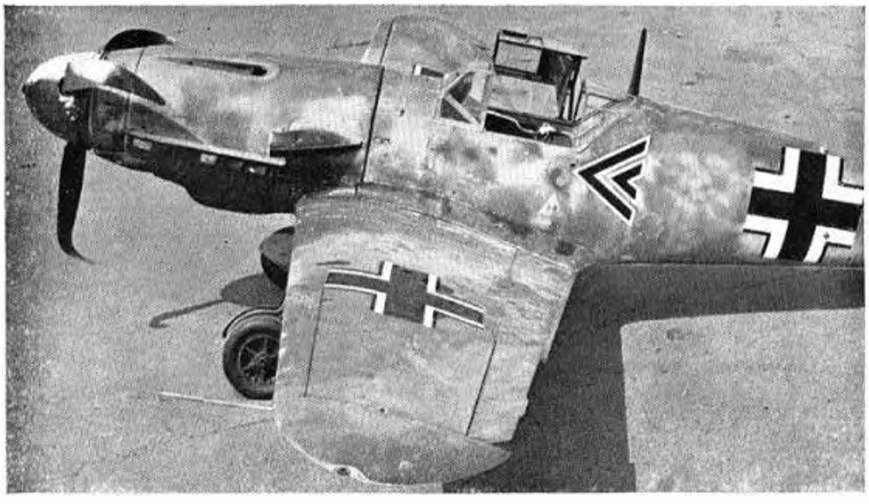
The cannon, with its extremely high rate of fire of 900 rounds per minute, can carry ammunition (200 rounds) for only about thirteen seconds of fire, and the two 7·92 mm. Rheinmetal-Borsig machine-guns are supplied with 500 rounds each, or about thirty seconds' fire.

The Me 109F is produced in two forms: the 109F1 with a 20 mm. cannon and the 109F2 with a 15 mm. cannon. The particular one captured was a 109F1, Series 2. The 109F1 carries its wireless aerial between the mast on the deck behind the pilot's cockpit and the fin, the 109F2 between one wing tip and the fuselage.

A pale blue colour scheme seems to be standard at present for German fighters. Some of them are blue mottle, but the former dark green or black for upper surfaces seems to have been almost completely abandoned.

For comparison, figures of the Me 109E and the Me 109F are given below. (Unhappily, figures for our new Spitfire V cannot be revealed).

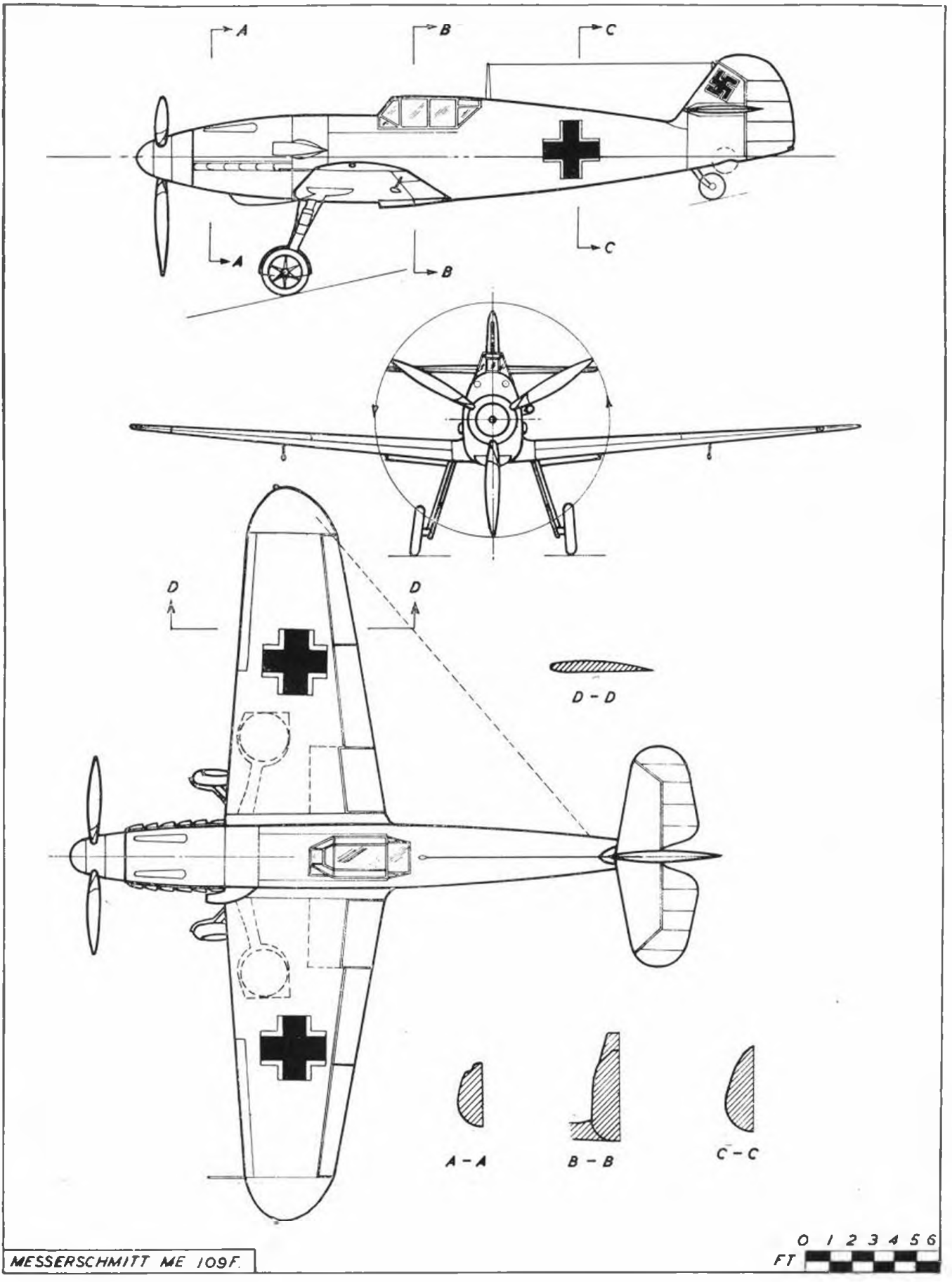
	Messerschmitt Me 109E	*Messerschmitt Me 109F*
Span	32 ft. 6 in.	33 ft. 0 in.
Length	29 ft. 6 in.	29 ft. 8 in.
Height	9 ft. 9 in.	10 ft. 0 in.
Track	7 ft. 0 in.	7 ft. 0 in.
Wing area ...	176·5 sq. ft.	186 sq. ft.
Tare weight ...	4,180 lb.	4,740 lb. (Estd.)
Weight loaded	5,520 lb.	6,000 lb. ,,
Wing loading	31·4 lb./sq. ft.	36·6 lb./sq. ft. ,,
Power loading	4·8 lb./h.p.	5·2 lb./h.p. ,,
Max speed ...	354 m.p.h. at 12,300 ft.	380 m.p.h. at 21,000 ft. (Estd.)
Service ceiling	36,000 ft.	40,000 ft. ,,
Range	621 miles	600 miles at 262 m.p.h. (Estd.) 370 miles at 307 m.p.h. (Estd.)



THE MESSERSCHMITT Me 109 F

Photos by courtesy of the Ministry of Aircraft Production.

On the right is shown the Russian I—16 Rata fighter, which will form the subject of next month's article in this series. According to Russian reports these little monoplanes have done well in action.



MESSERSCHMITT ME 109F.

CLUB NEWS

By "The Clubman"

AT the last minute (and, in fact, after I had written my last month's notes) word was received from the S.M.A.E. giving the results of the " Gutteridge Trophy " and the first six places in the " Plugge Cup " event.

As I expected, the Ashton Club is leading by a good margin of points, and all those competitors who have groused in the past over the suspected advantages London clubs have in these events should find much to think over on the present position.

As matters stand at the moment, a Manchester club is in the lead, with two West Country clubs, namely Bristol and Bath in second and third places. With only the " K. and M.A.A." (biplanes) and the " Thurston " (gliders) Cup events to be run, it looks as though the Ashton boys will be very hard to shift from their leading position. However, stranger things have happened in the past, and these chaps must still keep pegging away to run out this year's winners. Incidentally, what has happened to the Halifax Club this year? These chaps started off fairly strongly, but seem to have taken a back position ever since. (I wonder who can tell me what happened up in Fife when they sent their entry for the " Gutteridge Trophy " just seven days too late).

You will all have noticed a rather bad bloomer in last month's " Club News " where, in pulling up certain clubs for their inattention to notification, you were asked to send in details not later than August 20th. This was a printer's error and should have read the 30th, as of course nobody would have had time to send in details, when the earliest that anyone could have received the September issue was August 20th. However, all notifications received by the time this issue goes to press have been accepted, and further details will follow most likely next month.

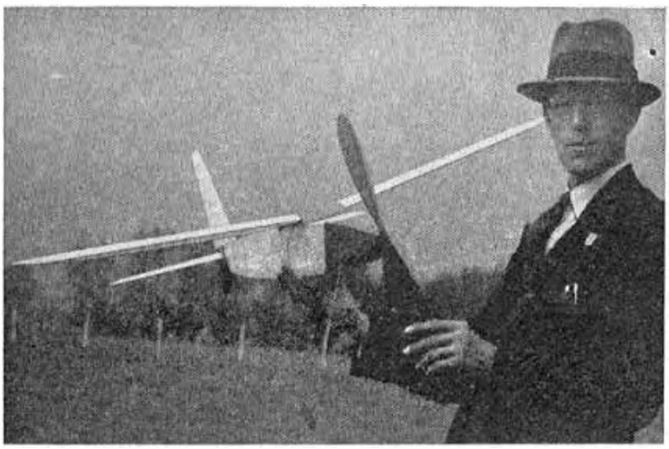
Now we are getting near the end of the outdoor competition season I expect most clubs will be turning their attention to social and indoor flying activities. I should like to see more r.t.p. competitions staged, and in spite of the poor support received last winter, I trust the S.M.A.E. will be conducting further decentralised events on the same lines as last year.

On the subject of S.M.A.E. matters, you will have noticed in last month's Society report that the question of classification of records is considered. This is no mean task, as it has been pointed out to me that the ordinary classes of model could be divided and sub-divided into some hundreds of sections, and we must obviously arrive at some basis where the system will not be unwieldly. I trust, therefore, that the Society will take this opportunity to eliminate some of the out-and-out freak classes which, in my opinion, serve no useful purpose other than a means of experiment with a very small minority of aero-modellers. At such time as a particular breed of model has proved itself, and is receiving support from more than just a few experimenters, then is the time to institute a records class for such types, but I think you will all agree with me that a general set of records is of far more use and more instructive than innumerable sub-divided classes, which gives the opportunity for a " pot hunter " to scan the list and build something that will record six seconds as against the five seconds of its predecessor. I speak feelingly on this subject, as I know that in the past one or two chaps have set out deliberately to build something freakish with which any sort of a flight could be claimed as a British record. I am certain this sort of practice is not to be encouraged.

A couple of Swedish lads enjoy themselves with a spot of seaplane work. I wonder if they make a habit of flying uncovered fuselages over there?

Our friend, the Editor—Rushy to you—had a field day when he visited the OXFORD M.A.C. Open Rally. Naturally we've talked this meeting over from all angles, and allowing for his natural enthusiasm at flying in a meeting for the first time in nearly two years, the event must have been very enjoyable and well managed. I have seen the Oxford club ground, and believe me, there is not much wrong with it from a model flyer's point of view. Dead flat, and with an area almost as big as Fairey's Aerodrome, it has only one snag, e.g. the river that runs down one side of the field. However, this did not cause much heart-burning on the day in question, as an almost complete absence of wind (yes, I have it on oath, there was No WIND) made flyaways very few and far between. In fact, it must have been an official's paradise. I know what it is like to have models soaring away on the wind, and getting smashed and lost, and at the end of the day chaps must still be waited for who are searching for their models. Competitions cannot be closed and, in fact, it makes it a real job of work to sort things out.

All this was avoided at Oxford, and though the weather was inclined to be dull, and slightly damp at first, the conditions certainly showed up the best models to advantage. The biggest snag of aero-modelling is that, in certain conditions, a poor model can at times beat a tip-top model solely on the finding of an errant thermal. Only once during the day did these elusive beings appear, and two models were lost at once, but fortunately recovered later in the day. One of these, the " Isis," belonging to Mr. Courtney, was noticed for its steady performance and, as will be seen from the results, won for him the main event of the day.



The "Isis" and her master! A. A. Courtney, of Gamage Cup fame, and his winning model that has carried off so many honours.

The programme had been well thought out, and it was only necessary for one model to be carted along, and all events could be entered. This is a thoughtful move in these days of difficult transport, and to be recommended. Clubs from all over the place took part, and some very good flying was to be seen. Models were generally well built and of widely varying design, showing a tendency to the streamline classification. (I am told of one model that was a job to classify, being a "paper bag" of uncertain parentage, and in some opinions only fit for the fire).

The first and second places in the Open Duration event were inclusive of the thermal flights mentioned, and accounts for the large margin over the following competitors. I feel that a word of praise is timely here for the way the Oxford members, especially Messrs. Courtney and Houlberg, showed up in the final results. I know from personal experience how difficult it is to give one's attention to the conduct of a meeting and compete at the same time—it's no sinecure of a job. To run a successful meeting, and to place so well in the actual flying, is a tribute to these chaps.

Full results given here indicate how the honours went the rounds, and this again is a very satisfactory result to any open meeting. Rushy says that he had the time of his life, and reckons that everyone else did, so it's me for the next Oxford meeting, even if I have to pawn the wife's clobber coupons to get there.

His times in the Junior event also won the "Enoch Cup" for Courtney, junior. I'm hoping I can fly a model next time—there's no holding Rushy down now that he's won a competition.

NEAREST 45 SEC.

1	C. S. Rushbrooke (Leicester) ...	45 sec.
2	Ryde (Northern Heights) ...	46·4 ,,
3	A. A. Courtney (Oxford) ...	46·8 ,,
	Pickup (Northern Heights) ...	46·8 ,,
5	Ryde (Northern Heights) ...	46·9 ,,
6	Massey (Northern Heights) ...	47 ,,

OPEN DURATION. THREE FLIGHTS R.O.G. (Senior).

		Agg.
1	A. A. Courtney (Oxford) ...	641·8
2	Young (Northern Heights) ...	619
3	A. D. Piggot (Blackheath) ...	459·6
4	C. S. Rushbrooke (Leicester)	390·6
5	Stevenson (Northern Heights)	387·6
6	Clarke (Northern Heights) ...	294·5

JUNIOR OPEN.

1	R. A. Courtney (Oxford) ...	257·6
2	Warner (Witney) ...	206·2
3	J. Richards (Northern Heights)	198

SPOT LANDING.

1 B. S. T. Ryde (Oxford).
2 R. A. Everard (Oxford).

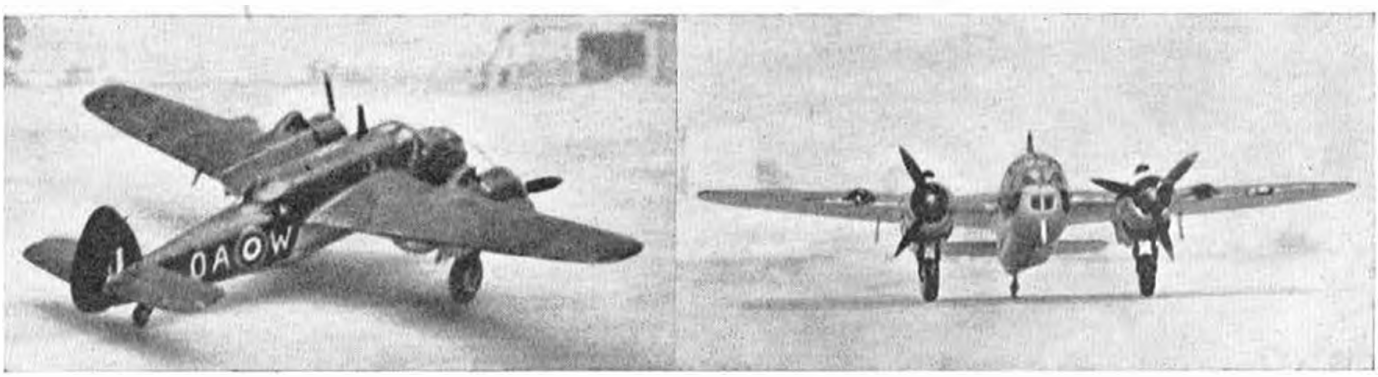
TEAM EVENT.

(Four per team, two flights r.o.g.).

Oxford M.A.C. ...	1,060·5 points
Northern Heights M.F.C. ...	951·5 ,,
Witney M.A.C. ...	365·7 ,,

The HEAVITREE (Exeter) M.A.C. are to be congratulated on the regaining of their old flying ground, so they have, as it were, reopened their flying season. A scratch competition held to celebrate the event was won by A. Smith with 1 : 55·8, followed by D. Peters with 1 : 44. This was in spite of appalling weather, the majority of flights being made in a downpour. A member of this club had an amusing (?) experience recently when a yokel reported his "Air Cadet" as a troop-carrying glider—and 'phoned the police. Wotalife!

An inter-club meeting with the Leicester Club was staged by the HINCKLEY M.A.C., but the advent of a gale prevented good times being set up. G. Dunmore (Leicester) made the best time of the day with 1 : 04 h.l., so you will gather thermals were very much absent.



Nice work by the Rev. Sherwood, of the St. Nicholas (Leicester) M.A.C. Built from AERO-MODELLER *plans.*

Leicester won the team event and the h.l. duration contest, while Hinckley collared the r.o.g. and nomination events.

A low-wing competition held by the TROWBRIDGE AND D.M.A.C. was won by C. F. Selby with an aggregate of 1 : 18·8, but he was extremely lucky in view of the fact that V. D. Wilkins lost his model on a test flight just prior to the start of the competition, clocking 14 min. o.o.s. Unfortunately this was not officially timed, otherwise he would have had another record to hang up with the figure of 7 : 10 set up when winning the "Any Type H.L." event. His total time for this competition was 10 : 07, the runner-up being friend Selby with 2 : 17·75.

An amalgamation of the clubs in Derby has taken place. the new body being known as the DERBY M.A.C., with Secretary H. Clamp, of 18 Mortimer Street, looking after things. Two competitions have been held recently, K. Swales winning two events, with Messrs. Green, Ashworth, Thompson and Clamp taking other classes.

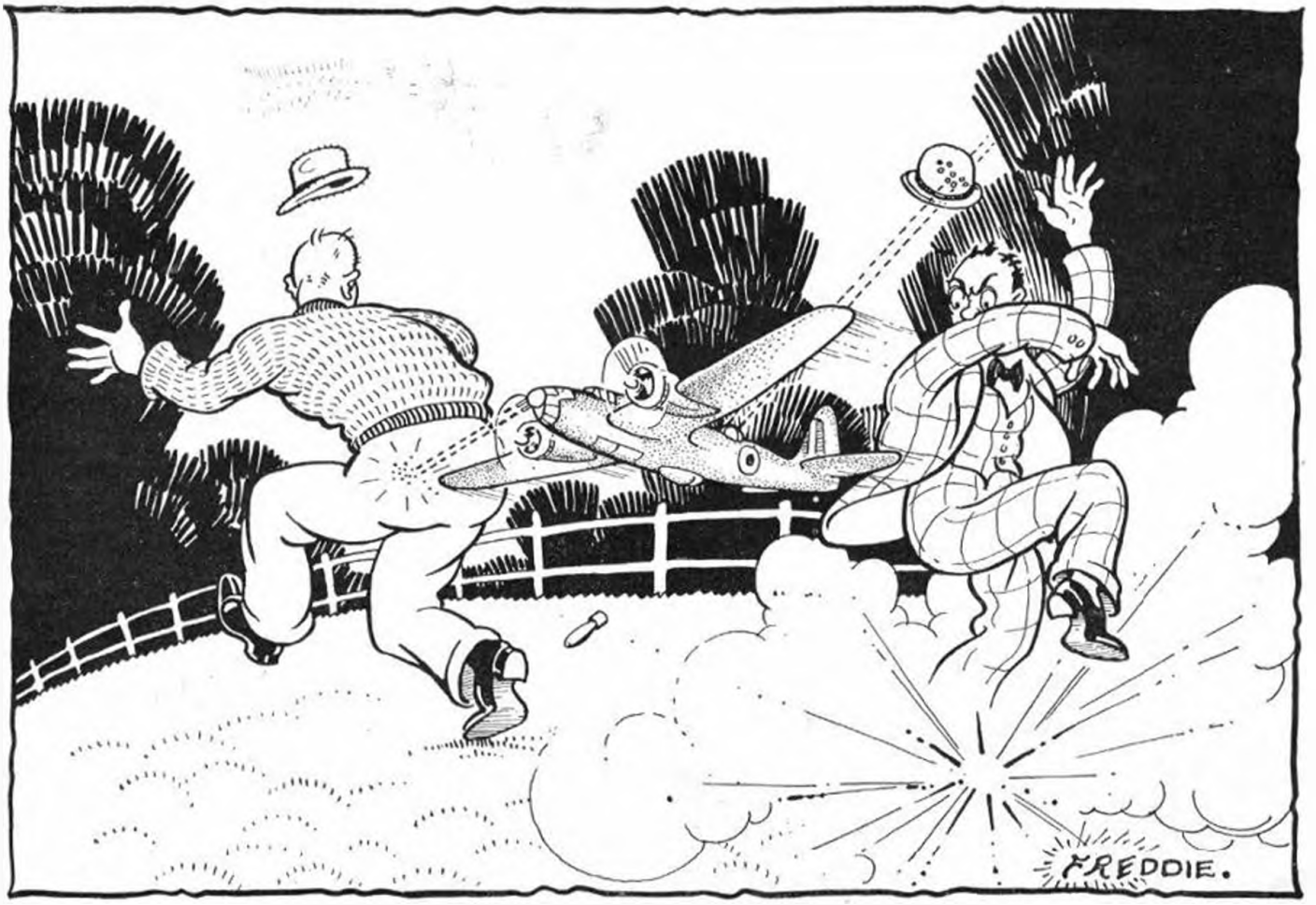
The ILKLEY M.A.C. had a beautiful gale for the Igranic Challenge Cup day, the total time for the club being 1 : 20·4, consisting of one flight o.o.s. Wind again spoilt the entry for the Gutteridge event, so we get back to the old times, eh? I wonder just how many models have been smashed and how many competitions abandoned through that pest of pests, *wind*. K. Anning has raised the club flying scale (r.o.g.) figure to 52·4 sec., while J. Townsend has pushed the biplane r.o.g. time up to 1 : 24·5.

The WALTHAMSTOW M.A.S. has been formed since June 13th and meetings are held every Friday at St. Michael's Church Hall, Palmerston Road, with flying meetings on Sundays at Chingford Plain. Two competitions held were won by H. J. Richards and L. Phipps, who averaged 25·7 and 1 :1·5 respectively. Club records are held by H. E. Bateman (r.o.g.), 2 : 42·4 and R. Sharpe (h.l.), 1 : 22·2.

During the past month both the h.l. and r.o.g. records have been broken in the STREATHAM AERO-MODELLERS' group, the first by L. Pribyl, whose modified "1936 Bendix Trophy Winner" flew for 18 : 30, of which 10 : 00 was officially timed. R. Miler grabbed the r.o.g. figure with a time of 3 : 33 and lost his model. This club is steadily increasing its membership, usually at the rate of two per week, which makes me wonder why some clubs have to close down owing to lack of members.

The record figure for the DUBLIN M.F.C. was raised to 2 : 46·5 during a team contest with a number of other Irish clubs, which the Ulster team finally won. Dublin fellows did very well at a meeting staged by the Malahide Club, taking seven out of the nine places possible. Bad weather spoilt the event, but I am assured that the "Air Cadet" has captured all hearts for its ability to take it in spite of poor conditions.

The ULSTER M.A.C. main item of news is, of course,



"DON'T OVERDO REALISM IN SCALE MODELS!"

their success in the M.A.C.E. decentralised team event noted above, their points for the team being 1,117·7.

One member of the NORTHERN HEIGHTS M.F.C. actually *cycled* the journey to the Oxford Open Meeting! This club welcomed the return match with the Halifax boys and came out the final winners by 696·2 points to Halifax's 618·5 points. High wind spoilt the day, but an enjoyable time was had by all.

The LUTON AND D.M.A.S. has now the use of the local golf course, which is much appreciated in view of the snags met on the old ground—trees, pylons and kids. The junior members are showing their mettle and a lady member is proving a serious opposition to even the hardened seniors. A new clubroom is in course of preparation.

CHEAM M.A.C. are already reaping the benefit of the new clubroom which was recently opened at 3 Park Lane, Cheam Village. Attendances at the meetings, which are held every Friday evening, have been uniformly good, and interest has been sharpened by the bench-testing of home-made petrol motors.

The result of the Gutteridge Trophy has caused some head scratching (with the inevitable splinters) among the more thoughtful of the boys, for Pop Kelsey took third place with one flight only, improving the club's duration record by 98·5 sec., and this with a ship he built at least three years ago.

The club hopes Pop will continue in his present form until he knows how to do these times on his third flight, and not on the first one as hitherto.

C. Fox, of Mitcham, a 13-year-old enthusiast with a few of his large collection of well-built models.

Allez-oop! *A three-year-old model built by H. W. Monks, of Harlesden, shows how to get up there.*

Blackheath's Open Day gave the boys a chance to shine, and they duly collected the team award with an aggregate of 744 sec. Freddie Briggs turned in a typical effort to rank first in the team with one flight of 327 sec.

A new club has been formed in Leicester known as the ST. NICHOLAS' MODELLING CLUB. Its chief activities at present are the construction of solid scale aircraft.

The club meets on Monday and Friday evenings and Saturday afternoons at the St. Nicholas' Schools in Great Central Street. The organiser and leader of the club, the Rev. C. P. Sherwood, who has had considerable experience in building solids, will welcome visitors and those interested. He is also anxious to obtain the assistance of someone who can help in the matter of the construction of flying models.

R. Higham has raised the h.l. record for the STRATFORD-ON-AVON M.A.C. to 10 : 18 o.o.s. with his "Korda" model. These chaps spent an enjoyable time at the Oxford meeting, but were handicapped owing to two of their best models being lost the previous week.

Wings, the official organ of the HALSTEAD M.F.C., is a very well produced little paper, and contains much interesting reading matter. One point raised in the Editorial is well worth the study of all clubs, and I quote it here *verbatim*:

"It is an amazing fact, but true nevertheless, that most aero clubs seem to exist just in their own particular sphere. There seems, at any rate in some of the local clubs, no spirit of friendship at all. What we of this club would like to see more often is intercourse between all and every club within reason. Most of us, now that we have left, look back on schooldays with a sort of pride. 'Our form was the worst in the school' is the sort of thing. There existed then and still exists now between old boys a friendship and latent spirit that can surely never find an equal. We have been trying to foster this spirit, but so far have met with little success. The only club that has really shown any enthusiasm is the General Aircraft Model Aero Club. After this war some of the larger London clubs could do their share by inviting some of us smaller country organisations to a friendly gathering such as a social or dance. It is wonderful the incentive one gets from such gatherings, and it is the only thing that approaches the above-mentioned old boys' spirit."

I don't know just what these chaps' experiences have been, but I have generally found the utmost co-operation between local clubs. However, I know there are some black sheep, and I trust the airing given to the foregoing will bring it home to some folks that a little help here and

there can go a long way to making things so much better for others—and yourselves.

E. J. Taylor, of the TORQUAY M.A.C., won a recent event with an aggregate for two flights of 9 min., his second flight of 6 : 40 being a new club h.l. record. The first flight finished up in the sea, and after drying out set off in the same direction and was lost to sight. Just another of our secret weapons.

The " Lindsay Everard Cup " for Wakefield type models, and owned by the LEICESTER M.A.C., was won for this year by D. J. Dawson, followed closely by F. Davies.

The main event with the BEVERLEY AND D.M.A.C. was their Gala Day, when in spite of high winds eighty competitors supported a well organised meeting. Best flight of the day was set up by J. Townend, of Ilkley, the model being lost after 3 : 44. Results were :

UNDER 30 IN.

1	E. J. S. Townend (Ilkley)...	...	60 sec.
2	P. R. Watts (Hull)	...	50 ,,
3	R. Barnes (Hull)	...	46·6 ,,

OVER 30 IN.

1	E. J. S. Townend (Ilkley)	...	92·8 ,,
2	R. Smelt (Hull)	...	67·3 ,,
3	G. Clarke (Scunthorpe) ...	...	62·3 ,,

WAKEFIELD.

1	D. G. Fletcher (Hull) ...	...	107·5 ,,
2	E. J. S. Townend (Ilkley) ...	...	87·5 ,,
3	G. Clarke (Scunthorpe) ...	...	85·5 ,,

FLYING SCALE.

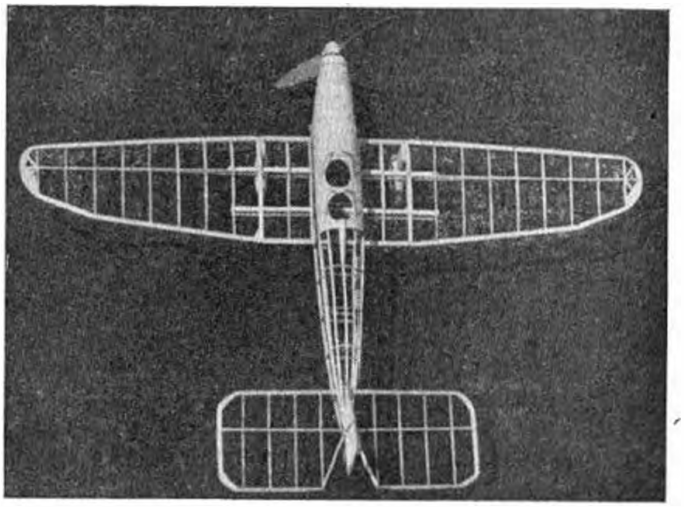
1 C. Verity (Hull).
2 K. E. Anning (Ilkley).

GLIDERS.

			Average.
1	F. Longson (B.D.M.A.C.)	...	44·5 sec.
2	F. Moses (York)	...	28·3 ,,
3	R. T. Ragg (B.D.M.A.C.)	...	26·6 ,,

Three competitions staged by the RIPON M.F.C. were hotly fought out by E. Lonsdale and the Elliotts—W. S.

J. Bellchamber, of Woking, has adapted his " Firebrand " to gliding pending the lifting of the ban.



A 25½-inch " Magister " built from AERO-MODELLER *plans (Feb. 1939) by a reader. Should fly as well as it looks.*

and C. F. Lonsdale won the " Spot Landing " class, with the Elliotts sharing the honours in this and other events. Best flight of the day was by C. F. Elliott with 1 : 17·8, but the weather spoilt a number of chances—and machines. This club is anxious that aero-modellers in the Harrogate district should get into communication with the prospect of arranging a joint flying day. Now then, what about it, you chaps. Secretary is C. F. Elliott, of " Measowe," Kirkby Road, Ripon.

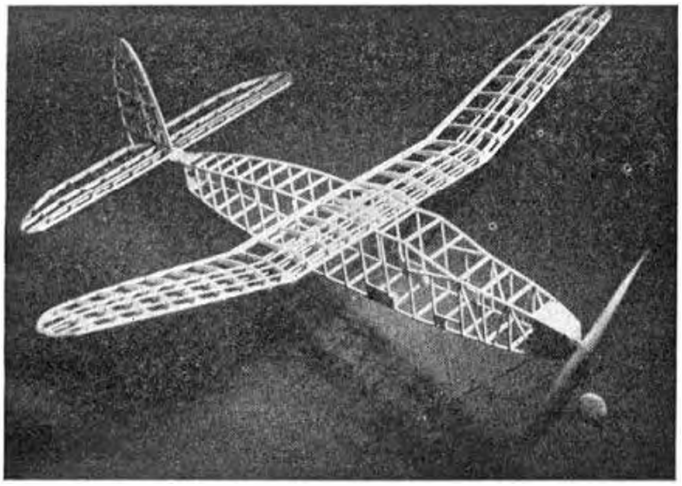
The FARNBOROUGH M.A.C. is once again operating. An inter-club meeting with the Aldershot Club resulted in a draw, Mrs. K. Reynolds, of the Farnborough being the individual winner with an average for three flights of 1 : 49. This lady is certainly making her presence felt, having won two competitions and placed third in two more. Her average time for fifteen competition flights this year is 1 : 28, which is giving the lads a headache. An unusual type of event staged by this club was the " 400 " event, where the winds for the second flight were limited to 400. G. W. Harriss won after a fly-off with Mr. Reynolds, both totalling 4 : 53. Harriss had two fine flights of 11 min. and 3 min. during tests for another competition, but Reynolds pipped him in the competition to win with an average of 2 : 20.

G. E. Stevenson, of the WHITSTABLE, TANKERTON AND D.M.A.C., has raised the club r.o.g. record to 4 : 32. Unfortunately these chaps will not be able to hold their projected Open Day owing to coastal restrictions in their part of the world.

One hundred and fifty competitors entered for the various events at the BLACKHEATH M.F.C. Open Day, though the flying scale only attracted five worthies. (I should like to see more attention given to this class of model, especially under existing conditions where I feel the out and out thermal hunt is not to be encouraged). Seventeen clubs were repesented, and thirteen of these entered for the team event. High wind and showers spoilt an otherwise fine day, and the competitors are to be congratulated on their showing. Results were :

OPEN DURATION R.O.G. CONTEST.

1	R. W. Ashby (unattached)	...	311 sec.
2	P. W. Lammiman (Brighton)	...	264·1 ,,
3	D. M. Searle (Thames) ...	...	261 ,,



Nice framework by K. Youngman, of Newton Abbot, the model being of course a "Korda."

INTER-CLUB TEAM CONTEST.

1	Cheam	744·7 sec.
2	Streatham	710·3 ,,
3	Bushey	708·75 ,,

GLIDER CONTEST. (First flight only).

1	M. W. White (Blackheath) ...	96·5 ,,
2	J. Marshall (Hayes)	93 ,,
3	D. J. Armstrong (Park)	86·5 ,,

FLYING SCALE MODEL CONTEST.

1	H. C. Baines (Blackheath), Heston Phœnix)	50·5 pts.
2	— Love (Walton), Leopard Moth	46·3 ,,
3	D. Molyneux (Hornchurch), Moth Minor	42·1 ,,

The committee wishes to thank all those who generously assisted in timekeeping, judging models, etc.

The newly-formed STOCKTON (Rugby) M.A.C. held its first meeting on August 3rd, when a number of good flights were set up and interested the surrounding villagers. It is hoped that others will get in touch with the secretary, Mr. P. J. Hodges, of 19 George Street, Stockton, near Rugby, and help swell the ranks.

At last the CROYDON AND D.M.A.C. is bucking its ideas up, and though the membership is down to about thirty, more entries are being made into national competitions than when the membership was up in the eighties. During the contest for the "Clarke Trophy" Ted Buxton's 'plane flipped round for 5 min. o.o.s., while one member's model decided to "hole in one" on the golf course, using a nice little hole left by the B.D.S.

A new club has been formed to be known as the WHITEFIELD MODEL FLYING CLUB, with K. J. S. Donaldson, of "The Firs," Polefield, Prestwich, Manchester, as secretary. A good clubroom and flying ground are available, and members will be welcomed.

E. Standing, of the ALDERSHOT M.A.C., has just lost his "Cloud Commander" after a flight of 26 : 06 o.o.s., but has the consolation of winning the competition.

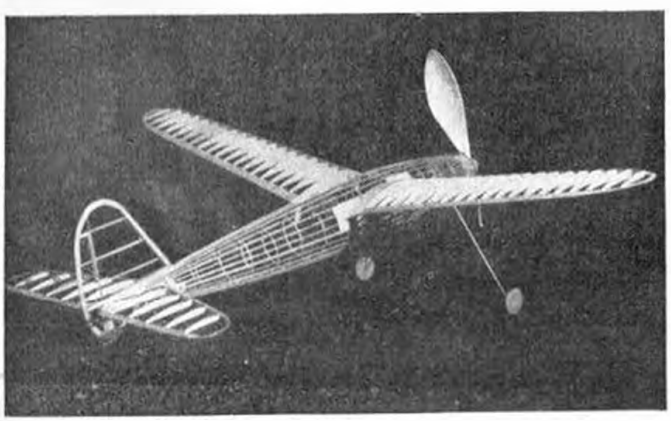
The weather up North has been anything but pleasant, and the BRADFORD M.A.C. have felt the draught well and truly. N. Brown averaged 1 : 04·4 to win the junior event, where the competitors had to make three r.o.g. and three h.l. flights, R. Gallagher and J. N. Dean being the runners-up. Dean made the best time of the day with a flight of 2 : 18·2 o.o.s. This chap also wins the Junior Wakefield Trophy.

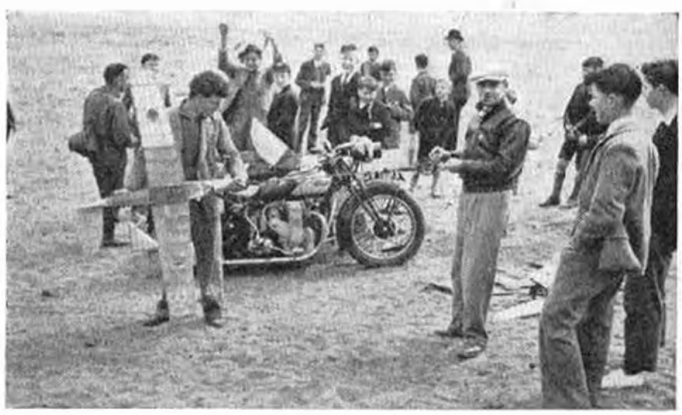
G. V. Watson, of "Fairlight," Main Road, Dovercourt, Essex, wishes to form a club in his district, and is sure that an organised body will be well received. Too many people there think aero-modelling is a "kid's game," and he intends to scotch that fallacy once and for all. It's about time some folk got cracking in some of these places, and showed the scoffers that there is a lot more in both building and flying a model aircraft than just sticking a couple of bits of wood together.

I have requests from the following chaps, who would welcome the co-operation of senior fellows in the forming of clubs in their respective districts: E. F. Jones, 14 Beaconsfield Road, Parkstone, Dorset; D. E. Bianchi, "Belmont," Chirton, Devizes; W. Rillie, 21 Argyle Street, Ayr; and F. C. Cooper, 52 Huntingdon Street, Gipsyville, Hull. Now then, some of you older chaps, what about starting something to help these youngsters? It doesn't take much to start a successful club, and your efforts would be much appreciated.

Well, that's that for this month, and here's to the next time. Keep smiling, and even if it does blow a gale now and then, what's a bit of wind here and there? Oh yeah!

THE "CLUBMAN."





A "Copland's Wakefield" by R. Jefferies, of Northern Heights, while Mr. Sadler (Aldershot M.A.C.) winds her up for a flip.

Small Traders' Announcements

The charge for these insertions is 5/- each prepaid for a minimum of 30 words, extra words charged at the rate of 2d. per word.

BIRMINGHAM Model Supplies, 96 Dale End, wish to draw the attention of buyers to their Mail Order department; send for list of aircraft, solid, flying; also ship kits and accessories.

BLACKPOOL.—The Sports Shop, Palladium Buildings, Waterloo Road. All model supplies. Joy, Studiette, Cloud, Drome, Kite, balsa, cements, dopes, grand flying scale kits. Latest models, solids, duration. Remember "The Sports Shop."

BROMLEY.—H. E. Hills & Son, 481 Bromley Road, Downham. 'Phone Hit. 4197. Model Aeroplane Supplies. Dozens of kits, Keil Kraft, Cloud, Atlanta, Skyleada, Veron, Truscale. Caton's rubber, Joy-Plane, Studiette Balsa Tools.

CHISWICK.—G. W. Jones Bros. & Co., 56 Turnham Green Terrace. (Chiswick 0858). Largest stock of kits and accessories in West London. Agents for Veron, Keil Kraft, Club, Atlanta, Airyda, Aero-models, Penguin, Scalecraft, Skybird, Skyleada, etc. We specialise in spare parts for Solids. Caton's rubber, Joy-plane products. Aircraft publications, and photographic postcards.

CHISWICK.—A. A. Baker, 526 High Road. Large selection of flying scale, duration and solid kits. Ball races, propellers, wheels and other accessories. Balsa cut to sizes as required. Agents for Hobbies. 'Phone: 3816 Chiswick.

DUMFRIES.—Campbells, 46 High Street. Send for our free lists all model aeroplane kits, balsa wood, and sundries. Largest stockists in Scotland. Frog, Penguin, Airyda Scalecraft, Truscale, Star, C.M.A., Veronite.

EDINBURGH.—"Calling all aero-modellers." Whatever your requirements, Frank Royle, 54 South Clerk Street, is at your service. Fullest range of kits, balsa wood, accessories.

EDINBURGH.—Everything for the aero-modeller. All the leading models stocked. Joy-plane cements, dopes, Jap. tissue, ball races, etc. Wade & Co., 40 Chambers Street.

HEREFORD.—Alfred Kear & Co., 52 Commercial Street. Large selection of flying scale, duration and solid aircraft kits. Trix railways, Studiette ship kits, and constructional models of all kinds.

HEREFORD(SHIRE).—Utility Supply Stores, J. G. Hill, 54 Eign Street. Every small item for aero-modellers. Balsa wood (callers only). Slick Brands, Joy-plane, Halfax Products, National Modellers Supplies. Ships Kits, aero kits, duration kits and ready-made models of all best makers. Paints, enamels, dopes, lacquers, knives, blades, gramophone records, needles, springs. After 8 it's not too late to call.

IPSWICH.—A. J. Sneezum & Sons, 31-36 Norwich Road. 'Phone 2779. Model aero supplies, Joy-plane products, Caton's rubber. Limited stocks of all leading makes of Duration, Scale and Solid Model Kits.

LEICESTER.—Harper's—The Aero-modellers' Stores. Large selection accessories and kits. 34 Belgrave Gate, and 67 Braunstone Gate; also at Oakham, Melton Mowbray, Market Harborough.

LONDON, S.E.—Toy and Model Shop, 15 Sydenham Road, S.E.26. Skyleada, Cloudcraft, Keil Craft, Keelbild, C.M.A. kits. Waterline and Leyden ship kits. Balsa, dopes, cement, tissue, rubber, brushes, bamboo, wire, plans, etc. Tremo warship and aeroplane models. *AERO-MODELLER* stocked.

SHEPHERD'S BUSH, W.12.—K's, Hanover Court, Uxbridge Road. Large selection of flying scale, solid and duration kits. Accessories of every description, and Joyplane products.

STAFFORD.—Aircraft Models, South Walls, is just the place to call and see a good variety of models, and obtain advice from modellers like yourself.

STOCKPORT'S Aero-model Shop.—Materials and accessories in stock. Large range, of kits, Cloud, Studiette, Keil Kraft, Airyda, 'Drome, Skyleada, and Chingford, etc. 54 Wellington Road South.

WILLESDEN'S Leading Aero-model Suppliers. Woods Sports Ltd., 98 Chamberlayne Road, Kensal Rise, N.W.10. Comprehensive stocks of all kits, materials, prints, etc. 'Phone LADbroke 1414. Buses Nos. 6, 46, 52, 70 stop at door.

WILMSLOW, Cheshire.—Wilmslow Model Aircraft Co., Water Lane. We have a big range of kits and accessories, including Keil Kraft, Skyleada, Scalecraft, Studiette Elite, Club, Atlanta, Halfax, Tower and many others.

WOLVERHAMPTON.—Regent Cycle Stores. Kits by all popular makers, Duration, Flying Scale, Solids, cements, dopes, tissues. Expert advice given. Regent, Cleveland Street, Wolverhampton.

WOLVERHAMPTON.—The Aero-modellers' rendezvous. Starr & Sons, 61 Victoria Street. Kits by all popular makers. Cements, dopes, etc. Complete range of materials and accessories. Expert advice.

WORCESTER.—A. N. Cutler, Bridge Street. For balsa, dopes, tissues, elastic, propellers, cements, etc. In fact, all accessories for the aero-modeller. Stockist of 'Drome, Studiette, Skyleada, Scalecraft, etc. 'Phone: Worcester 4137.

FOR SALE.—Dopes, Insignias, Cement, Balsa, Piano wire, etc., at very reasonable prices. Send 1d. stamp for list to Smith, 13 Kenton Lane, Gosforth, Newcastle-on-Tyne, 3.

MISCELLANEOUS AND PRIVATE ADVERTISEMENTS

WANTED.—Aero engine (petrol) from 6-14 cc., complete with propeller. Ross Junr., Redmoor Cottages, Oxford Road, Bicester, Oxon.

WANTED.—7 cc. petrol engine with fly-wheel, for hydroplane. Write R. Hardman, 43 Boardman Street, Bolton, Lancs.

WANTED.—Petrol engine, about 6 cc., in good working order, and one about 1.5 cc. State price. J. A. L. Kennedy, 16 Westbourne Grove, Withington, Manchester.

WANTED.—Complete Ohlsson "23" and Brown Junior with condenser, coil, also pair of 4½ in. and 3½ in. air-wheels, all in good condition. Write Mellor, 63 Stanley Road, Oldham.

WANTED.—A 9 cc. Ohlsson Gold Seal Petrol Engine with coil and condenser. New or second-hand. Write Bateman, Oak Timbers, Uplands Road, Farnham, Surrey.