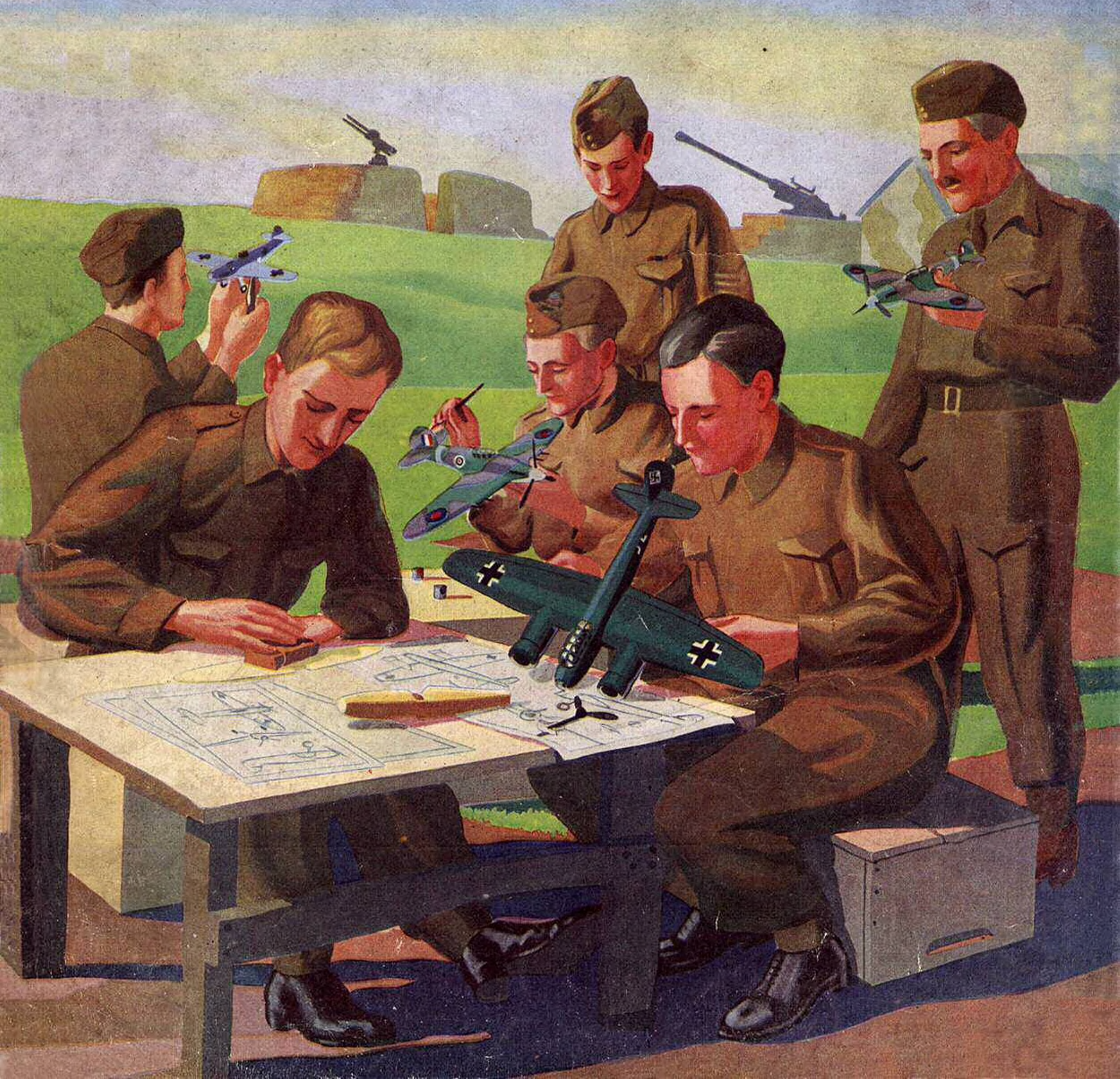
AERO MODELLER

JULY - 1942
VOL 7 No. 80
ONE SHILLING



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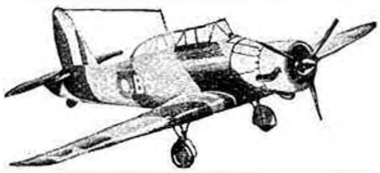
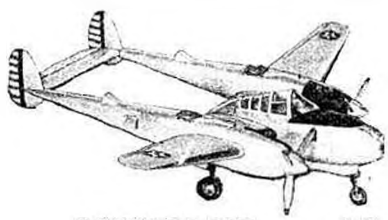
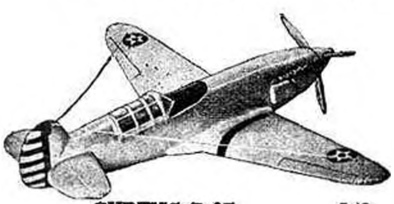


BLACKBURN SKUA. 6/9

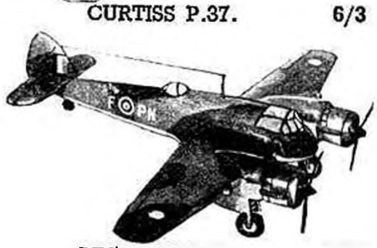
BELL AIRACOBRA. 6/3



LOCKHEED P.38. 8/9



CURTISS P.37. 6/3



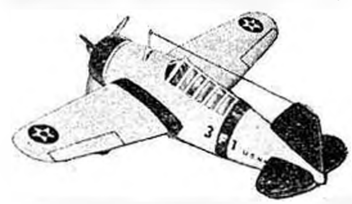
BEAUFIGHTER. 7/11

BRISTOL BLENHEIM. 6/11

HAWKER HURRICANE. 5/3

FAIREY BATTLE. 5/6

BOULTON PAUL DEFIANT. 6/9



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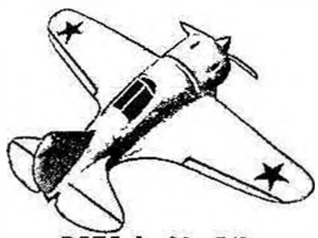

RATA 1—16 5/3

MODELS NOT ILLUSTRATED

S.E.5.	4/11	D.H. DRAGONFLY	5/6
PFALZ D.12	4/11	DOUGLAS BOSTON	8/3
MESSERSCHMITT B.F. 109	4/11	FOKKER G.1	8/11
MORANE SAULNIER 405	5/3	POLISH P.Z.L. P24	5/3
BRISTOL FIGHTER	5/3	WESTLAND WHIRLWIND	6/6

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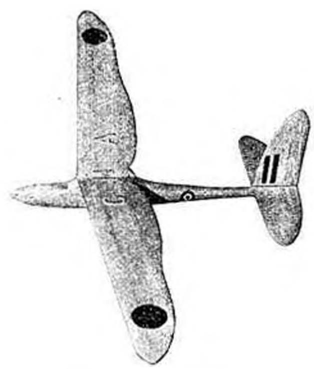

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Kit contains all parts cut to shape, cement, transfer insignia, banana oil, and complete instructions.

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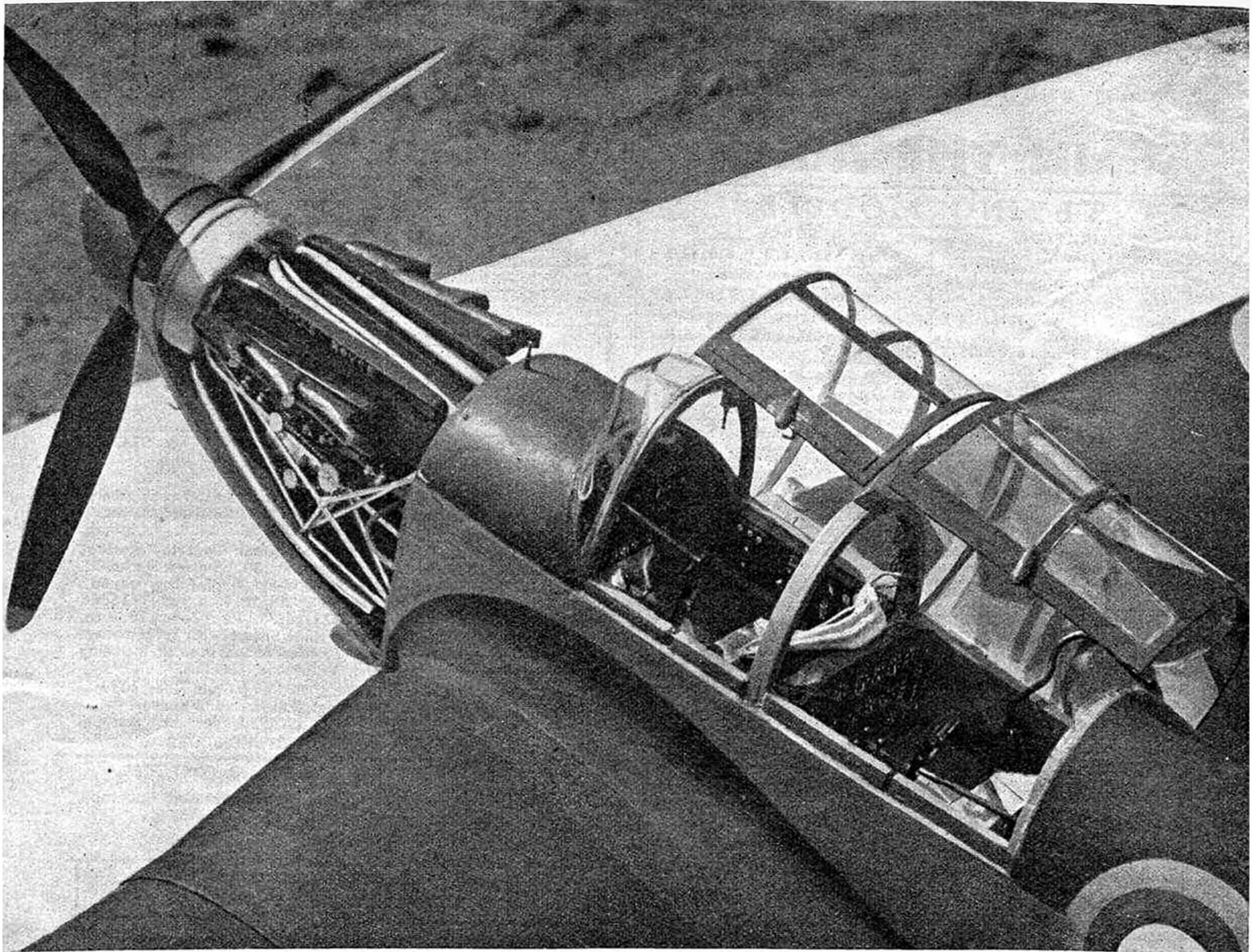

Photo by D. M. Roberts

Powered with a Rolls-Royce Kestrel XXX 585 h.p. engine, the Miles Master was introduced in 1937-8 as a two-seater advanced trainer. This view of the plane on the concrete apron in front of the hangar shows the compact engine mounting and general layout of the cockpits. (By the way, this model was exhibited at the Brussels Exhibition in 1938!)

CONTENTS OF THIS ISSUE

THE AERO MODELLER

Established in 1936

(INCORPORATING "THE MODEL AEROPLANE CONSTRUCTOR")

(Proprietors : Model Aeronautical Press, Ltd.)

THE MODEL AERONAUTICAL JOURNAL OF THE BRITISH EMPIRE

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

Vol. VII - No. 80 JULY, 1942

ALLEN HOUSE, NEWARKE ST., LEICESTER

EDITORIAL

"AIRCRAFT model building and aircraft model flying afford the youth of the country the most immediate practical access to aviation." — Dr. George W. Lewis, Director of Aeronautical Research, National Advisory Committee of Aeronautics, and Chairman of the N.A.A. Air Youth Board.

"Encouragement of junior aviation activities among the youth of America and the provision of training in this field are contributing factors in support and understanding of the *national defence* programme. *From your group must come the manpower* for the protection of our nation as well as the development of aviation."—Thus Col. Frank Knox, Secretary of the American Navy, on the placing of an order for 500,000 (*half-a-million*) solid aircraft models with the schools of America.

The Navy's Bureau of Aeronautics prepared plans and specifications, for the models required, and delivered them to the U.S. Office of Education, which arranged for their distribution throughout the schools of the U.S.A.

Some 50 separate aircraft types are included in the scheme. They are all to be built to the recognised 1/72 scale, and are to be used for the training of military personnel in aircraft recognition, range estimation in gunnery practice, and civilian training in aircraft recognition.

Well! That's the story of America's War Effort, so far as Model Aviation is concerned. *Official recognition* by the highest of Government officials, *official support* by the Educational Authorities, and 100 *per cent. contribution* of all plans, instructions, materials, etc., by appropriate Government departments and local bodies.

Flying Model Aircraft, too.

That the building *and flying* of model aircraft is recognised as a valuable contribution to America's War Effort is shown by the following statement :—

"The building of flying model airplanes is of great value in acquainting many young men with the principles of airplane design, construction, and operation in a manner which would not be available to them otherwise. Perhaps 50 per cent. of the 600 now in our Engineering Department are familiar by experience and have benefited greatly through model airplane construction."—G. A. Page, Chief Engineer, Curtiss Wright Corp., Airplane Division.

Recognition of the standing of the American Academy of Model Aeronautics (equals British Society of Model Aeronautical Engineers), has been afforded by the appointment of the Academy's Executive Director, Mr. A. L. Lewis, as Acting Director of the National Aeronautic Association Youth Division, Chairman of which is Dr. G. W. Lewis, Director of the N.A.A.

In a sentence, American Model Aviation has "gone to it" with full Government and trade support.

1/72 Scale Plans of Aircraft of the 1914-18 War.

During the past few months, very considerable research work has been undertaken by our staff with the view to *implementing* the A.P.S. range of 1/72 scale plans for military aircraft, by the inclusion of plans of aircraft of the 1914–18 War. A first list of some 40 aircraft is now published on page 317, and will, we know, be read with great interest by many modellers. Further 1914–18 aircraft will be added from time to time. Prices for these plans are as for other 1/72 scale plans, viz., 6d. each; 1s. 9d. for any 6; and 3s. 0d. for any 12, all post free.

"Our (Plans) Service is a Feature" . . . . . . but—

We have a number of orders uncompleted owing to insufficient information in regard to addresses having been given.

If the undernoted will let us have their *full* addresses we will "deliver the goods" :—

G. Wilkinson, Bulford, Wilts. Order—Albacore plans.
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J. C. Lane, ? ? Order—N.G.A. transfers.
Martin Lane ?, Youngs Close, Justicetown, Westlinton. Order—" Scale Model Aircraft that Fly."

Oh yes! there is also the fellow, who by postmark on the envelope of his letter, wrote from Erpingham, enclosing 2s. 6d. postal order, but giving no address or information as to what he wanted!

The "Horus."

The little biplane described on pages 298–9 of this issue is yet another addition to that range of "in-between" models :—In-between the truly miniature of only a few inches span, and the "usual run" of models 3 ft.–4 ft. span. Once again we give certified "performance figures"—which range from 40 to 50 seconds—with an average of 45 seconds . . .

Jackdaw II.

Judging by the number of orders received for full-size scale plans of Jackdaw II—a 35 in. span, semi-scale, cabin-type, high-wing duration monoplane, fully described in our last issue, and available through THE AERO-MODELLER Plans Service, price 2s. 0d. post free—we can expect a large entry for the several competitions we have organised in connection with this model. £5. 5s. 0d. is offered for the best flight, and three £2. 2s. 0d. prizes are offered for photographs of the model. Immediate delivery of the plans can be given. The model is constructed entirely *without* balsa—basswood, spruce, and birch being used.

Airscrews and/or Propellers.

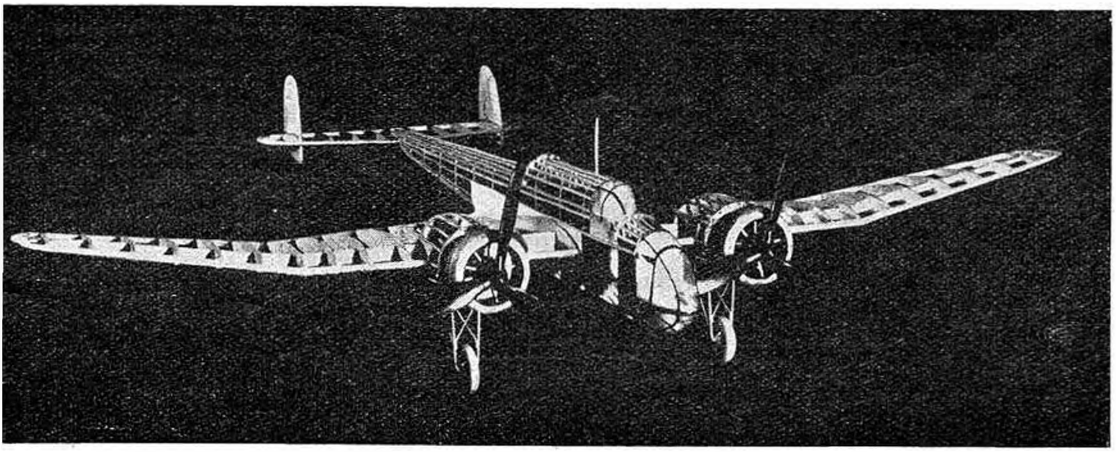
Owing to its "general interest" value, we quote the following paragraph from the Editorial of "Flight," published on June 4th last :—

"*Readers will probably have noticed that in recent official announcements of one kind and another the word propeller has been used instead of the now familiar term airscrew. One firm* *of airscrew manufacturers expressed its attitude very neatly by the wording, " Propellers, by Request." Rumour has it that a Royal Air Force squadron in the Middle East sent a request to base for four airscrews, and in due course received four air crews ! The story is probably quite untrue, but it does seem to be a fact that the changeover from airscrew to propeller was decided upon as a result of this possibility of error in transmission of messages. The same might be said of a few score of other equipment the names of which have not been changed.*

Although propeller is something of a misnomer, in that all present aircraft are of the tractor type, there was some excuse for making such a change. But the powers that be could not gather sufficient courage to go the whole way. The ruling, we understand, is that the word propeller is to be used when dealing with operational units, but in technical literature the word airscrew is to be retained. That, of course, makes everything delightfully simple ! A young man while under instruction will be taught all about airscrews, but as soon as he is posted to a squadron the windstick becomes a propeller. Doubtless, with the adaptability of youth, he will in time get accustomed to the propeller ; but if at any time later he should have occasion to study a handbook describing the working of a new type, he will be back to airscrews again. Only a Ministry could have planned such a state of affairs."

" Only a Ministry could have planned such a state of affairs." Lest it be thought that the Editorial policy (or staff) of The Aero-Modeller might be associated with such confused reasoning (sic), let us here record that, so far as we are concerned, airscrews are airscrews !

D. A. R.



My husband is a modeller,
I am, too.
He went to a contest,
I went, too.
He won a trophy,
I won TWO.
Now he won't speak ;
What'll I do ?

(With acknowledgement to " Air Trails.")

CROWDS of aero-modellers congregate at the nearest hotels when the American National meetings are in progress and by all accounts lead the residents a pretty dance. One favourite trick was to stick small strips of coloured tissue on to flies and let these loose in the lobbies, to the utter confusion of the non-flying section who were confronted with the strange sight of small pieces of paper performing all sorts of aerobatics !

BIPLANE petrol models have appeared from time to time, but very rarely do we hear of a triplane. One United States aero-modeller produced a scale model Fokker triplane powered by a 6 c.c. motor and, possibly inspired by this, a commercial kit is now offered for a high tri-wing. The three wings are staggered and mounted high on the fuselage giving a relatively low C.G. position. To ensure adequate stability the thrust line would also need to be fairly high, but no flight details are available of this extremely interesting design.

THE Americans always have a name for it ! Though some of their models do not always live up to their high-sounding titles the description of a meeting as *The Model Maniac Contest* has been fully endorsed by some of the " maniacs' " wives !

THERMAL BUSTER is the name given to a certain gadget used on some American petrol models to prevent fly-aways. It consists essentially of a slow-burning fuse fitted under the fuselage which, after a certain period of time has elapsed, burns through the wing retaining bands. The wing itself is tethered with cord and now slides backwards at the same time increasing the angle of attack, this giving a " pancake " descent. A strip of asbestos paper secured to the fuselage prevents the fuse setting the whole on fire—rather a " Heath Robinson " contraption !

ALLOY metals of a highly specialised nature have been developed for model aero engines and it is claimed that these have five to six times the heat conductivity, one third the weight and three times the wearing quality of cast iron or the usual alloy steels now employed.

FOLDING wings have been fitted to a model catapult launch glider ! The wings are folded for the launch and the model shot up to a great height like a projectile. At the top of its " climb " the wings unfold and it commences a long flat glide. Further developments are being carried out along these lines with the idea of fitting a similar scheme to a petrol model. In this case the wings are to be semi-retractable to give a rocket-like climb to a great height, by grossly over-powering the machine, and then fully extended when the power is cut to prolong the glide.

AMERICAN scale models are allowed to use an oversize propeller and a material increase in performance is apparent when this is of the folding type. Henry Struck won first place in the 1941 Nationals with an average of 2 minutes 38 seconds.

MODEL aircraft are frequently used to illustrate scientific lectures. The Franklyn Institute of America recently toured the country giving talks on the development of aviation and illustrated this with demonstrations by flying models and scale models. In addition they had a small portable wind tunnel with a " visible air stream "—made possible by injecting smoke into it—in which the basic principles of flight and control were clearly shown. The duration of the lecture was about an hour and a half and was extremely well received by a number of enthusiastic audiences and fully justified the project of " bringing the museum to the country."

A 28-in. SPAN SCALE MODEL H. P. HAMPDEN

By D. R. MURRIN

The heading photograph shows the Handley Page Hereford which is essentially the same as the Hampden but with Napier "Dagger" engines in place of Bristol Pegasus.

Photograph by courtesy of the Air Ministry

General description.

The model is built of balsa throughout with the exception of the 1/16th square stringers which are of bass. The fuselage is built up on a 1/16th sheet balsa keel to which the formers are first of all attached. This keel is broken in three positions by the cabin and gun positions and the necessary portions should be cut out when the fuselage assembly is almost completed.

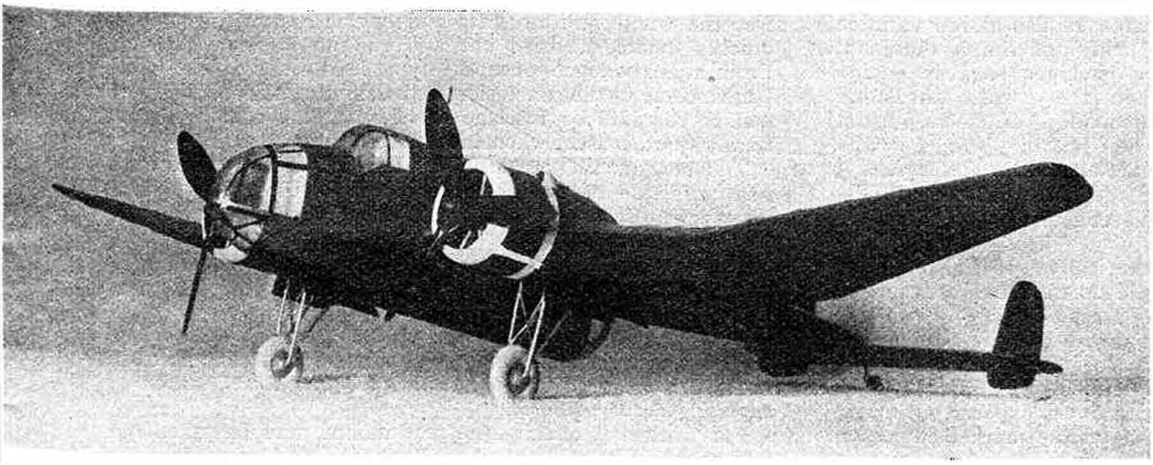
The stringers are cemented to the outside of each former, not slotted in, and spaced as shown on the plan. A slit must be cut in the rear end of the keel to accommodate the tailplane, this being secured by cement, and the tailwheel fixing bound and cemented to the keel.

All the gun positions and the cabin are then filled in with 1/16th sheet and painted matt grey. The two fins and rudders are cut from two laminations of 3/32 in. sheet and the position of the rudder hinge line and the trimming tab should be scored on the wood. They are then cemented in their correct position on the tailplane.

The wings are built in two parts and the dihedral set on the outer sections. The fuselage is set on an even keel and the wings are raised to the correct level, cemented in place and left to set. The leading edge and the main spar are cemented to formers 5 and 6 respectively. The 1/8th sheeting at the centre section may then be added and also the 1/16th sheet fill-in between the stringers around the wing centre section. Finally add the wing fillets of cartridge paper.

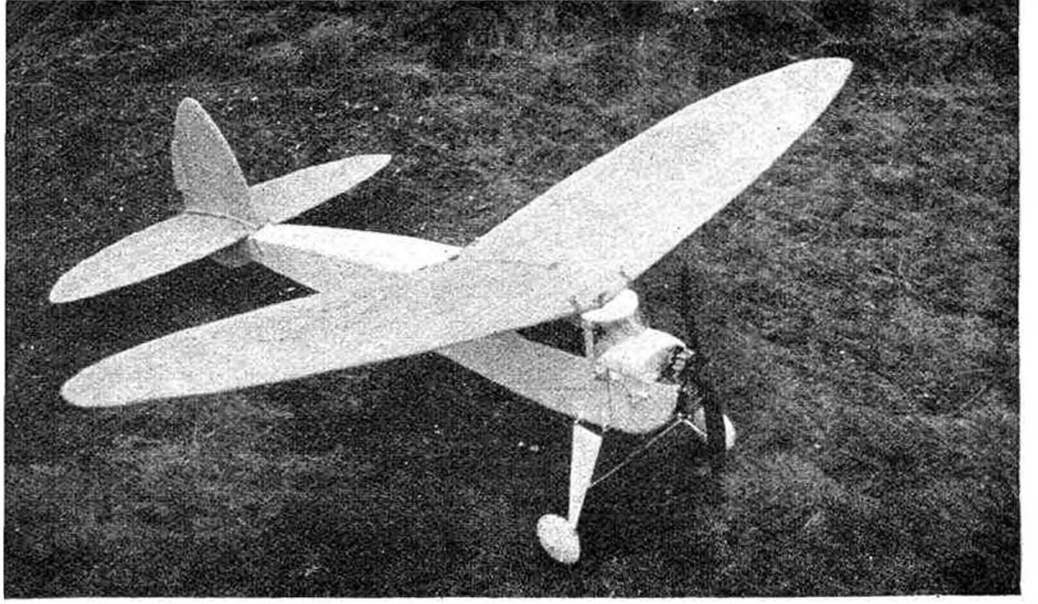
The undercarriage legs are bound and cemented to the wings. The engines are mounted on ¼ in. square strips and the nacelles built up. The engine push rods are painted silver, with the interior details of the engine black and the collector ring, exhausts and air intakes matt grey. The cowlings themselves are cut from cartridge paper with the gills cut or scored at the trailing edge.

The cockpit covers are the most difficult part of the model. To make these a wooden former of the required shape is first of all necessary, and this should be lightly greased. Each former must be slightly longer than the required cover and a small notch is cut near the back. A sheet of gelatine is then taken and placed in water, removing before it commences to dissolve. The water is gently shaken off the sheet which is then moulded over the form with the fingers, taking care to remove all wrinkles, etc., Hold in place with a rubber band find leave to dry overnight. It will then slide off the block quite easily. The covers may then be lined with Indian ink to represent the framework, but this must be used sparingly or the gelatine will soften and lose its shape. As a final precaution the finished cover should be varnished.



The photographs of the finished model show the particularly good finish which was obtained by covering the whole model with white tissue, water spraying to tauten, and then clear doping. Camouflage dopes were then applied and the control hinge lines and other details marked in with Indian ink.

HALF SIZE, FULLY DETAILED WORKING DRAWINGS ARE GIVEN ON PAGES 304 & 305.



PETROL 'PLANE

By Lt.-Col.

The writer, so well known as a petrol modeller of many years' standing, follows his last discussion with a further article on petrol 'plane development. Lt.-Col. Bowden was one of the first to popularise the detachable engine mount, which has greatly reduced the liability to damage

Fig. 3

Cleaning up the Engine Mounting.

In my last discussion I mentioned the value of fitting wing-tip slots to a petrol model to improve stability and prevent the stall. I also described some highly satisfactory experiments with small accumulators weighing $4\frac{1}{2}$ oz. and $2\frac{1}{2}$ oz. respectively, which eliminate trouble in connection with fading of engine revolutions on switching over from the booster accumulator, and also uncertain power output from the model aero engine.

The next practical simplification of the model that I want to suggest is in connection with that all-important thing the engine mounting.

In the early days of petrol models I used the detachable type of engine mount formed by an electron casting, which I used to have cast to my pattern by a light alloy foundry.

The engine was mounted upon the casting and was held to the nose of, the fuselage by elastic bands. This type of mounting has the advantage of saving damage to the engine crankshaft in the event of a crash. It also allows variable downthrust or sidethrust to be quickly and simply obtained, and altered, by merely inserting packings between engine mount and fuselage nose. When the correct thrustline has been obtained these packings are made a permanent fixture.

With this type of mount the coil has to be fixed in the fuselage. The battery and timer are also in the fuselage.

All this demands long wiring, and the wiring has to be broken whenever the mount and engine are taken off to make adjustments to the engine.

Short wiring is more efficient electrically. It is also lighter, and it is a further advantage if the coil can be mounted nearer the engine.

The condenser must, of course, always be near the ignition points.

Even in peace time there is the difficulty for many people of obtaining electron castings, added to the expense, although several model firms eventually put on the market copies of my type of electron mountings when they became popular.

To overcome all these difficulties, and yet to obtain the fundamentally sound principle of the detachable mounting, I have since evolved a more simple mounting incorporating a " power egg " that can be made up from 3-ply and wood. It contains the coil and time switch and flight flash-lamp battery, or, as I now advocate, the baby accumulator for ignition. It is still detachable and can be knocked off in a crash and will save damage to the engine.

Fig. 1 shows the old type of mount, and alongside is a sketch of the new mount, containing the entire ignition unit and wiring.

Some people may say, there is now too much weight forward. Actually this becomes an advantage and will permit a longer fuselage to balance the forward weight and so fore and aft stability will be much increased and a smaller tailplane and fin can be used.

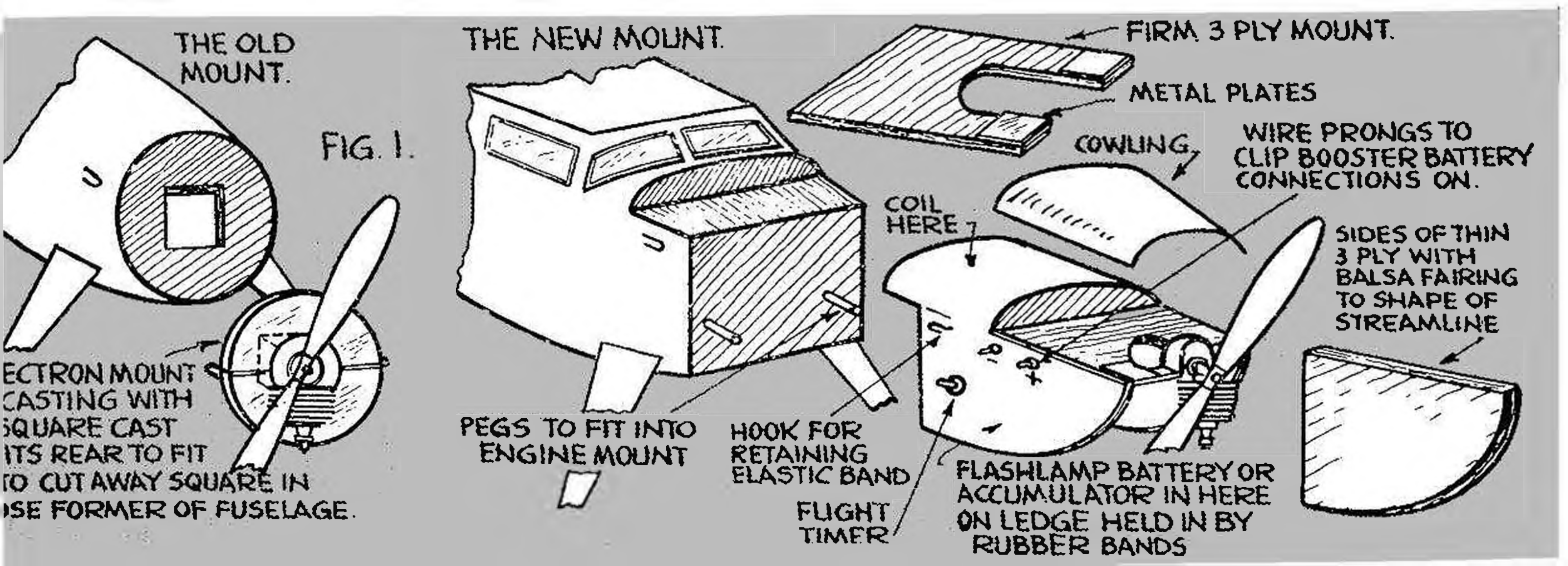
This new type of mount is also particularly suitable for model flying boats as shown in Fig. 2, for if the machine gets wet the whole ignition gear and engine and wiring can be quickly detached, dried out and run up in the workshop. From my experiences of model flying-boat and seaplane work, I have come to the conclusion that the old type of wiring with coil in the hull or fuselage is responsible for more bother than any other item when there is sea water about !

The new mount can still be altered for thrustline, until final adjustments have been made, and for those who wish to do so in the future days of peace, this type of mount can still be cast in electron.

Let me remind the novice and semi-novice that there is one great secret of petrol model flying. It is so simple that many people neglect it.

Line up your model into a perfect and flat glider. Leave all wing and weight settings after the perfect straight glide has been obtained. Then adjust for climb and turn under power by adjusting the thrustline.

For workshop testing, the new mount may be taken out and attached to a board suitably shaped and gripped in the



DEVELOPMENT

C. E. BOWDEN

of this vital unit during crash landings. The original material employed, electron, is now practically unobtainable and so this article deals primarily with a new and improved wooden mounting possessing many advantages over the original, and should have a wide appeal to all petrol fans.

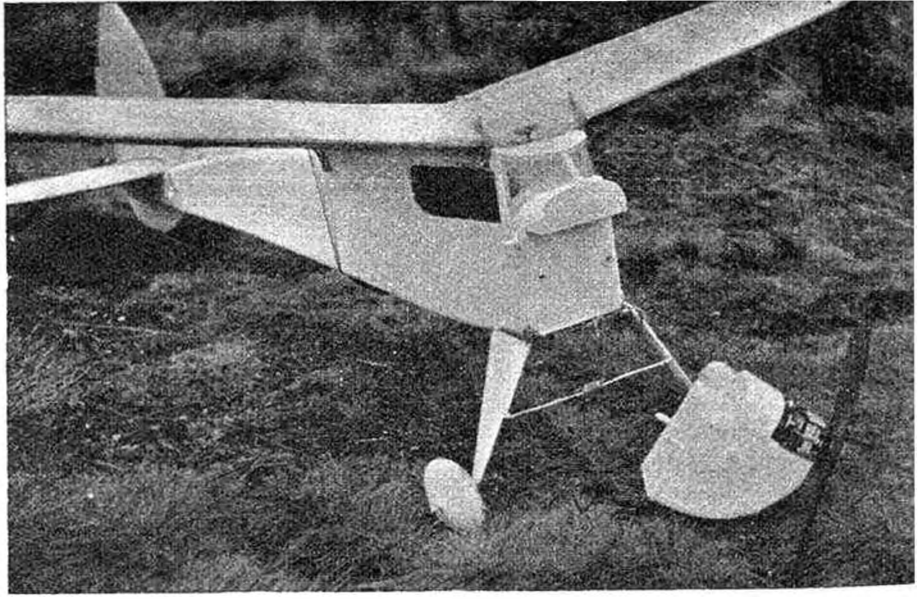


Fig. 4

bench vice. The engine and ignition gear can then be tested and operated in comfort at home, and can be taken out on to the flying field where one can proceed with a day's flying, sure of the power department.

The fuselage now becomes a shell to mount wings, undercarriage, tail and fin upon.

Any one can build one of these mountings at a minimum of cost from simple plywood and fairing.

Fig. 3 is a photograph of a simple little model fitted with the mount, whilst Fig. 4 shows the mount removed.

The model shown is a development of my old simple little model called the "Porlock Puffin" which was described in

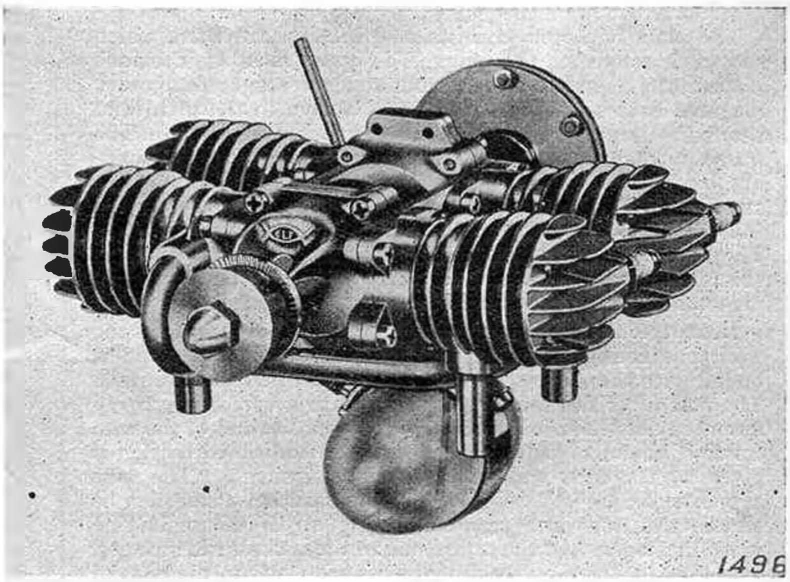


Fig. 5

The Aero-Modeller. The model was fitted with various 2·5 c.c. engines including the little 2·4 c.c. "Elf" engine. Readers may be interested to have a few details of the model. It has a simple fuselage made from 1/16 in. balsa sheet. The length is 35 in., excluding the engine mount, which is 3¾ in. long. The wing is now of elliptical form and is only 4 ft. 6 in. span but has a centre chord of 11 in. Actually the wing area is greater although it is of lesser span. The elliptical tail span is 25 in. with centre chord 6½ in. The fin is 7 in. high, with a lower fin combined tail skid of 1½ in.

America Developments.

Just before America entered this war some delightful little flat twin and flat four two-stroke engines were produced by the "Elf" engine firm. Some readers may remember that about 1935 or 1936 I tested the first and, at that time, the smallest commercial engine obtainable. It was a 2·4 c.c. engine called the "Elf." It had two main bearings and a tiny car type contact breaker, and for those days the whole engine was a great advance in small size.

It ran beautifully smoothly and steadily, and it weighed only 4½ oz. It had a rather limited power output however.

This firm has now produced a tiny flat twin-cylinder engine of ·198 cu. in. displacement, weighing 5 oz. Also the firm has produced a flat four-cylinder engine of small size with a displacement of ·396 cu. in. It weighs 9 oz. and is in Class C models. It is suitable for 10 ft. span models for wireless control.

These engines have been most successful in American competitions recently. The twin won 1st place in "A" Class of the American Nationals of 1941.

Both these engines are of particular interest to petrol enthusiasts owing to their advanced, compact and novel design, and are pointers to the future post-war development of the small multi-cylinder model aero engine.

Fig. 5 is a photograph of one of these most intriguing little aero engines.

Details of these engines will be of interest :—

The flat twin, comes in the "A" Class (America). It operates at speeds of 7·500 r.p.m. Power, ⅛ h.p. Bore, ·468 in. Stroke, ·564 in. Pistons, forged aluminium. Bearings, 12-ball thrust bearings. Two main bearings. Air filter on carburettor intake. Petrol tank, ½ oz. capacity.

The flat four, comes in the "C" Class (America). Speed, 7·500 r.p.m., with 13 in. diameter propeller. Power, ¼ h.p. Bore, ·468 in. Stroke, ·564 in. Pistons of forged aluminium. Three main bearings with ball-thrust race. The distributor fires in pairs. Petrol tank holds ¾ oz. and there is an air filter on the carburettor.

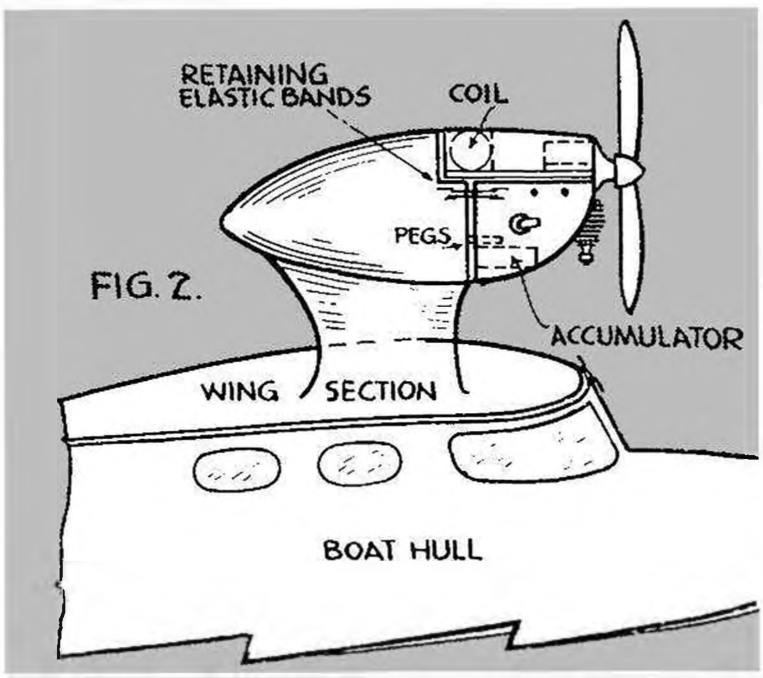
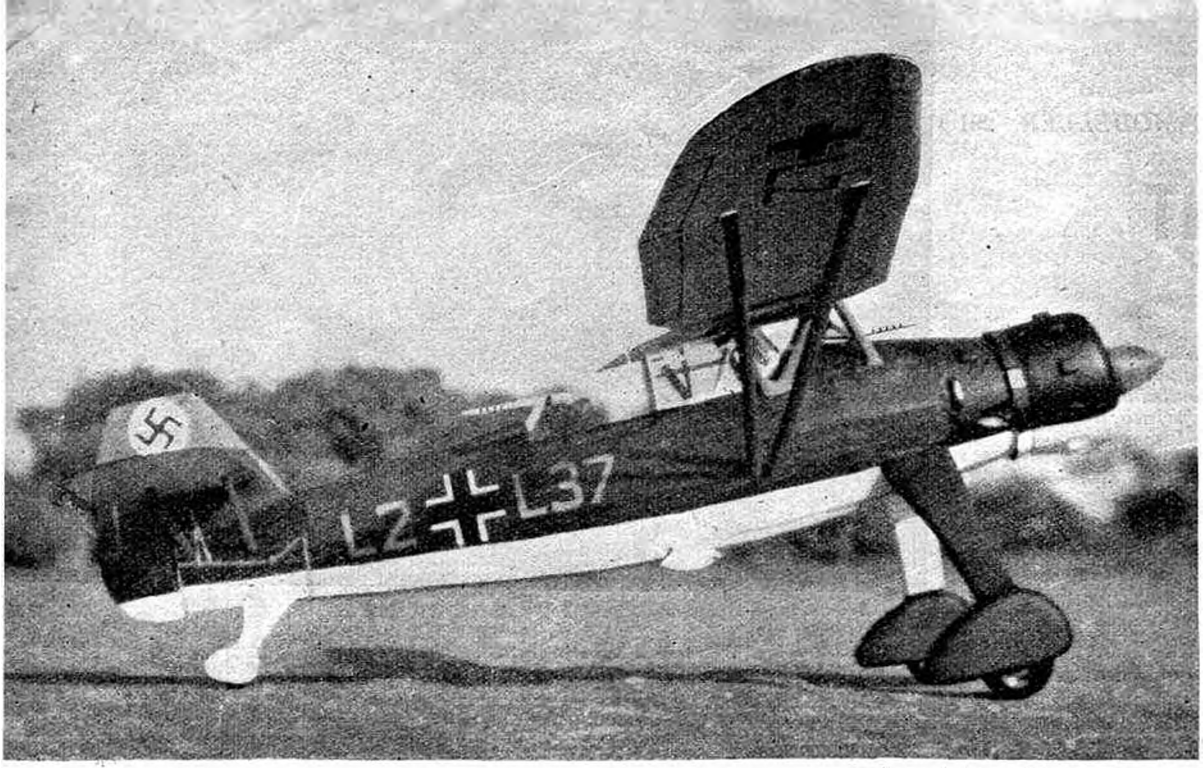


FIG. 2.



THE HEN

SUPER DETAIL
PLANS AVAIL
AEROMODEL
PRICE

General Features.

This particular type was developed from the Hs 122, which had an entirely open cockpit and less pleasing lines. The Hs 126 was first put into production in 1936 by Henschel Flugzeugwerke, A.G. at Schonfeld, Berlin, and it is believed that many are still being turned out by other firms. A considerable number are in service.

Main dimensions and performance figures are as follow:—

Span, 47 ft. 7 in. Length, 35 ft. 7 in. Height, 12 ft. 4 in. Wing area, 340 sq. ft. Aspect Ratio, 6 2 : 1.

Maximum speed, 221 m.p.h. at 8,850 ft.; range, 680 miles at 197 m.p.h.; initial climb, 1,870 ft. per min. Service ceiling, 28,000 ft.

The landing speed is 59 m.p.h., i.e. 7 m.p.h. faster than that of the Lysander and its top speed is slightly lower than that of the British machine.

The standard armament is one fixed machine gun firing forward and one movable machine gun handled by the observer. The air crew consists of a pilot and observer.

A B.M.W. Dc motor, giving a maximum power output of 870 h.p. at 8,200 ft. is fitted, which is again slightly inferior to the Perseus of the Lysander, the latter being capable of developing 905 h.p. at a similar altitude.

Henschels were mainly met in the battles of France and the Low Countries although a few have been observed over this country, presumably on reconnaissance.

A 1-in. to the foot Scale Model.

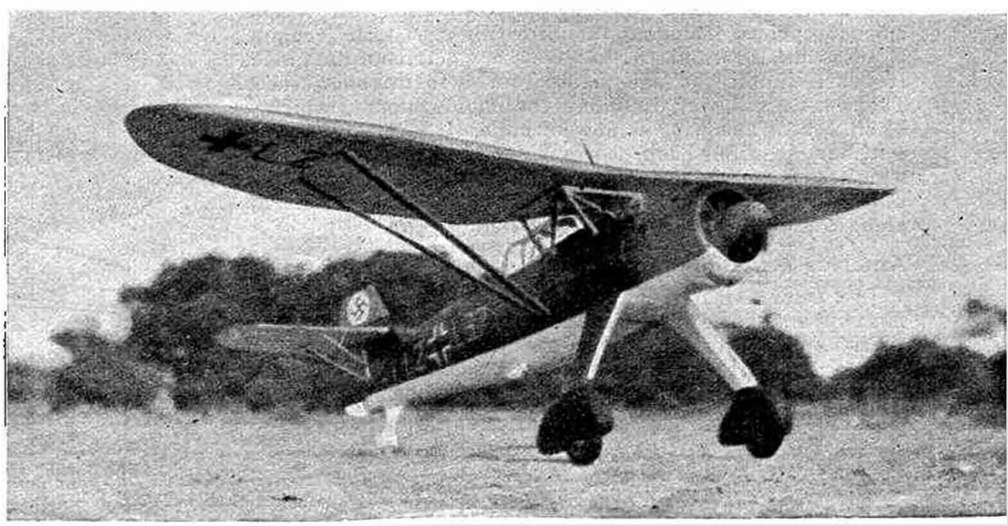
Full size, fully detailed working plans of this excellent scale model are available through THE AERO-MODELLER Plans Service and the reader is strongly advised to work from these should he wish to build a copy. The colour scheme adopted on the original model was in keeping with that of the full size aircraft, with the sole exception that white tissue was used to cover the under surfaces instead of pale blue. This latter point afforded a considerable saving in weight as these surfaces did not then require colouring and the general effect was unchanged. If coloured tissue of the required shade is obtainable this, of course, should be employed. Upper surfaces of the model were coloured with black dope, also the wheel spats and the outsides of the undercarriage legs. The insides of the legs were white and the struts light grey. The correct insignias and markings were fitted, namely black crosses on the fuselage and wings and a black swastika on a white disc outlined in black and mounted on a red strip of the fin and rudder. Squadron lettering was in light grey on the fuselage.

Details of construction are as follows.

The main backbone consists of ⅛ in. sq. hard balsa which should be pinned to the plan. The upper members continue through the cockpit and are cut out at a later stage. Temporary diagonal braces are then added (not shown in the plan) and the half formers, Nos. 1 to 12, cemented in place. The framework is then removed from the plan and the corresponding half formers of the other side fitted. Fit the master stringers of ⅛ in. sq. balsa and be sure that these are true as the accuracy of the whole fuselage depends upon this. The tops of formers 6, 7 and 8 can then be cut away and the 1/16 in. sq. stringers added. At this stage the temporary diagonal braces can be removed.

Next the undercarriage tubes are fitted in position, the front one consisting of 16 s.w.g. tubing, 4¼ in. long, and is bound with thread to stringer (*a*) situated 1 in. from former 3. The rear tube is similar but is soldered to a wire frame freely mounted between the stringers. The opposite end of the wire frame is bound to the main keel at (*b*). Additional tension is given by the cross wire (*c*) attached to former 5. The tube supports (*d*), (*e*), (*f*) and (*g*) of ⅛ in. sq. hard balsa can then be added, the front and rear connecting up to the main side master stringers and the centre one to the cockpit rail stringer. The 1/32 in. three-ply backing pieces are fitted to the ends of the tubes, noting that the rear tube must move easily in the

The excellent flying characteristics of the full-size machine are amply demonstrated in this one-inch to the foot scale model, which is capable of an average flight of 45 secs. R.O.G. This first-class performance makes this model one of the most outstanding of its type yet produced.



SCHEL Hs 126

By R. L. WALKER

ED, FULL SIZE WORKING ABLE THROUGH THE LER PLANS SERVICE 5/- POST FREE

slot. The gap between the backing pieces is filled with sheet balsa and plastic wood to form a neat fillet.

The tail wheel and spat may now be fitted. The construction of this is layers of 1/8 in. sheet and cored with 18 s.w.g. wire to allow for backward springing.

Wing Platform.

The wing platform consists of 1/8 in. by 1/8 in. and 1/8 in. by 1/16 in. balsa encasing a length of 20 s.w.g. wire bound at one end to the cockpit stringer and bent over into the 1 mm. three-ply at the top. Care must be taken to include the correct incidence. The 1/32 in. balsa sheeting forming the front of the cockpit cabin can then be added.

Note that in the photographs of the uncovered model shown overleaf a slightly different former spacing and sheeting arrangement was adopted to that given on the plans.

To complete the cockpit add the cabin, the formers consisting of 1/32 in. ply and the horizontal members of 3/32 in. sq. reed cane. Finally true the fuselage up and leave until completely set.

The Cowl and Nose Block.

In the original model two motors geared together with a step up ratio of 2 : 1 and a scale diameter propeller were used, the whole assembly being in a detachable nose block and run on ball races.

The gills are from a piece of 1/32 in. ply, 1 in. by 13 7/16 in. marked off into 18 equal sections and divided up lengthways into two parts of 5/8 in. and 3/8 in. width. The larger portion forming the actual gills is cut down to the dividing line. A strip of 1/16 in. by 1/2 in. balsa is wrapped around the smaller portion of ply and two similar layers added, each 3/16 in. nearer the front.

A circular disc of 1/16 in. sheet balsa is now added to the front of former 1 and is of the same diameter as the outside of the last strip. Finally a piece of soft 3/32 in. sheet is wrapped around the whole and the front of the cowl added. Sand down to a smooth finish and add the nine blisters of 1/8 in. sheet.

Undercarriage.

A wire frame is bent as shown in the isometric view on the plan and forms the springing arrangement. All wire joints are bound and soldered. The legs themselves consist of two pieces of 1/8 in. balsa encasing a tapered piece of block. The spats are built up of two layers of 3/16 in. sheet with a piece of 1 in. block.

The leading edge is of 3/16 in. sq. hard balsa set diagonally and cracked to the shape shown on the plan: reinforce with cement. The spar is built up from 1/8 in. sheet and 1/4 in. by 1/16 in. forming a " T " section. All ribs are of 1/16 in. sheet with the exception of No. 1 which is of 1/8 in. sheet. Trailing edges and wing tips are cut from 1/8 in. sheet and sanded to section after assembly. 1/32 in. sheeting is added to the upper and lower surfaces as shown. An additional rib, 2a, is fitted to strengthen the anchorages.

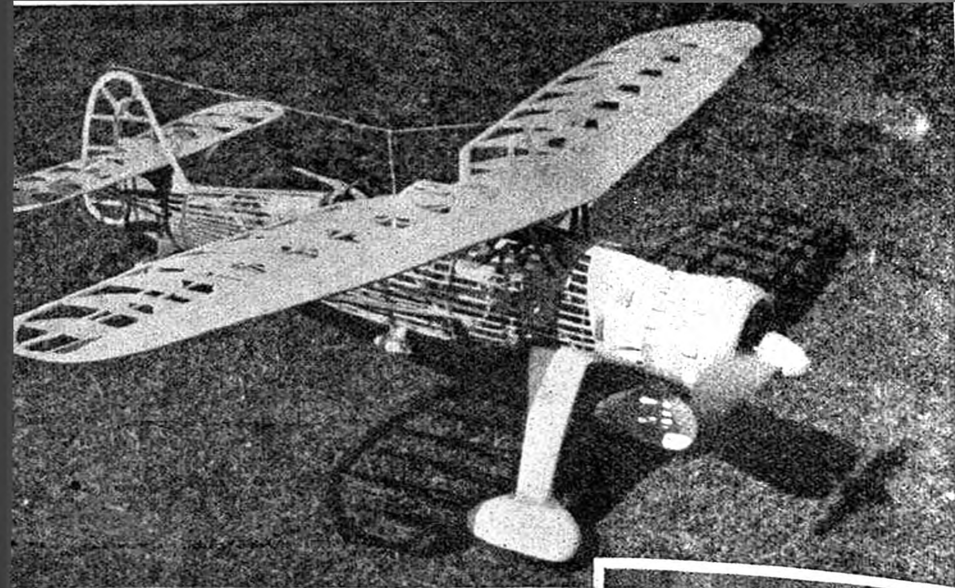
The first-class workmanship and finish, and the excellent photography, is well illustrated on these pages. These photographs might well be mistaken for those of " the real thing " with motor running.

Struts.

The wing struts attach to the wing panels themselves and fit lightly into slots in the fuselage, thus allowing for slight movement of the wing if necessary. The front tail strut is attached to the tailplane itself and the detachable part of the tailplane fairing (plugging into small brass tubes). The rear strut fits simply into a slot in this fairing and will thus allow adjustment of tailplane incidence. The length of the front strut must be carefully determined as this decides the squareness of the tailplane in lining up with the wings.

Power.

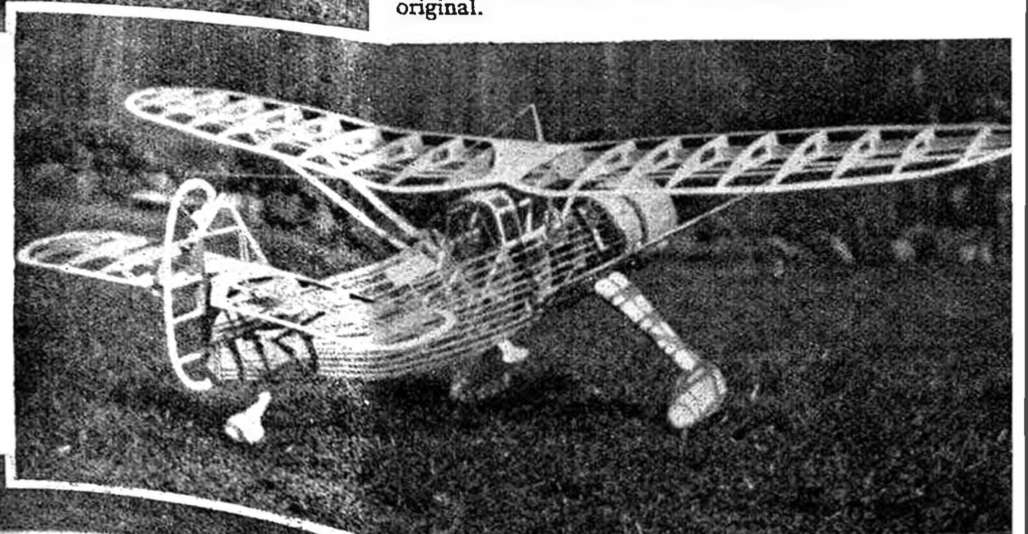
In the original model employing two geared up motors, 28 strands of 1/4 in. strip elastic were used. This was divided into two skeins of 14 strands each, giving a motor run of about 40 secs.

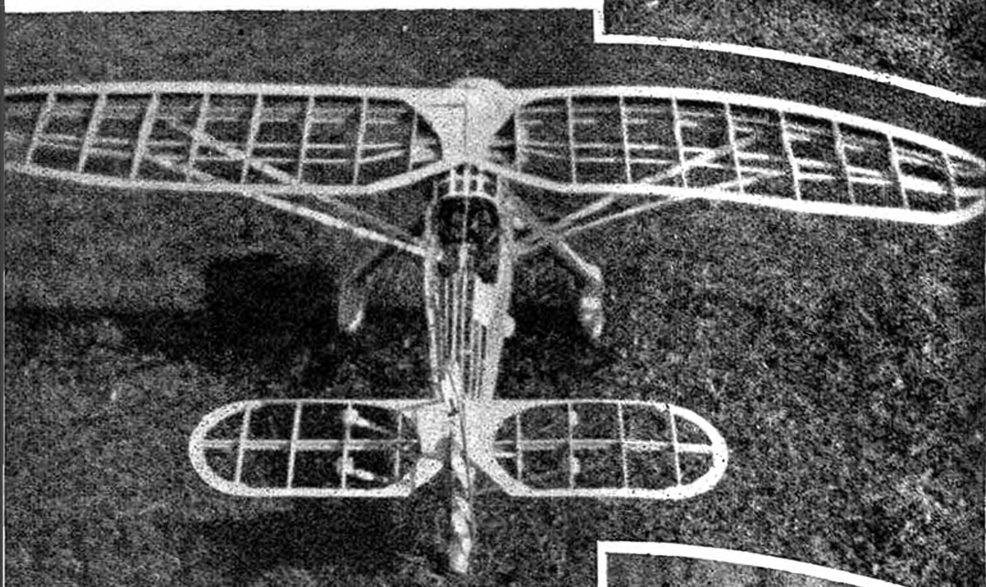


Note how carefully the main features of the full-size machine are faithfully reproduced, combined with a general robustness of constitution, making it ideally suited for scale flier.

This may seem somewhat high to the average model builder but the propeller is geared up in the ratio of 2 : 1 and thus the rate of unwinding is not unduly rapid. The propeller naturally revolves fairly rapidly but this only enhances the scale appearance of the model when in flight. The photographs on the two previous pages show how nearly it does approach the actual machine in looks when taxy-ing for the take-off. By saving a little weight on certain of the component parts the amount of rubber used could be reduced with a consequently longer motor run; but it is not advisable to carry this to extremes as the original model was both rugged, and thus reasonably crash proof, as well as having an extremely gratifying flight performance. In a model of this type it is better to err on the side of excess strength and a well finished appearance.

Little or no difficulties should be experienced in trimming. It may be found advisable to employ a certain amount of sidethrust or downthrust if the model tends to be vicious on full turns, but no such vices were apparent on the original.

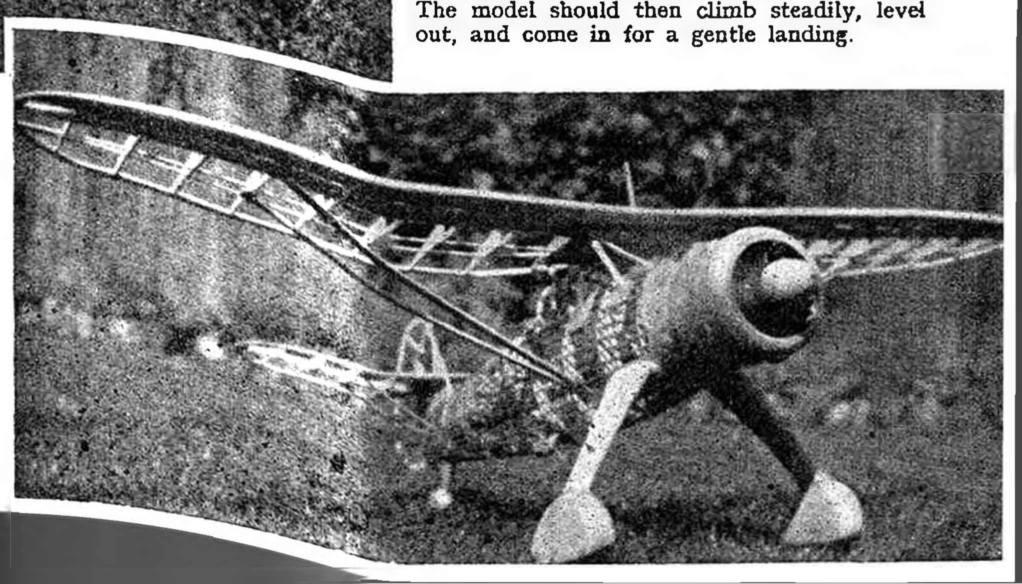




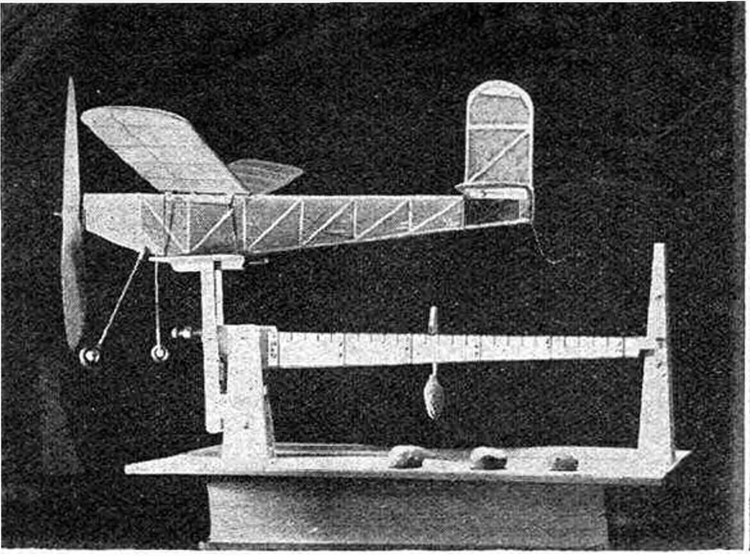
Flying.

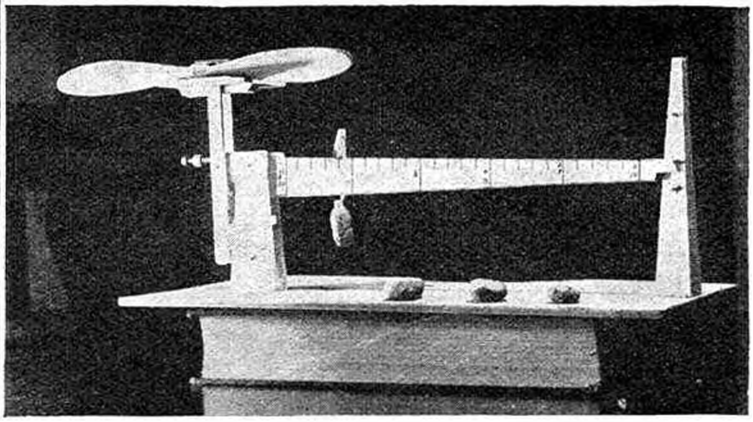
In spite of the scale diameter propeller and the comparatively high parasitic drag, the speed is fairly low—in fact the model has exceeded expectations in flight tests. Average duration R.O.G. is about 45 secs. and the whole flight is quite stable. The undercarriage being fully sprung in three directions will take all landing shocks and the general robustness of construction make it a very pleasant model to fly.

Test flights should preferably be carried out over long grass, commencing with a few hand launch glides to check the trim, and once the glide is satisfactory a power flight should be attempted with about 200 turns on the motor. The model should then climb steadily, level out, and come in for a gentle landing.



Some idea of the detailed design of this model can be obtained from the four photographs on this page. By a particularly ingenious arrangement the undercarriage legs and the tailwheel leg are fully sprung in two directions and the wheels themselves are further sprung inside the spats. This relieves the main structure of heavy landing shocks to a great extent and lessens the risk of damage in a hard landing.





THE AEROMODELLER'S WEIGHING MACHINE

By ARNOLD WATHEW

EVERY designer of flying model aircraft—or full-sized aircraft, for that matter—finds himself at the very outset of his labour faced with the problem of weight. He may design the most perfect aerodynamic structure, but if it is too heavy it will not fly or only very badly. Weight, then, is all-important. This being so, it seems to me a remarkable thing that, in the model aircraft world, so little is seen or heard of suitable means of computing this weight with the necessary degree of accuracy.

So far as I can recollect only two constructional articles describing machines for weighing model aeroplanes have appeared in the model aircraft press during the last three or four years. I built them both, but found myself in need of something easier to use than the suspended steel-yard type, particularly when it came to Wakefield models. The weighing machine I wanted must have some kind of platform upon which the article or machine to be weighed could be placed (not hung), it must weigh up to at least ten ounces and it must be accurate to 1/10th of an ounce or better. The weighing machine that was built to satisfy these demands is now one of the most valued items in my workroom! How I managed without it, I cannot think. If you will follow the instructions carefully, you may make one like it in an evening, and at negligible cost.

Referring to the side elevation drawing you will note that the machine consists of a baseboard " A " (mine was plywood, but board is better), uprights " B " between which is pivoted the weighing lever " E." At its thick end the weighing table " D " is pivoted. A link " H " connects the foot of the weighing table to " B " and prevents it falling over. At the other end of the baseboard the upright " C " carries the dowel stops for the end of the lever, and has a horizontal mark to show when the lever is in the mid-way or balanced position. " F " is the cursor, or moving weight, and its position on the lever enables the weight to be read off the scale. There is a hole in the lever at " Y " where additional weights " G," " J " and " K " may be hung. " L " is a piece of screwed rod with a small nut for fine adjustment prior to first using the machine. It should not be touched when weighing is being done.

Now, although I have given dimensions in almost all cases, the only ones that MUST be adhered to are those of the lever size itself (and markings), and the distance between the various pivoted joints. For the rest, you may use the nearest material you have on hand in the scrap box. On my machine, all pivots are made from 16 s.w.g. steel wire. All pivot holes are bushed with seamless brass tube to fit the wire. Bushes are essential and are cemented in, but must be exact in position, and drilled perfectly true.

The base board can be deal and must be flat and free from any sign of warp. All the rest of the machine is made from hard sheet balsa, ¼ in. and ⅛ in. stock. The piece of screwed rod " L," is 3/16 in., or 2 B.A. screwed brass rod. A brass stud 1½ in. long will do, if you remember to thread the nut on before cementing into its hole. This nut should not turn too easily and should be left alone after the scale has been trued up ready for work after any long period of idleness. The scale on the lever is best done in Indian waterproof ink on typewriter paper and pasted on. When you have assembled your machine and seen that the lever works freely with no binding or rubbing at any point, you must set about b ancing the lever and making your extra weights.

Procure about two ounces of plasticine and get your three S hooks " G," " J " and " K " and the cursor " F." Go to any local sweet shop where they have a really good pair of scales which weigh in quarter ounces and get them to weigh up the following lots for you :—

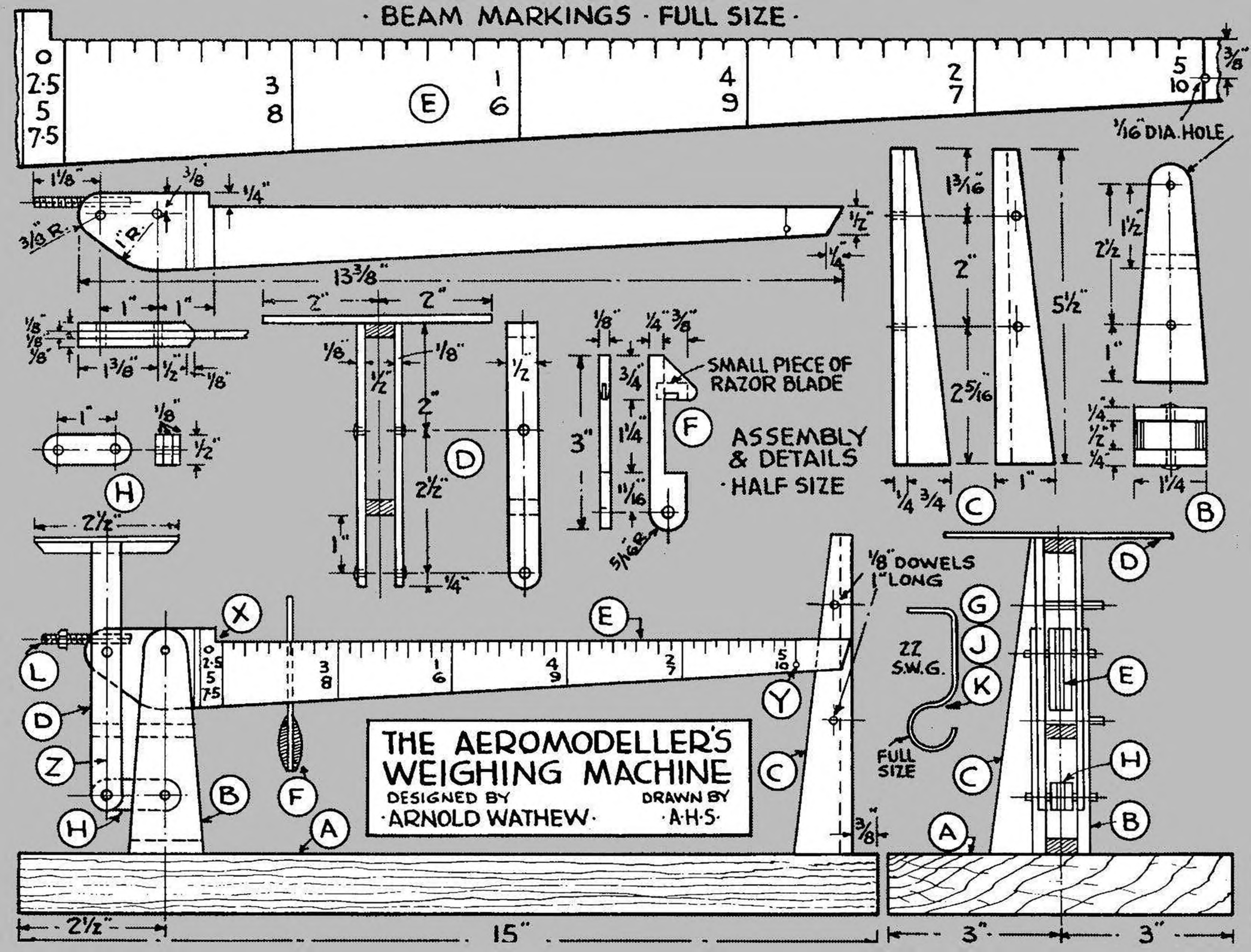
(1) The cursor plus enough plasticine to make ¼ ounce.
(2) S hook " G " plus enough plasticine to make ¼ ounce.
(3) S hook " J " plus enough plasticine to make ½ ounce.
(4) S hook " K " plus enough plasticine to make ¾ ounce.

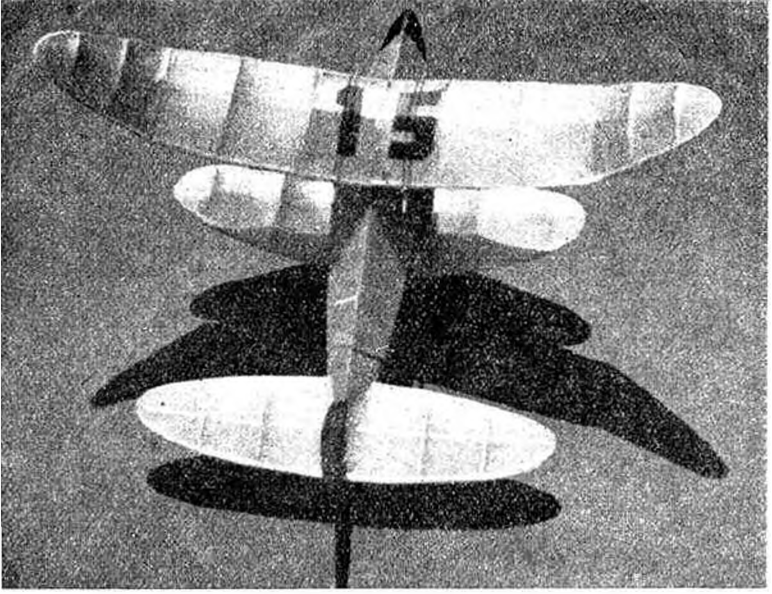
This must be done very carefully indeed. If you prefer, (3) and (4) may be made of less bulk by substituting small bits of lead or nails for some of the plasticine. They may be buried in the plasticine and will not show. Weights " G," " J " and " K " must be moulded so as to leave the top of the hook free to insert in the hole Y. Shape them like a pear. The plasticine with the cursor must be moulded in and around the hole in the bottom of the cursor, which is for this purpose. The actual lever scale is 10 in. long and is divided into fifty equal divisions of ·2 in. each. Every 2 in. there is a heavy vertical line. Figure the scale as on the drawing, and stick in the exact position on the lever.

Place cursor at point X or O on the scale. Screw nut on rod " L " right down to wood of lever. Now add weight in the form of plasticine or anything that is convenient and will stay put, between legs of platform " D " between the two pivot points at " Z " until the lever is practically level as on drawing. Now screw out nut on rod " L " until lever just tips up, and your machine is ready for use.

Weighing is carried out as follows :—

Place article to be weighed on platform " D " and move cursor along scale until the lever will just stay level. You will find that there is a point at which moving the cursor one notch either way makes the lever tip either up or down. If you fear your lever is sticking at all, give the table a few mild bumps with your fist. You will notice that a movement of the cursor of 4 in. brings you to the 1 oz. mark, 8 in. to the 2 oz. mark. At 2½ ozs. you go off the scale! Stop a minute. This is where weight " G " comes in. Hang it at " Y " and you can start again with cursor at point " X " and weigh from 2·5 ozs. to 5 ozs. Then weight " J " is substituted for weighing from 5 to 7·5 ozs. and weight " K " for 7·5 to 10 ozs. Further weights are not advisable as friction becomes troublesome at the pivots with really heavy weights and accuracy is lost. By this time I hope you will have realised that each division of the scale represents 1/20th of an ounce, and as we use it four times, our true scale is, in effect, 40 in. long. The small monoplane on the scale in one photograph you will see weighs 1·15 ozs. and the propeller and nose block shown in the other, ·4 oz.


· BEAM MARKINGS · FULL SIZE ·
0
2·5
5
7·5
3
8
E
1
6
4
9
2
7
5
10
3/8"
1/16" DIA. HOLE
1 1/8"
3/8"
1/4"
3/8 R.
1" R.
1/2"
1/4"
13 3/8"
1"
1"
1/8"
1/8"
1/8"
1 3/8"
1/2"
1/8"
2"
2"
1/8"
1/8"
1/2"
2"
D
2 1/2"
1"
1/4"
1/2"
1/8"
1/4"
3/8"
SMALL PIECE OF
RAZOR BLADE
3"
3/4"
1 1/4"
11/16"
F
5/16" R.
ASSEMBLY
& DETAILS
· HALF SIZE
1 3/16"
2"
2 5/16"
5 1/2"
1/4
3/4
1"
C
1 1/2"
2 1/2"
1"
1/4"
1/2"
1/4"
1 1/4
B
1"
1/8"
1/2"
H
2 1/2"
X
E
1/8" DOWELS
1" LONG
D
G
J
22
S.W.G.
K
E
L
D
Z
Y
C
FULL
SIZE
C
H
B
F
A
H
3/8"
A
B
2 1/2"
15"
3"
3"
THE AEROMODELLER'S
WEIGHING MACHINE
DESIGNED BY
· ARNOLD WATHEW ·
DRAWN BY
· A·H·S ·



THE "HORUS"

By R. MALMSTRÖM

This neat little 19 in. span biplane weighs but 1¼ ounces and has a certified average duration of 45 secs. in evening air. It is quite simple to build and has a particularly pleasing appearance, as can be seen from the photographs. The rigging position advised, i.e., lower wing at a small negative angle of incidence, coupled with the large tailplane should make the model practically stallproof and thus easy to fly. With its light wing loading it should also prove a frequent "thermal catcher."

IN introducing the Horus to readers I feel that it is rather to be regretted that the biplane type of model has not been more widely adopted, as my experience with this type of model shows definitely that a good performance can be obtained, while from the standpoint of appearance a well proportioned biplane leaves nothing to be desired.

The Horus possesses a flat glide and an excellent climb, is as stable as any high wing, and on windy evenings quite devoid of thermals. 45 sec. flights were consistently made. Hot afternoons should easily produce the minute. If anything further were needed to recommend the Horus to readers it might be added that the little bus is extremely economical, and will deplete precious stocks of balsa to a very small extent.

Fuselage.

This is of the diamond-shaped type. Make two sides over the heavy black lines on the plan. Join these sides by means of spacers equal in length to those of the two sides. A square box structure is thus formed and is used set upon one edge. The fuselage is in two parts; a main body and a tail portion. Care should be taken to locate the laminated wing supports (A, B and C) in the correct positions above and below the fuselage. Bamboo outriggers run through the notches on the supports, and these are further secured by wire fastened as in Sketch 3. Remember the hooks at the rear of the body and on the tail portion. Small rubber bands over these hooks ensure a firmly fitting tail unit.

The bamboo undercarriage struts should be well bound and cemented to spacer No. 2. The plan clearly shows the construction and fitting of the streamline wheels.

Having carved and sanded the nose-block, it must be bushed to ensure the propeller shaft being at the correct down-thrust angle.

Wings.

The upper wing is constructed in two halves, care being taken to see that the rib marked 1 (on both halves) is set at the correct angle. The two halves are then cemented together and the tip dihedral obtained by cracking the spars, raising the tips to the correct angle and recementing. Gussets of 1/16 in. sheet are cemented where shown, and the incidence blocks are also cemented in their correct positions.

The lower wing is built in a similar manner to the top wing, i.e. in two halves. The centre rib is omitted and two pieces of 1/32 in. sheet are cemented between the leading and trailing edges from rib 3 to rib 4. To get this platform flat the L.E. and T.E. must be built up with 1/16 in. sheet balsa. This platform fits flush against the lower outriggers. The wing is held in position by rubber bands.

The approximate positions of both the top and the lower wings are given on the plan but slight adjustments fore and aft may be made for trimming if required, although this should not be necessary if the instructions are followed carefully.

The wings tips are of 1/16 in. sheet blending into the L.E. and T.E. and sanded to a knife edge at the extreme tip.

The Tail-plane and Fin.

The tail-plane should be built in one piece, but omit the two centre ribs until the tail-plane has been slipped through the rear part of the tail unit. The two centre ribs are then cemented in position to conform to the angle of the fuselage. See Sketch 2. The plug is formed from ¼ in. sheet and an additional frame of ⅛ in. laminated to it. The outline of the fin is made from 1/16 in. sheet, and the spars are 3/32 in. square. The underportion of the fin is 1/16 in. sheet.

The Propeller.

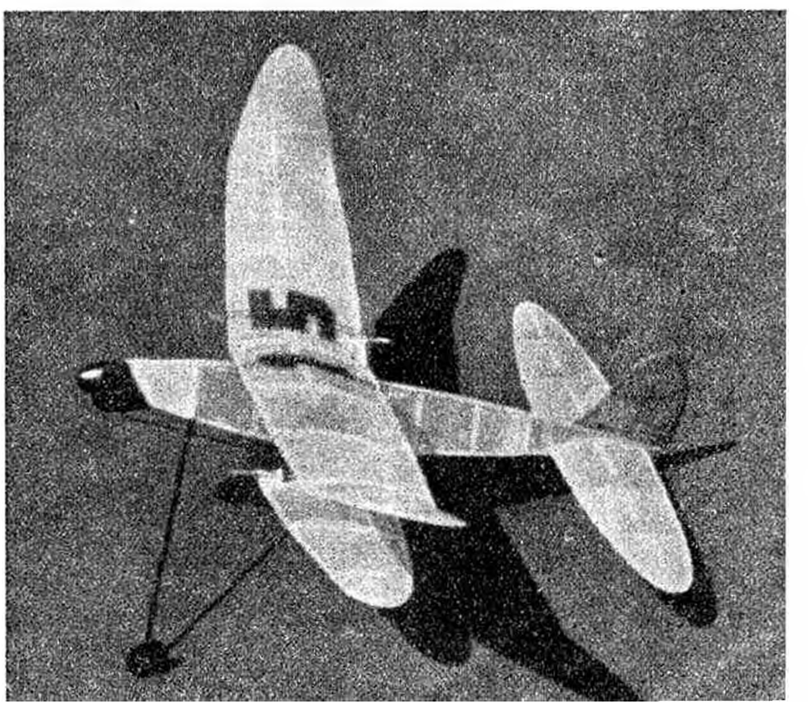
The propeller on the original model is of the one-bladed type and has given complete satisfaction. The blade and counter-weight dimensions are given on the plan. A two-bladed (8 in. dia.) propeller may, however, be used. A simple type of free wheel, as indicated, must be fitted. Cup washers are used on the propeller shaft.

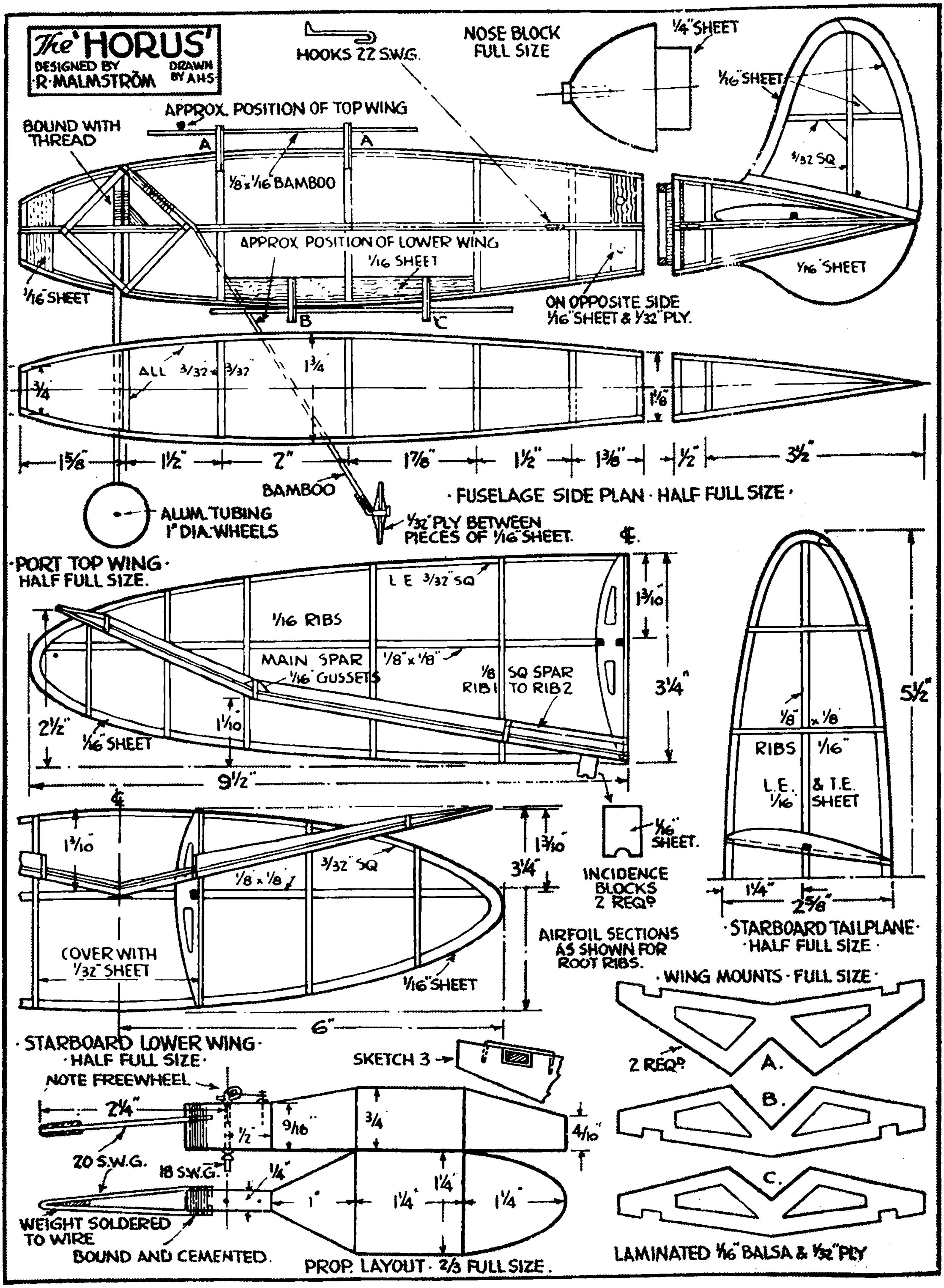
A ⅛ in. diameter hardwood dowel through 1/16 in. sheet blocks at the rear of the fuselage forms the after anchorage for the motor. After covering, the model is given one coat of banana oil No. 2.

Flying.

Power consists of eight strands of ⅛ in. by 1/30 in. strip, 26 in. long, prewound and well lubricated. The L.E. of the top wing should be approximately 1¼ in. in front of the L.E. of the lower wing. To remove any tendency to stall, pieces of 1/16 in. should be cemented under the front of the lower outriggers, thus imparting a *slight negative incidence* to the lower wing. This is important. Maximum number of turns = 875.

The first Horus flew off the drawing board, as it were, and those who build it are assured of a consistently good flight performance under almost any conditions.




The 'HORUS'
DESIGNED BY R·MALMSTRÖM
DRAWN BY A.H.S.
HOOKS 22 S.W.G.
NOSE BLOCK FULL SIZE
1/4" SHEET
1/16" SHEET
3/32 SQ
1/16" SHEET
APPROX. POSITION OF TOP WING
BOUND WITH THREAD
1/8" x 1/16" BAMBOO
A
A
APPROX. POSITION OF LOWER WING
1/16" SHEET
1/16" SHEET
B
C
ON OPPOSITE SIDE 1/16" SHEET & 1/32" PLY.
ALL 3/32 x 3/32
3/4
1 3/4
1 1/8
1 5/8"
1 1/2"
2"
1 7/8"
1 1/2"
1 3/8"
1/2"
3 1/2"
BAMBOO
·FUSELAGE SIDE PLAN · HALF FULL SIZE·
ALUM. TUBING 1" DIA. WHEELS
1/32" PLY BETWEEN PIECES OF 1/16" SHEET.
·PORT TOP WING· HALF FULL SIZE.
L E 3/32" SQ
1/16 RIBS
MAIN SPAR 1/8" x 1/8"
1/16" GUSSETS
1/8 SQ SPAR RIB 1 TO RIB 2
1 3/10
3 1/4"
2 1/2"
1 1/10
1/16" SHEET
9 1/2"
1/16" SHEET.
INCIDENCE BLOCKS 2 REQD.
1 3/10
3/32" SQ
1/8 x 1/8
1 3/10
3 1/4
COVER WITH 1/32" SHEET
1/16" SHEET
6"
AIRFOIL SECTIONS AS SHOWN FOR ROOT RIBS.
5 1/2"
1/8" x 1/8"
RIBS 1/16"
L.E. 1/16 & T.E. SHEET
1 1/4"
2 5/8"
·STARBOARD TAILPLANE· HALF FULL SIZE·
·STARBOARD LOWER WING· ·HALF FULL SIZE·
·WING MOUNTS · FULL SIZE·
2 REQD.
A.
B.
C.
LAMINATED 1/16" BALSA & 1/32" PLY
SKETCH 3
NOTE FREEWHEEL
2 1/4"
9/16"
1/2"
3/4
4/10"
20 S.W.G.
18 S.W.G.
1/4"
1"
1 1/4"
1 1/4"
1 1/4"
WEIGHT SOLDERED TO WIRE
BOUND AND CEMENTED.
PROP. LAYOUT · 2/3 FULL SIZE.

SMALL TOOLS FOR THE "SOLID" MODELLER

By R. H. MAY

IN the past few years much has been accomplished toward the advancement of model building. There are numerous manufacturers of expensive power tools which unquestionably are a great help to the modeller in aiding him to turn out better models in less time, yet little has been done to give him hand-tools small enough to meet his requirements.

Indispensable in shaping parts that are difficult to get at, such as the hollowing of fuselages and boat hulls, the shaping of spars and leading and trailing edges, etc., is the tiny thumb plane shown in the accompanying drawing.

These drawings should be self-explanatory, but the accompanying descriptive matter will help to simplify the construction.

The body, or plane block, is made of two pieces of hard wood, preferably maple, 1½ in. by ⅝ in. by ⅜ in., drilled to take the two ⅛ in. dowels, and cut to shape as shown. These are then cemented well with the dowels in place, clamped and allowed to dry thoroughly. When dry, drill holes for the 1/16 in. music wire locking plate brace, and for the ⅛ in. dowel which supports the handle. A drawer knob makes an excellent handle which should be just the right size to fit snugly into the palm of the hand. The locking plate is made of ⅛ in. soft steel, filed to shape, drilled and tapped with a 6-32 machine tap and fitted with 6-32 thumbscrew. This screw is of the variety which is used in conjunction with electrical binding posts, and is obtainable from any radio supply house. The blade is made from a hacksaw blade—care should be taken not to take the temper out of the blade by overheating while removing the saw teeth and grinding to shape.

The cutting edge of the blade must, of course, be ground to conform to the shape of the bottom of the plane.

There is no commercially made spatula small enough to be used to apply cement to those hard-to-get-at joints so frequently encountered in model work. The common procedure is to apply cement with a scrap of wood or wire, a very clumsy substitute for a spatula.

Fig. 1 shows the lay-out of two spatulas which are very simple to make. The materials needed can be inexpensively obtained from any model supply dealer if they are not already on hand. Fig. 1A is a rigid blade spatula. It is made of ⅛ in. diameter, round, hard brass rod, cut to a length of 4⅞ in. The tip of the blade is shaped with a rat-tail file as shown in the drawing. This should not be more than ⅜ in. long, otherwise it may become too easily bent or broken.

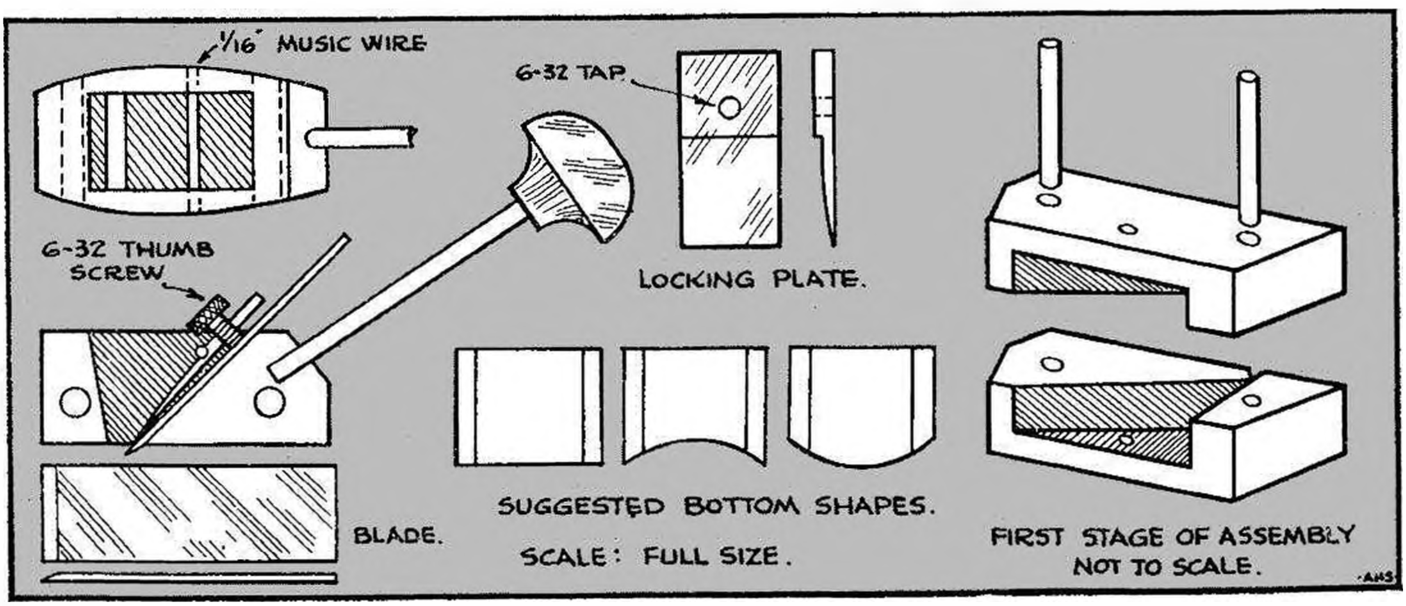
The spatula shown in Fig. 1B has a longer, flexible blade. The handle is made of a 4 in. length of aluminium tubing having an outside diameter of 3/16 in. and an inside diameter of ⅛ in. The blade is made of ·004 in. steel thickness gauge stock, 1¾ in. long and ⅛ in. wide. Make a small plug of hardwood which will fit snugly into the opening in the tubing. Make this plug ⅞ in. long and split it in half lengthwise. Apply a small amount of metal mending cement to the flat surfaces of the plug and place the blade between them as shown in the drawing. Apply metal cement to the inside of one end of the tubing and insert the blade and plug assembly, taking care that it does not slip apart. The end of the hardwood plug should be flush with the end of the tubing, and the blade should protrude ⅞ in. from the end of the handle.

I have found it to be the general opinion of model builders that joints made with quick-drying cement need merely to be held together in the hand until the cement has set. This is, however, a most difficult if not impossible task; and quick-drying cement, like the slower drying adhesives, must not be subjected to the slightest motion or strain from the time it starts to set until thoroughly dry. Consequently, a means of clamping is of great importance, for quick-drying cement starts to set almost as soon as it comes into contact with the air.

One available commercially for a very reasonable sum is the small "C" clamp illustrated in Fig. 2. This has a ¾ in. opening, a depth of ⅝ in. and is not too heavy. It can be obtained from the larger hardware dealers.

Fig. 3 gives the lay-out for small, light-weight clamps which the modeller should have no trouble in duplicating at a very small cost. These may be made in any desired size.

The material used is ½ in. square aluminium bar, cut to length, and the nose filed to shape as shown in the lay-out. Before drilling and tapping the holes examine the drawing carefully to avoid error. Each bar has one hole tapped and one hole *not* tapped; located as indicated. Tapped holes are drilled with a 36 drill and the thread cut with a 6-32 machine tap. Holes not tapped are drilled with a ⅛ in. drill. The holes must all be absolutely perpendicular to the clamp faces. The thumb screws are ordinary 6-32 brass machine screws, 2 in. long for the 2 in. clamps and 2½ in. long for the 3 in. clamps. Cut off the slotted heads and screw into place the brass inserts taken from 6-32 bakelite binding post caps. (These may be obtained from any radio parts shop, the bakelite being removed by cracking it with a hammer.) These brass inserts serve as the knurled portions of the thumb screws and should be screwed down on the machine screw until flush with the end from which the head has been cut. A drop of solder on this end will hold it in place. Two of these are required for each clamp.



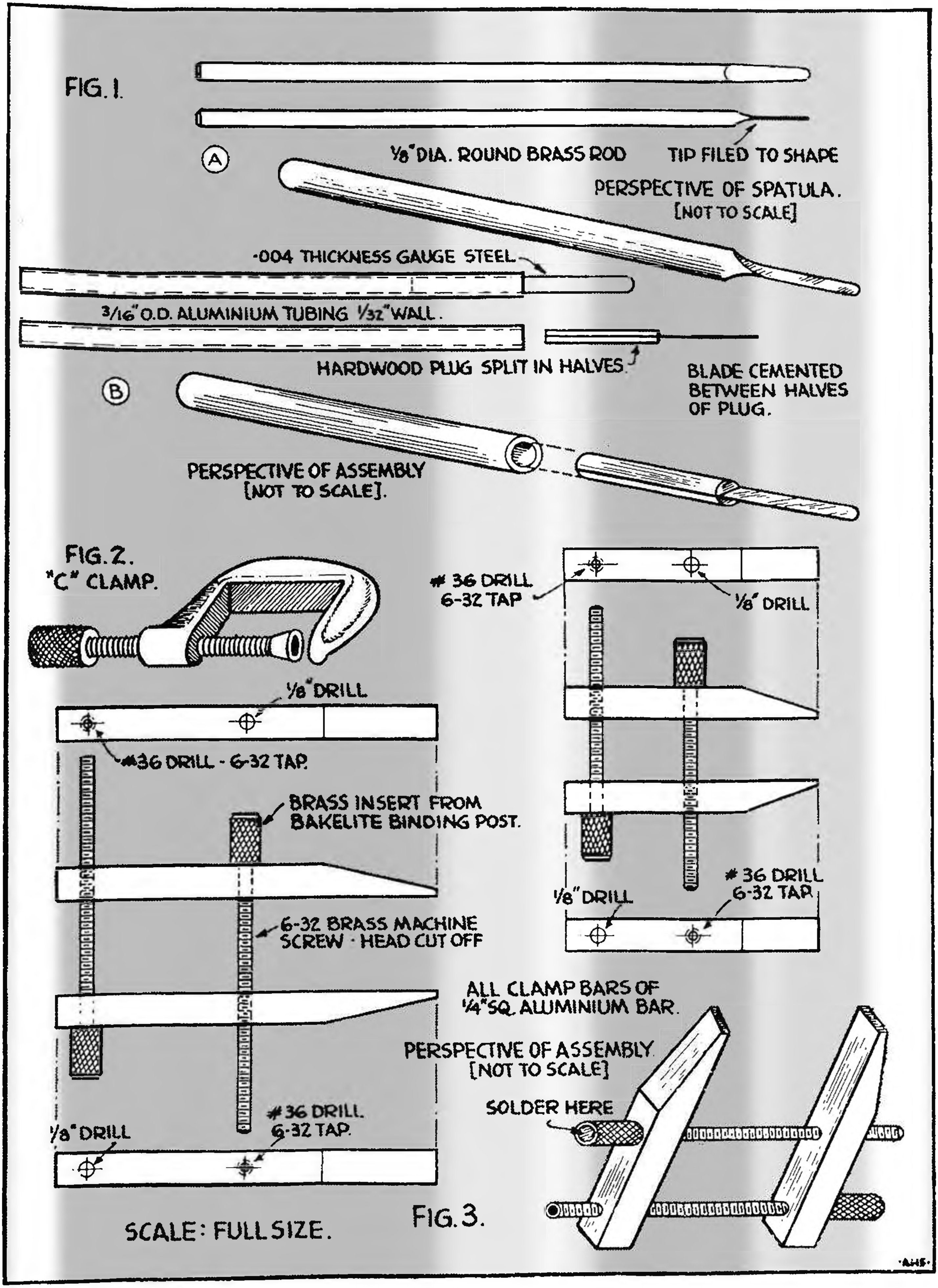


FIG. 1.
Ⓐ
1/8" DIA. ROUND BRASS ROD
TIP FILED TO SHAPE
PERSPECTIVE OF SPATULA.
[NOT TO SCALE]
·004 THICKNESS GAUGE STEEL
3/16" O.D. ALUMINIUM TUBING 1/32" WALL.
HARDWOOD PLUG SPLIT IN HALVES.
BLADE CEMENTED BETWEEN HALVES OF PLUG.
Ⓑ
PERSPECTIVE OF ASSEMBLY [NOT TO SCALE].
FIG. 2.
"C" CLAMP.
36 DRILL 6-32 TAP
1/8" DRILL
1/8" DRILL
#36 DRILL - 6-32 TAP
BRASS INSERT FROM BAKELITE BINDING POST.
1/8" DRILL
36 DRILL 6-32 TAP
6-32 BRASS MACHINE SCREW · HEAD CUT OFF
ALL CLAMP BARS OF 1/4" SQ. ALUMINIUM BAR.
PERSPECTIVE OF ASSEMBLY [NOT TO SCALE]
SOLDER HERE
1/8" DRILL
36 DRILL. 6-32 TAP.
SCALE: FULL SIZE.
FIG. 3.
·AHS·

TECHNICAL TOPICS

By R. H. WARRING

The adjacent photograph, taken in an aircraft factory, shows two de Havilland metal airscrews damaged in crashes. Take heart, readers, for breakages are not solely confined to model aircraft! It is interesting to note, however, that 80 per cent. of the damaged airscrews returned to this factory are repaired and put into active service again.

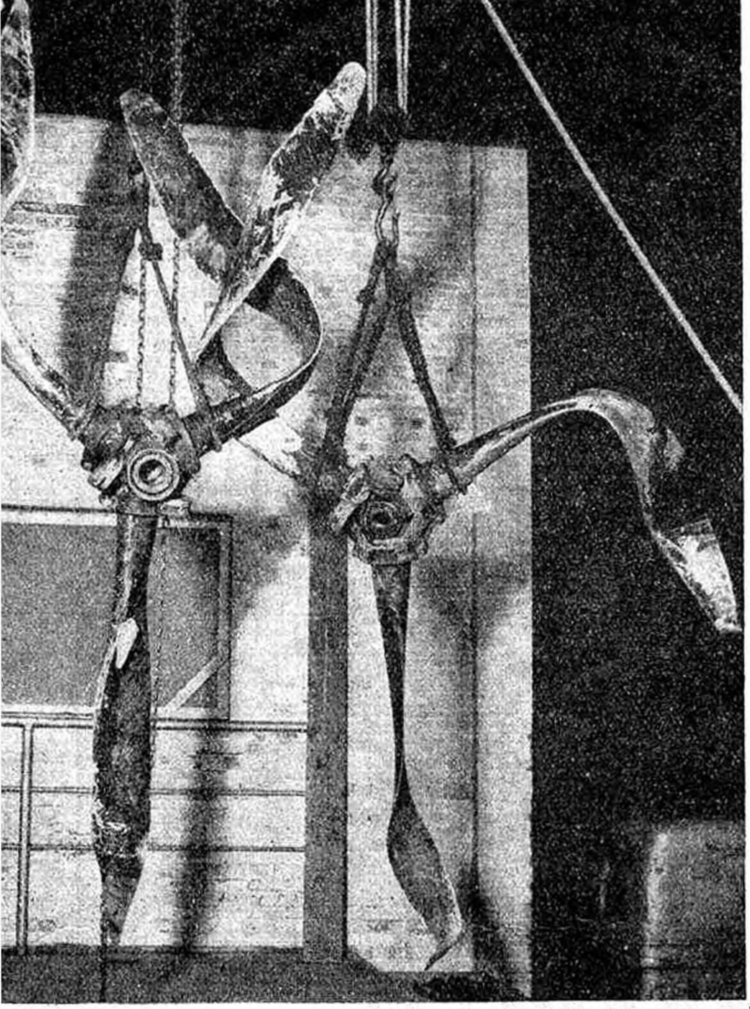


Photo by courtesy of de Havilland Aircraft Co., Ltd.

"HOW do you find the pitch of a propeller?" has been a common query in this month's post-bag and this question requires more than just a straightforward answer and a formula. In the first place, I prefer to use the word airscrew instead of propeller; strictly speaking the latter only applies to a pusher arrangement. This distinction is still maintained in this country although a great number of people insist that it is an archaism and prefer the Americanised term "prop.", but I feel that the distinction should be appreciated in order to avoid licentious terminology.

Having dealt with this point there now remains the question of pitch. Now in the case of a bolt being screwed into a nut the bolt will advance a certain amount for each turn, this advance being called the pitch. If we imagine then, our airscrew being screwed forward through an unyielding medium we get a similar advance which is called the *geometric pitch* and here the analogy ceases. The theoretical advance per revolution, then, is the geometric pitch. During this advance each element of the airscrew blade will trace out a helical path, the result of combining a rotary velocity and a forward (*i.e.* translational) velocity, and the actual advance per revolution will depend upon the blade angle of the element. Calling this angle θ, the pitch equals $2\pi r \tan\theta$, where r is the distance of that particular blade element from the hub.

Now it is obvious that the whole of the blade must have the same pitch, *i.e.* the product $r \tan\theta$, must be constant, and thus as r *increases* $\tan\theta$, (and thus θ) *decreases*. This means that the greatest blade angle must occur near the hub where r is quite small, and the least at the tip where r is a maximum and equals the radius of the blade. The whole airscrew blade may thus be likened to a twisted wing.

The usual measurement quoted for pitch is the *geometric mean pitch*, this being the pitch of a blade element at .7 radius from the hub.

Thus $\text{G.M.P.} = 2\pi \times .7R \times \tan\theta$
$= 2.2D \tan\theta$

where D = airscrew diam., θ = blade angle at .7 tip radius.

Given in terms of the airscrew blank $\tan\theta$ = depth/width of blank at .7 tip radius. If the airscrew has already been carved then the blade angle must be measured at .7 tip radius and the G.M.P. found by substitution in the above formula.

The *actual* advance per revolution is less than the geometric pitch due to the fact that a certain amount of slip takes place. A little thought will show that if the *actual pitch* is less than the geometric pitch then the blades will be operating at a certain angle of attack; thus slip is necessary to generate the aerodynamic force necessary to give thrust, for the blades may be treated as twisted airfoils. Not quite, however, for even when the angle of attack is zero (*i.e.* actual pitch = geom. pitch) a cambered section still has a certain amount of lift and thus we come to a further definition. The *experimental mean pitch* is that pitch when the airscrew thrust disappears. If α_z is the angle of attack of zero lift of the blade section concerned, then

$$\text{E.M.P.} = 2.2D \tan(\theta - \alpha_z)$$

Since α_z is negative this means that the E.M.P. is greater than the G.M.P.

This now raises a sore point with Mr. R. Burns, of Glasgow, with regard to slip and efficiency and the Editorial comments to his January article on Performance were rather unfortunate in being somewhat confusing. Now whilst the efficiency does depend upon slip, the former being a maximum when the slip is such as to give a working angle of attack to the blades such that they are operating at maximum efficiency, it does not follow that 20 per cent. slip means a 100–20 per cent. efficiency—far from it. By our definitions above it is possible to get a *negative* slip and then the efficiency based on this false, but rather common, assumption would be more than 100 per cent. Actually it is zero in this particular case! This follows from consideration of the equation of efficiency

$$\text{Efficiency } (n) = \frac{TV}{2\pi n Q} \qquad T = \text{thrust.} \quad Q = \text{torque component.}$$

Thus n is zero if T disappears.

The losses associated with a working airscrew are made up in various ways. Firstly, there is the profile drag of the blades themselves, which at certain attitudes may be quite large, and then the Kinetic Energy of the slipstream which has been induced. Briefly the slipstream consists of a column of air swept back from the airscrew disc. The boundary is marked by a shell of spiral vortices extending downstream outside which the airflow is purely instational. Inside this boundary there may be a series of similar vortex shells if circulation along the blades is not constant and a further rotary component which has as its axis the line of the airscrew shaft. A complete analysis is, however, beyond the scope of this article.

Having arrived at an efficiency figure, which in the case of models can only be found accurately by practical tests, the power available is the total power (brake power) times the efficiency. ***It has been the practice to work in units of the H.P. for model calculations and this seems rather incongruous. To avoid fractional figures I suggest that a new unit, the M.P.U. (Model Power Unit) be adopted, whose value is $\frac{1}{1000}$ of a H.P.*** Thus a rubber motor of Wakefield size may develop, say, .008 brake h.p. which, in the new system, is 8 brake M.P.U.

The *actual* power available is then 8 n M.P.U.

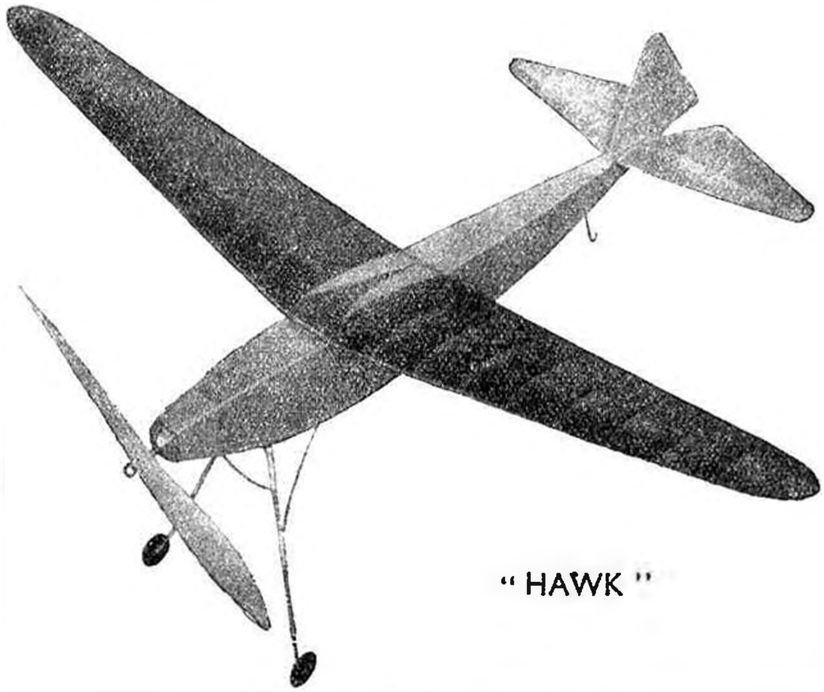
i.e., $\text{M.P.U.}_a = n$ brake M.P.U.

Excess M.P.U. = M.P.U._a—M.P.U. required.

and $$\underset{\text{(ft./min.)}}{\text{Rate of climb}} = \frac{528 \times \text{E.M.P.U.}}{W} \qquad (W = \textit{wt. in ounces.})$$

SUPER COMPETITION MODELS

"VERON" SERIES KITS



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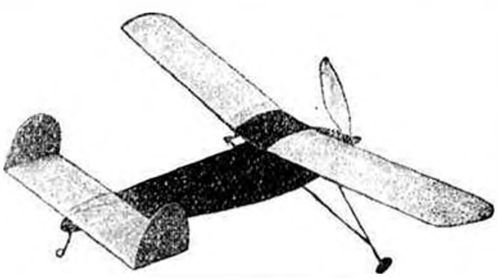

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No. 4	LOW WING	span 22 in., price	**7/4**
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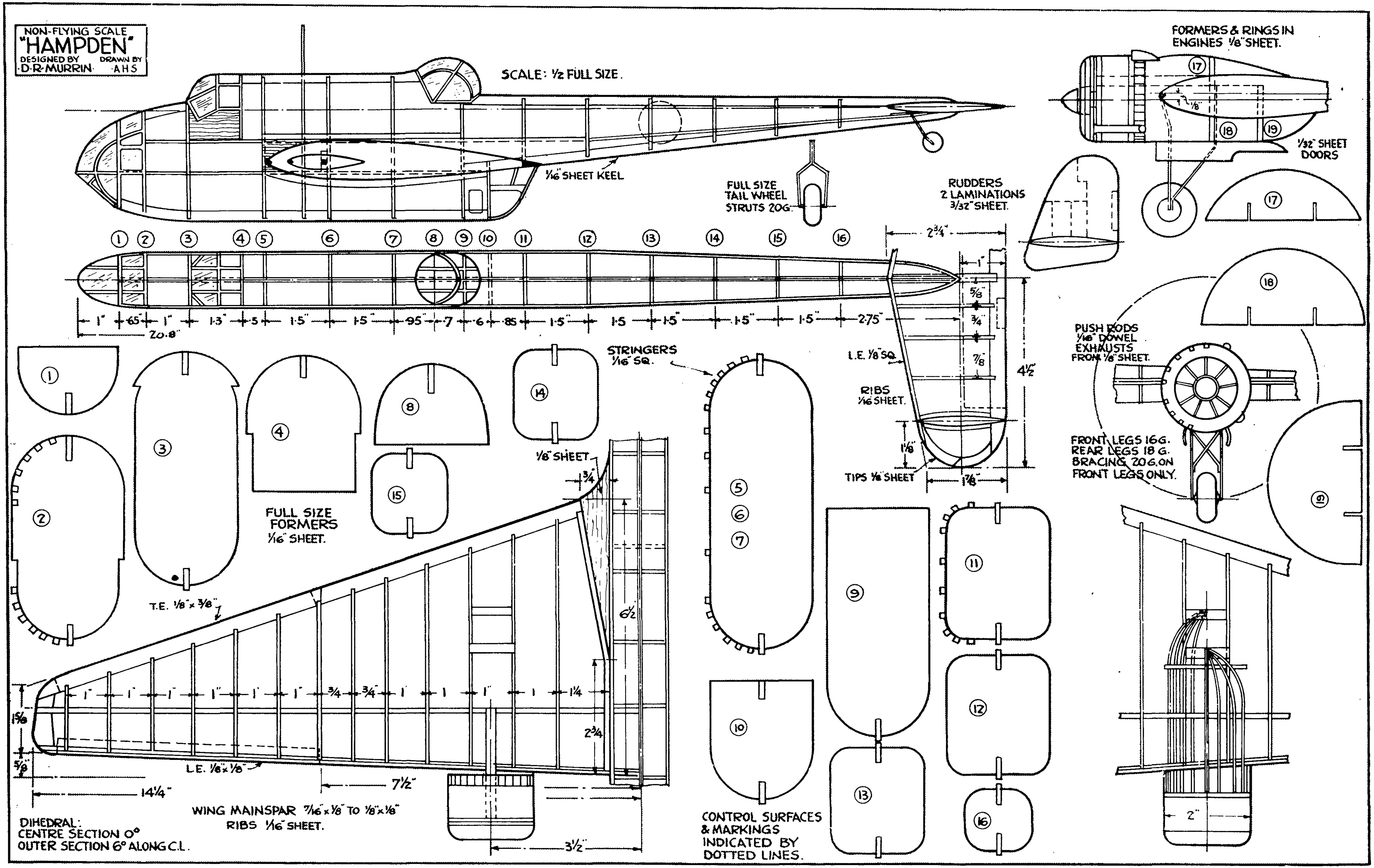
NON-FLYING SCALE
"HAMPDEN"
DESIGNED BY D·R·MURRIN·
DRAWN BY ·AHS
SCALE: ½ FULL SIZE.
1/16" SHEET KEEL
FULL SIZE TAIL WHEEL STRUTS 20G.
FORMERS & RINGS IN ENGINES 1/8" SHEET.
1/32" SHEET DOORS
RUDDERS 2 LAMINATIONS 3/32" SHEET.
1" ·65 1" 1·3" ·5 1·5" 1·5" ·95" ·7 ·6 ·85 1·5" 1·5 1·5" 1·5" 1·5" 2·75"
20·8"
2¾"
1"
5/8"
¾"
7/8"
4½"
L.E. 1/8" SQ.
RIBS 1/16" SHEET.
1/8"
TIPS 1/8" SHEET
1⅞"
STRINGERS 1/16" SQ.
1/8" SHEET
FULL SIZE FORMERS 1/16" SHEET.
T.E. 1/8" × 3/8"
6½"
2¾
1" 1" 1" 1" 1" 1" ¾ ¾ 1 1 1" 1 1¼
1⅝
5/8
L.E. 1/8" × 1/8"
7½"
14¼"
3½"
WING MAINSPAR 7/16" × 1/8" TO 1/8" × 1/8"
RIBS 1/16" SHEET.
DIHEDRAL:
CENTRE SECTION 0°
OUTER SECTION 6° ALONG C.L.
CONTROL SURFACES & MARKINGS INDICATED BY DOTTED LINES.
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FRONT LEGS 16G.
REAR LEGS 18 G.
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THE USE OF HARDWOODS IN MODEL AERO CONSTRUCTION

By **PETER S. FOOTE**

NOW that balsa is getting scarce we aero-modellers must turn our thoughts to perfecting, or at any rate improving, models made of any one of the hardwoods such as spruce, birch or any of the balsa substitute woods with which you are now very familiar.

The most obvious drawback is that of weight, hardwoods being much heavier for the same cubic capacity than balsa. There are several ways in which we can cut the weight down to our advantage and I will deal with one or two methods for the cutting down of weight in the wings, fuselage, and other parts that make the finished model.

I find that the wings are the most difficult to lessen in weight as they have to be very strong or they are inclined to fold up when the model hits the ground as even the best model does at some time or the other. The ribs should be cut out of 1/32 in. sheet if the 'plane is 30 in. or over in span, or 1/64 in. sheet if the span is not going to exceed this amount; the wing section should be either R.A.F. 32, Eiffel 400, or any other of the well-known sections. They should be holed for lightness, but when you are cutting the holes be careful that you do not cut the holes too near the trailing edge of the ribs as this will weaken the structure of the wing. If your model is over 30 in. span and you want the ribs to be of 1/64 in. wood then you may do so only at the loss of strength in the framework of the wing in question. The only way to remedy this is to use cap strips over the top of the ribs, this adding weight to the model. In a model built of hardwood only a small spar is necessary as the leading and trailing edges are strong enough to absorb most of the shocks that occur in the course of a day's flying.

There are many ways of cutting down the weight of the fuselage. The best and by far the easiest method is that of lessening the spar sizes, i.e., if the fuselage is of ⅛ in. square balsa, then by using spruce or a similar type of hardwood this may be cut down to 3/32 in. square. The joints should be glued, *not* cemented, if the curve of the fuselage is rather steep, as I have found from experience that they come unstuck at the first bad landing. This was not due to bad construction as I have made several 'planes that are glued since, and none of the joints have ever come unstuck. If the fuselage is to be streamlined then the matter is rather more difficult as to obtain a good shape it is necessary to use at least 16 stringers, possibly more, making it hard to cut down the weight of this type of 'plane without losing the shape of the fuselage. The best way to lessen the weight of this type is to have 8 main stringers of 1/16 in. square or 1/16 in. by ⅛ in. hardwood and the rest of the stringers of 1/32 in. by 1/16 in. or 1/32 square, by so doing the weight of the fuselage is cut down considerably.

There is not much you can do about cutting the weight down of the tail unit of a model, as this is usually kept as light as possible to avoid tail heaviness. When building up the tail-plane it is advisable not to use any spars as the tail will be rigid without these. Again cut the ribs from 1/32 in. or 1/64 in. sheet.

Before I finish let me inform you that a model has been built in the manner described above and only weighed ⅛th of an ounce more than a balsa 'plane of similar design and can hold its own when competing against the balsa 'plane.

HOW ABOUT A SOLID STICK MODEL?

By **W. A. DEAN**

FULL SIZE WORKING PLANS OVERLEAF

HERE is a stick model that is really different. Only sheet balsa is used and unlike most stick jobs the general lines are quite graceful. Construction is very simple and the model should not take the average modeller more than four or five evenings to complete.

The plans are drawn full size so just lay some transparent paper over them and trace the various parts off.

The fuselage stick is made in two pieces from ¼ in. sheet to save wood and also to have the grain running the way we want it.

The wing mount is covered pretty well by the plan, but perhaps a few words regarding it may be helpful. Two soft pieces of 1/16 in. sheet are cut to shape and three pieces of ⅛ in. sheet sandwiched between them so as to leave a recess into which a tongue can fit. This is sanded to a streamline shape after cementing in position. The fuselage may now be also sanded to the indicated section and the tail hook bound in place.

Many stick models rely on a piece of bent metal for a propeller bearing, but this is not a very satisfactory method. With the type of stick on this model, bushes may be used in the ordinary way as with a nose block.

The airscrew is made from fairly soft balsa, white tissue being doped on when completed.

The freewheel arrangement is of quite conventional design and should not give you any trouble either when building or flying.

Next construct the undercarriage using one piece of wire. Make the "U"-shaped piece which fits over the fuselage slightly smaller than a ¼ in. Cut a shallow slot in the fuselage at the attachment point so that the "U" piece fits snugly in position. Apply plenty of cement at this point so as to make a rigid fixing.

The wing is made in two halves, each side being propped up when cementing, to give a dihedral angle of 2 in. The ⅛ in. sheet tongue is first cemented in place and then two pins pushed through the wing to form an additional support. The joints should be well covered with cement and then three strips of ½ in. wide tissue doped along each one.

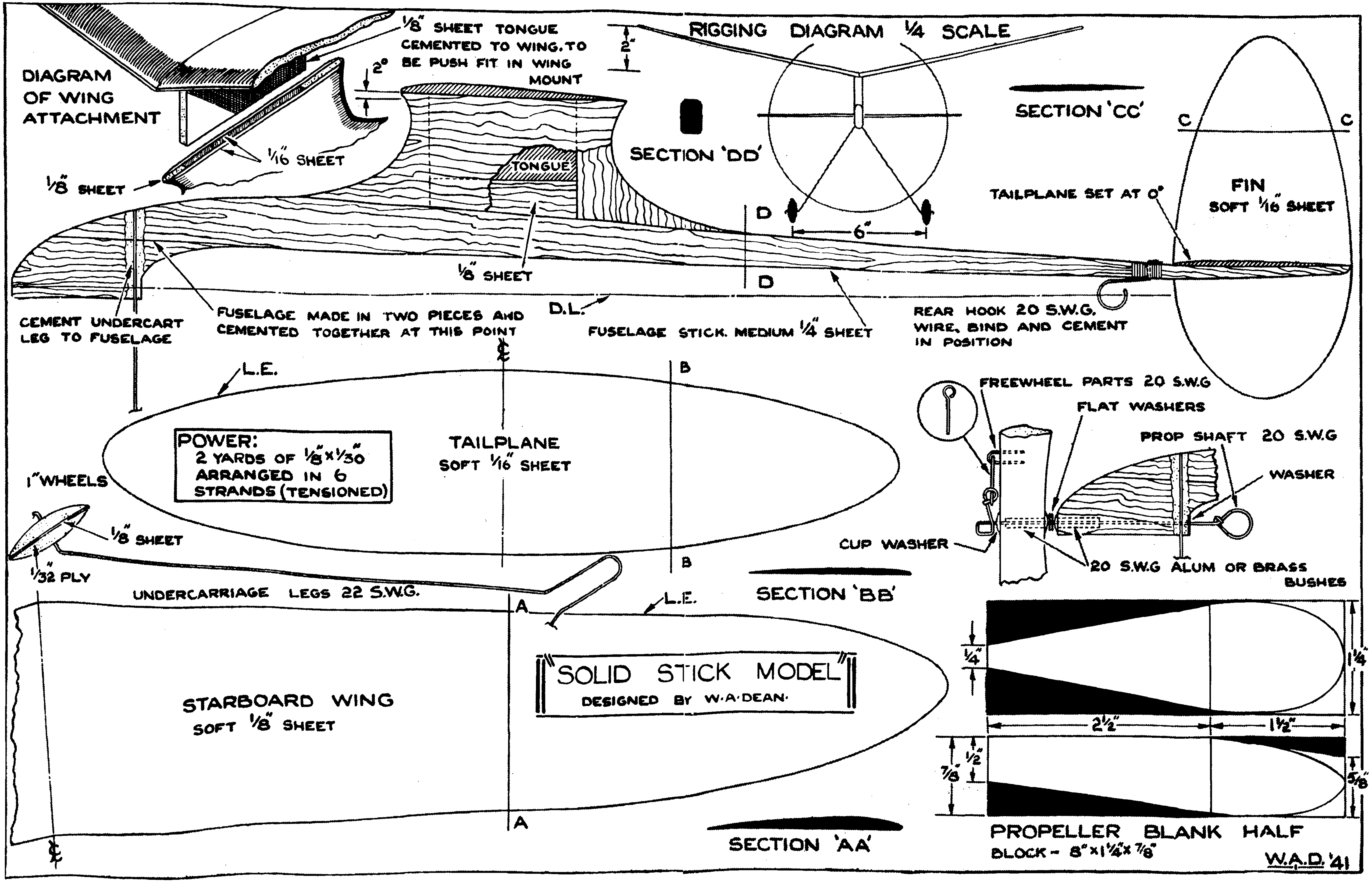
The tailplane is made in one piece and cemented to the fuselage. Check carefully with the wing for alignment, then cut out the two pieces forming the fin, fix in position using a set square to check the angles so formed with the tailplane.

In order to protect the flying surfaces from hard knocks, strips of ½ in. wide tissue may be doped along the leading edges of these members if desired. For protection from handling and moisture the fuselage can be given a couple of coats of banana oil, although care should be taken that this does not add too much weight as even one coat is surprisingly heavy.

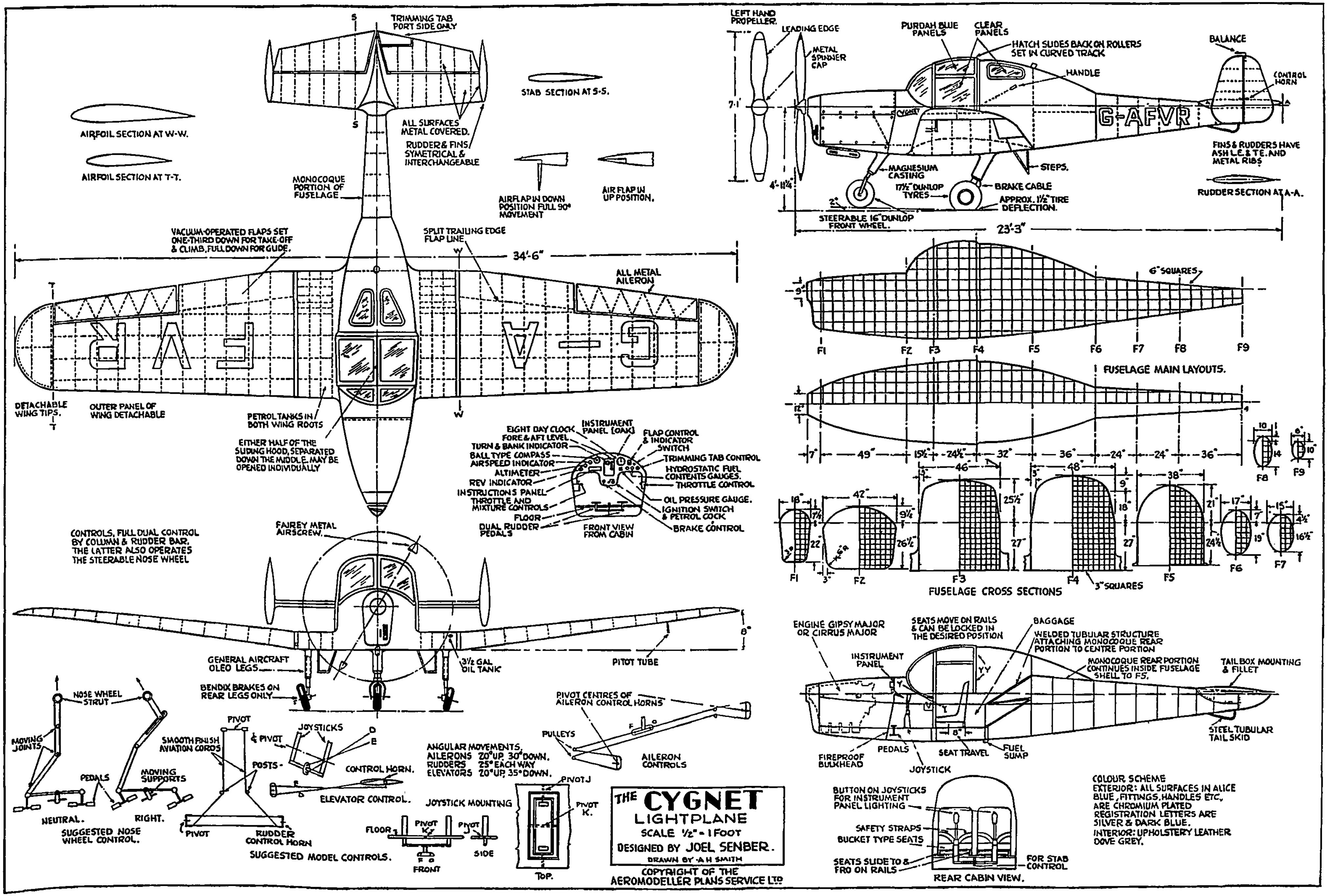
Lastly, the rubber motor is arranged in a rope—a small ring fitted to the rear end—and attached to the model. The point of balance should be about an inch behind the leading edge, but don't be worried if this is slightly different on your job, as the flying surfaces can be warped to obtain flying trim. If, however, the propeller used is on the light side and consequently your model balances somewhere near the T.E., there is nothing for it but to shift the wing mount back.

Choose a fairly calm day for the initial flights—try a few hand launches from shoulder level until a long flat glide is obtained—then give a few turns and R.O.G. As you get to understand the model increase the turns until the limit is reached. As all modellers know—"the limit" is the turn before the one on which your rubber breaks!

The rubber should be stretch-wound from the rear by means of the ring provided. Be sure to lubricate the motor well after every half-dozen flights or so.



1/8" SHEET TONGUE CEMENTED TO WING, TO BE PUSH FIT IN WING MOUNT
DIAGRAM OF WING ATTACHMENT
2°
1/16" SHEET
1/8" SHEET
TONGUE
1/8" SHEET
RIGGING DIAGRAM 1/4 SCALE
2"
6"
SECTION 'DD'
SECTION 'CC'
C
C
D
D
FIN
SOFT 1/16" SHEET
TAILPLANE SET AT 0°
D.L.
CEMENT UNDERCART LEG TO FUSELAGE
FUSELAGE MADE IN TWO PIECES AND CEMENTED TOGETHER AT THIS POINT
FUSELAGE STICK. MEDIUM 1/4" SHEET
REAR HOOK 20 S.W.G. WIRE, BIND AND CEMENT IN POSITION
L.E.
B
B
TAILPLANE
SOFT 1/16" SHEET
POWER:
2 YARDS OF 1/8"×1/30"
ARRANGED IN 6
STRANDS (TENSIONED)
1" WHEELS
1/8" SHEET
1/32 PLY
UNDERCARRIAGE LEGS 22 S.W.G.
FREEWHEEL PARTS 20 S.W.G
FLAT WASHERS
PROP SHAFT 20 S.W.G
WASHER
CUP WASHER
20 S.W.G ALUM OR BRASS BUSHES
SECTION 'BB'
A
A
L.E.
STARBOARD WING
SOFT 1/8" SHEET
"SOLID STICK MODEL"
DESIGNED BY W.A.DEAN.
SECTION 'AA'
1/4"
1 1/4"
2 1/2"
1 1/2"
1/2"
7/8"
5/8"
PROPELLER BLANK HALF
BLOCK - 8"×1 1/4"×7/8"
W.A.D. '41



THE CYGNET
LIGHTPLANE
SCALE 1/2" = 1 FOOT
DESIGNED BY JOEL SENBER.
DRAWN BY A.H. SMITH
COPYRIGHT OF THE
AEROMODELLER PLANS SERVICE LTD
TRIMMING TAB PORT SIDE ONLY
STAB SECTION AT S-S.
AIRFOIL SECTION AT W-W.
AIRFOIL SECTION AT T-T.
ALL SURFACES METAL COVERED.
RUDDER & FINS SYMETRICAL & INTERCHANGEABLE
MONOCOQUE PORTION OF FUSELAGE
AIRFLAP IN DOWN POSITION FULL 90° MOVEMENT
AIR FLAP IN UP POSITION.
VACUUM-OPERATED FLAPS SET ONE-THIRD DOWN FOR TAKE-OFF & CLIMB, FULL DOWN FOR GLIDE.
SPLIT TRAILING EDGE FLAP LINE
34'-6"
ALL METAL AILERON
DETACHABLE WING TIPS.
OUTER PANEL OF WING DETACHABLE
PETROL TANKS IN BOTH WING ROOTS
EITHER HALF OF THE SLIDING HOOD, SEPARATED DOWN THE MIDDLE, MAY BE OPENED INDIVIDUALLY
EIGHT DAY CLOCK
INSTRUMENT PANEL (OAK)
FORE & AFT LEVEL
TURN & BANK INDICATOR
BALL TYPE COMPASS
AIRSPEED INDICATOR
ALTIMETER
REV INDICATOR
INSTRUCTIONS PANEL
THROTTLE AND MIXTURE CONTROLS
FLOOR
DUAL RUDDER PEDALS
FRONT VIEW FROM CABIN
FLAP CONTROL & INDICATOR SWITCH
TRIMMING TAB CONTROL
HYDROSTATIC FUEL CONTENTS GAUGES.
THROTTLE CONTROL
OIL PRESSURE GAUGE.
IGNITION SWITCH & PETROL COCK
BRAKE CONTROL
CONTROLS, FULL DUAL CONTROL BY COLUMN & RUDDER BAR, THE LATTER ALSO OPERATES THE STEERABLE NOSE WHEEL
FAIREY METAL AIRSCREW.
GENERAL AIRCRAFT OLEO LEGS
BENDIX BRAKES ON REAR LEGS ONLY
3 1/2 GAL OIL TANK
PITOT TUBE
8°
NOSE WHEEL STRUT
MOVING JOINTS
PEDALS
MOVING SUPPORTS
NEUTRAL.
RIGHT.
SUGGESTED NOSE WHEEL CONTROL.
SMOOTH FINISH AVIATION CORDS
PIVOT
POSTS
RUDDER CONTROL HORN
JOYSTICKS
CONTROL HORN.
ELEVATOR CONTROL.
SUGGESTED MODEL CONTROLS.
ANGULAR MOVEMENTS,
AILERONS 20° UP, 30° DOWN.
RUDDERS 25° EACH WAY
ELEVATORS 20° UP, 35° DOWN.
JOYSTICK MOUNTING
FLOOR
FRONT
SIDE
TOP.
PIVOT J
PIVOT K.
PIVOT CENTRES OF AILERON CONTROL HORNS
PULLEYS
AILERON CONTROLS
LEFT HAND PROPELLER.
LEADING EDGE
METAL SPINNER CAP
PURDAH BLUE PANELS
CLEAR PANELS
HATCH SLIDES BACK ON ROLLERS SET IN CURVED TRACK
HANDLE
BALANCE
CONTROL HORN
G-AFVR
7'-1"
4'-11 3/4"
MAGNESIUM CASTING
17 1/2" DUNLOP TYRES
BRAKE CABLE
STEPS.
APPROX. 1 1/2" TIRE DEFLECTION.
STEERABLE 16" DUNLOP FRONT WHEEL.
23'-3"
FINS & RUDDERS HAVE ASH L.E. & T.E. AND METAL RIBS
RUDDER SECTION AT A-A.
6" SQUARES
FUSELAGE MAIN LAYOUTS.
F1 F2 F3 F4 F5 F6 F7 F8 F9
7" 49" 15 1/2" 24 1/2" 32" 36" 24" 24" 36"
FUSELAGE CROSS SECTIONS
3" SQUARES
ENGINE GIPSY MAJOR OR CIRRUS MAJOR
SEATS MOVE ON RAILS & CAN BE LOCKED IN THE DESIRED POSITION
BAGGAGE
WELDED TUBULAR STRUCTURE ATTACHING MONOCOQUE REAR PORTION TO CENTRE PORTION
MONOCOQUE REAR PORTION CONTINUES INSIDE FUSELAGE SHELL TO F5.
TAIL BOX MOUNTING & FILLET
INSTRUMENT PANEL
STEEL TUBULAR TAIL SKID
FIREPROOF BULKHEAD
PEDALS
SEAT TRAVEL
FUEL SUMP
JOYSTICK
BUTTON ON JOYSTICKS FOR INSTRUMENT PANEL LIGHTING
SAFETY STRAPS
BUCKET TYPE SEATS
SEATS SLIDE TO & FRO ON RAILS
FOR STAB CONTROL
REAR CABIN VIEW.
COLOUR SCHEME
EXTERIOR: ALL SURFACES IN ALICE BLUE, FITTINGS, HANDLES ETC, ARE CHROMIUM PLATED
REGISTRATION LETTERS ARE SILVER & DARK BLUE.
INTERIOR: UPHOLSTERY LEATHER DOVE GREY.

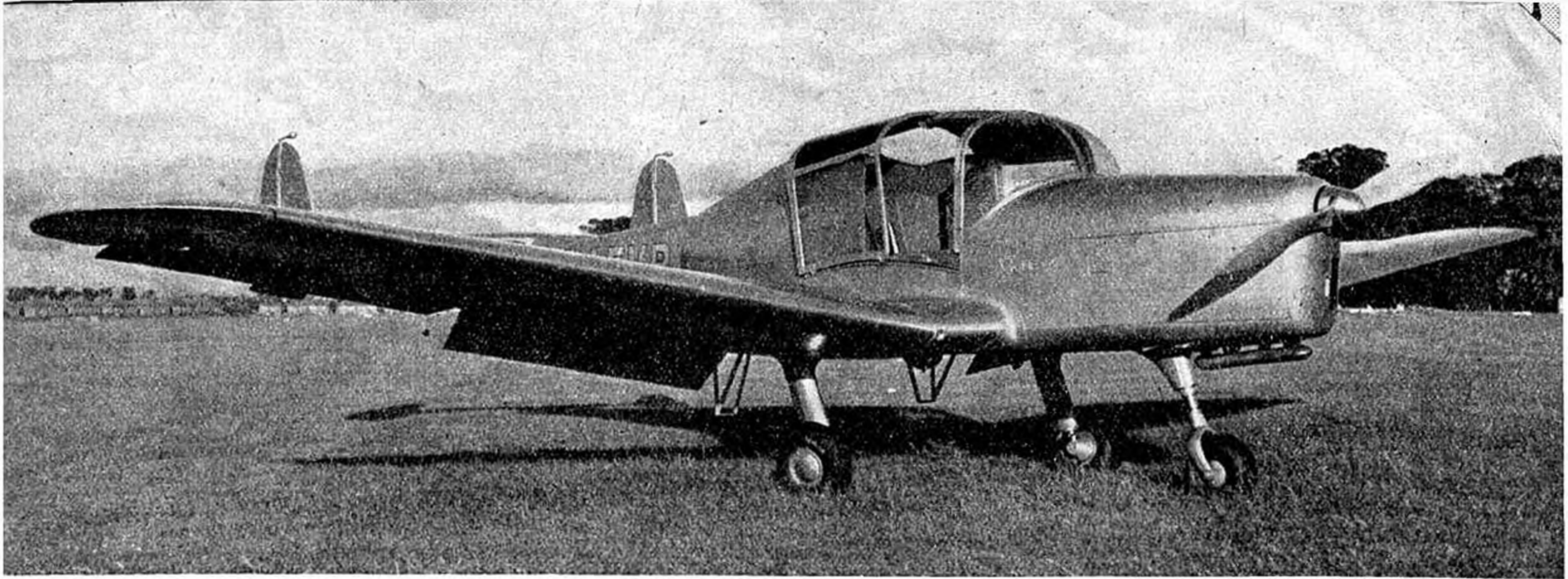


Photo by courtesy of General Aircraft Co., Ltd.

This article gives a fully comprehensive description of one of the world's most outstanding light 'planes with working drawings and instructions for making a super detailed scale model, either solid or built up. The Cygnet was the first British aeroplane to go into production with a tricycle undercarriage.

THE CYGNET

By

JOEL SENBER.

One of the most outstanding light 'planes of the flying world to-day, the Cygnet brings sport flying almost into the same category as driving a car. It is a successful outcome of a serious effort by General Aircraft, Ltd., to develop a light 'plane for the non-specialist—the man or woman who wants to fly an aeroplane that can be handled easily. Its design and construction are based on the well established modern formula, and, though resembling the conventional aeroplane to a marked degree, it incorporates many of the most advanced ideas, and it is the particular combination of these ideas that makes the Cygnet different.

The Cygnet is a single engined, low wing monoplane. Powered by a 150 h.p. Cirrus Major, or Gipsy Major, it features a twin tail arrangement, tricycle landing gear, and all-metal, stressed-skin construction. It carries two people side by side in a comfortably upholstered cabin, with ample space for luggage, and is intended for training and touring.

On the take-off, the Cygnet need not necessarily be pointed into the wind and there is no tendency towards directional instability on the ground. That is, unlike the conventional aeroplane, the nose of the 'plane does not tend to swing away from the direction in which one is going, also, since one is always in a horizontal position on the ground, visibility is excellent, which in turn facilitates taxying. These desirable features can be attributed to the tricycle chassis.

The throttle is pushed open, and when sufficient speed has been gained, and not until then, the joystick is grasped and given a hearty pull, and the Cygnet shoots off the ground. If one tries to pull the machine off the ground before flying speed is attained, nothing happens. The nose will not come up, so it is quite impossible to make a bad, slow-speed take-off. The climb is rapid, and once up there, it will be found that turns can be made quite easily using the stick alone. The Cygnet cannot be stalled hard enough to spin, due to the limited elevator movement. The freedom from any tendency to swing at any change in throttle setting is the result of using twin fins and rudders.

To land, the flaps are set one-third down, the throttle eased back, and the nose of the 'plane pointed down in the direction of the landing field. When one sees the ground reasonably close, one pulls back the stick, and hits the ground on three squashy G.A. oleo legs. Again differing from the conventional aeroplane, which has a definite landing speed, the Cygnet can be safely landed throughout a range of 60 to 85 m.p.h.

The Cygnet is of all-metal construction throughout, and heavily protected to resist corrosion. The whole theme of construction is to provide a solid structure with the loads well distributed. The structure is such that much local damage can be done without appreciably affecting the rest of the airframe. It can also withstand severe weather and climatic conditions, such as exposure to tropical hailstorms, dust storms, heat and humidity. This should make it specially appealing to private owners in out-of-the-way places, where hangarage is scarce, as there need be no fear of deterioration due to exposure or local conditions.

Delivery of this ship during war-time is not guaranteed, but has been very regular to date.

A Word about the Plans.

Before commencing work, the plans must be drawn up to the chosen scale. It is essential that the modeller works from full size plans and makes a comprehensive study of the drawings. Thus he should have a complete picture of the whole model in mind before starting construction.

The full-size plans should be drawn up in standard "L" shape, i.e., top, front and side views in the upper left, lower left, and lower right hand sides respectively. In the upper right-hand corner, the fuselage details could be drawn. A pair of dividers will be found very useful in scaling up the plans, particularly where one measurement is duplicated several times.

To go about scaling up the plans, the three main views should first be blocked out, and the centre-lines of each drawn. Next, points in the outline should be scaled off and joined. Then the details can be added to each view.

When these plans are ready, fuselage plan and elevator should be drawn on thin cardboard and cut out, to be used as patterns. Also, templates of all fuselage cross-sections should be made, as this will facilitate carving and sanding.

Another thing, full-size layouts of control details (they are not shown to exact scale on the plans), would be a great help particularly the nose wheel control.

Modelling the Cygnet.

There are two main ways to reproduce the Cygnet in model form, and either one will make a truly handsome replica. The first method is to make all parts built up, and cover with thin sheet metal, while the second, which is easier, requires less working time, and is therefore the more popular, is to carve all parts from wood and then hollow them out. We will describe the latter method in detail, as it is more than likely the majority of the modellers will use it. If, however, it is decided to make the model built up, a little ingenuity on the part of the modeller himself will see the job through nicely.

Suggestions given here and shown in the plans for the finishing details can be followed, no matter what make of construction is chosen.

One more thing before you dig in, and that is, decide upon what wood you will use. Balsa is the easiest to work, but soft pine or bass has a finer grain and will give a better finish.

To start, two blocks, each representing one-half the fuselage, are temporarily glued together. The top and side

A fine photograph of the Cygnet in flight. Note how carefully every little detail of the full size machine is faithfully reproduced on the plan opposite, enabling modellers to construct a very accurate replica.

Photo by courtesy of General Aircraft Co., Ltd.

patterns are marked out, and cut to shape. Then the body is carved, checking with the cross-section templates from time to time. When it has taken shape, the cabin hatch is cut out along line Y–Y and the final carving and sanding is done. Then the blocks are split apart and hollowed out, leaving a wall thickness of about 1/16 in. Now, lay the fuselage aside for a while, and start on the tailplane.

The stabilizer and rudders are also made in two pieces and hollowed out, i.e., assuming the builder intends to put in movable controls. If not, they can each be carved in one piece.

The wing is likewise made in two pieces, top and bottom, but in five panels, i.e., the centre-section, outer panels, and wing tips.

When the main parts have all been carved, take up the fuselage again, and start detailing it. All the details can be glued on one side of the fuselage, and adjusted before the other half is permanently glued in place.

First, though, glue the fuselage halves together again temporarily, and cut away carefully with a knife and fitting the centre-section in snugly. Then split them apart once more, and starting from the nose, put in the engine mount and instrument panel. At this point the front landing leg and control are built and put in. Mount the rudder pedals and joysticks and attach the rudder control cords and nose wheel control to the pedals and aileron and stabilizer control cords to the joystick. (Silk gut is a good imitation for aviation control cables.) The fuselage halves can now be glued together permanently.

Now, carve the tail fillet, and mount only the *lower* half of the stabilizer, so that the control cords for the elevators can be connected up. Mount the rudders similarly and when the fins have been attached, and all the movable surfaces on the tail are working perfectly, the top half of the stabilizer and remaining halves of the rudders are permanently glued on. Then all seams are sanded smooth, and minor details, such as tail skid, control balances, fillets, etc., added.

Next, the centre-section is glued in place, and the aileron control cords passed through it. The two rear oleo legs are now constructed and cemented firmly in place. Small air-wheels would be ideal, depending upon the size of the model, although wooden wheels will not detract from the model's beauty.

For the sliding hatch a framework of bamboo with celluloid windows, makes a realistic job. A form cut out of hardwood would facilitate bending the main "hoops," of which there are four. Don't forget that two panels are coloured purdah blue.

When this has been done, the seats are constructed (see plan) and mounted in place, so that they can travel to and fro. Then the final details, such as upholstery, throttle controls, etc., are added.

The bottom halves of the outer wing panels are glued in place, and the aileron controls connected up. Care should be exercised to have them operating freely.

The top halves of the wing panels and the wing tips are glued in place. Fillets between the body and centre-section should be made of plastic wood or beeswax.

The final touches are put on—front cowl, propeller spinner, etc., and the model should now be ready for painting. Now the builder should stop, look and think. We emphasize this, because a perfectly good model can be ruined by a messy paint job, while a fairly good one can be made a winner if care is taken in painting it.

Here are some hints for applying a super paint job. They apply to a balsa, pine or bass-wood model equally well, although the balsa requires an extra coat or two of wood filler.

First, all parts must be sanded really smooth, final work being done with 10–0 sandpaper. Then the entire model should be given two coats of a good wood filler, sanding with No. 320 sandpaper between each. Next, apply two coats of du Pont surfacer. Sand again with No. 320 paper. If there are any small pores which are not thoroughly filled up, apply more surfacer in successive coats until they disappear. To apply the actual paint job, which is in Alice blue, a sprayer would be ideal, although a brush job would look just as well if enough care were exercised. Two coats of the coloured lacquer should suffice. Scotch or masking tape will facilitate painting on the registration letters, which are dark blue and silver (see plan). All fittings, handles, etc., should be painted silver. A word here about imitating the rivets. In a large model, pin heads would look good, otherwise, some method of pricking the paint when still "tacking" to raise it, should be devised. A coat or two of banana oil, followed by a coat of liquid wax plus some rubbing and buffing, will produce a shine rivalling that of the best exhibition model yet produced.

Full size working drawings and instructions for building a model of the Cygnet available through the Aeromodeller Plans Service, Ltd., Allen House, Newarke St., Leicester
Price 2/- Post Free

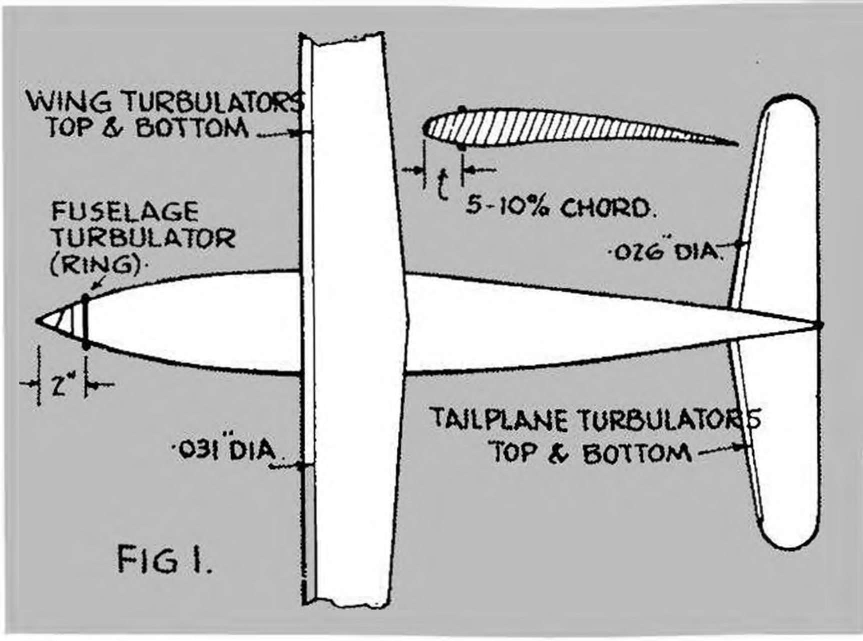


FIG I.

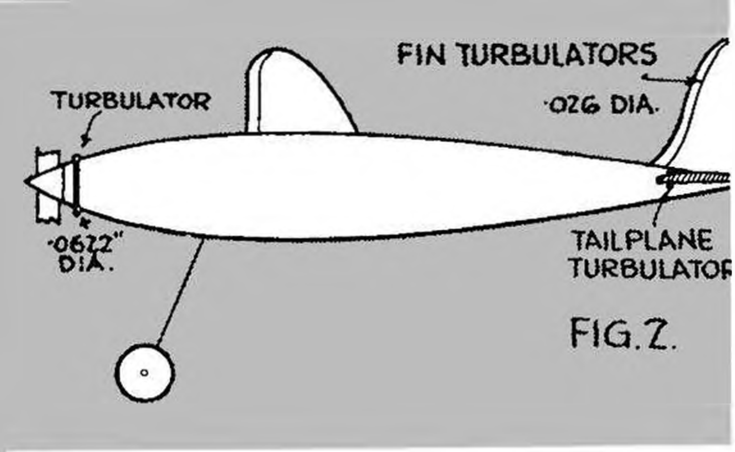


FIG. 2.

"TURBULATORS"

A suggested method of Drag Reduction as given by R. H. Warring in a recent lecture on " Improving Model Efficiency."

IT is only of recent years that the aero-modeller appears to have got down to serious consideration of design and the importance of scale effect has been realised. Now low values of the Reynolds Number such as occur at model speeds do not appear to affect the *slope* of the lift curve to any marked degree, but causes an early stall so that our working range of incidences is reduced.

However, since we seldom fly our models at high angles of attack this should not bother us unduly and it is the scale effect on *drag* that concerns us most.

It has been definitely proved that at low values of R.N., drag values are higher, so let us seek the reason for this. At some value of R.N. the boundary flow changes from laminar to turbulent, the laminar flow being associated with low R.N. and higher drag. It would seem, then, that if we could change our *laminar* boundary flow to *turbulent* we could reduce the drag of our models.

This may be done in two ways: (*a*) by increasing the Reynolds Number, or (*b*) by *artificially* inducing turbulence without increasing the R.N. This is the principle behind Mr. Jacob's experiments reported in Frank Zaic's 1939 Year Book, applied to a wing, but the following treatment is more detailed.

It is important to note that turbulence in the *boundary layer* decreases drag but turbulence in the *main flow increases* drag.

Now we should be able to artificially induce turbulence by breaking up the airflow by means of projections normal to the flow. For a circular cross-section fuselage a ring of wire will serve. This should be as near the nose as possible so that the maximum length of boundary layer is rendered turbulent.

If too large, the projection, or *turbulator* as I will call it, will also cause turbulence in the main flow *increasing* drag. Obviously then our turbulator must be within the boundary layer.

The thickness of the boundary layer is, according to Van der Hegge Zijnen :—

$$T = 4{\cdot}5\sqrt{\frac{KL}{V}}$$

T = thickness (in ft.) of boundary layer.
K = ·000159.
L = distance from leading edge (in ft.).
V = airspeed (in ft. per sec.).

Taking a typical Wakefield fuselage and measuring from the tip of the airscrew spinner we will put our turbulator 2 in. in, i.e. on the extreme nose of the fuselage proper. Assuming an airspeed of 20 ft./sec. the thickness of the boundary layer at this point is then :—

$$T = 4{\cdot}5\sqrt{\frac{{\cdot}000159 \times 2}{12 \times 20}}$$
$$= {\cdot}00518 \text{ ft.}$$
$$= {\cdot}0622 \text{ in.}$$

Thus a wire of ·0622 in. diameter placed around the fuselage 2 in. in from the spinner should effectively transform the boundary flow from laminar to turbulent.

From experimental results it would seem that the thickness of the boundary layer at model speeds is greater than that given by the formula. However, this is in our favour, for even if the turbulator only extends through a part of the boundary layer the whole of the latter will still be rendered turbulent without inducing turbulence in the main stream.

On the wings the turbulators should be fitted on both upper and lower surfaces and at a certain fixed percentage of the chord from the leading edge. This percentage has not been accurately determined, about 10 per cent. seems best for a Wakefield wing, but less for a larger wing. The object is to render as much of the boundary layer turbulent as possible, but it is not advisable to approach the front stagnation point too closely in fitting turbulators otherwise there is a danger of causing turbulence in the main stream also.

On a tapered wing the turbulator should also be tapered for ideal conditions, but this is scarcely necessary. Taking a 5-in. average chord as typical of Wakefields and turbulator position 10 per cent. of chord from the leading edge the boundary layer thickness at this point is :—

$$T = 4{\cdot}5\sqrt{\frac{{\cdot}000159 \times {\cdot}5}{12 \times 20}}$$
$$= {\cdot}00259 \text{ ft.}$$
$$= {\cdot}0311 \text{ in.}$$

Thus the turbulator should be ·0311 in. diameter.

The tailplane is dealt with in a similar manner; the 10 per cent. chord position may be used or less for low aspect ratios. Based on a 3·5 in. *average* chord the boundary layer thickness at 10 per cent. chord from leading edge is :—

$$T = 4{\cdot}5\sqrt{\frac{{\cdot}000159 \times {\cdot}35}{12 \times 20}}$$
$$= {\cdot}002167 \text{ ft.}$$
$$= {\cdot}026 \text{ in.}$$

Thus the turbulator is ·026 in. diameter, fitted to top and lower surfaces as before.

The fin may also be fitted with similar turbulators, one on each surface and again at the same approximate position.

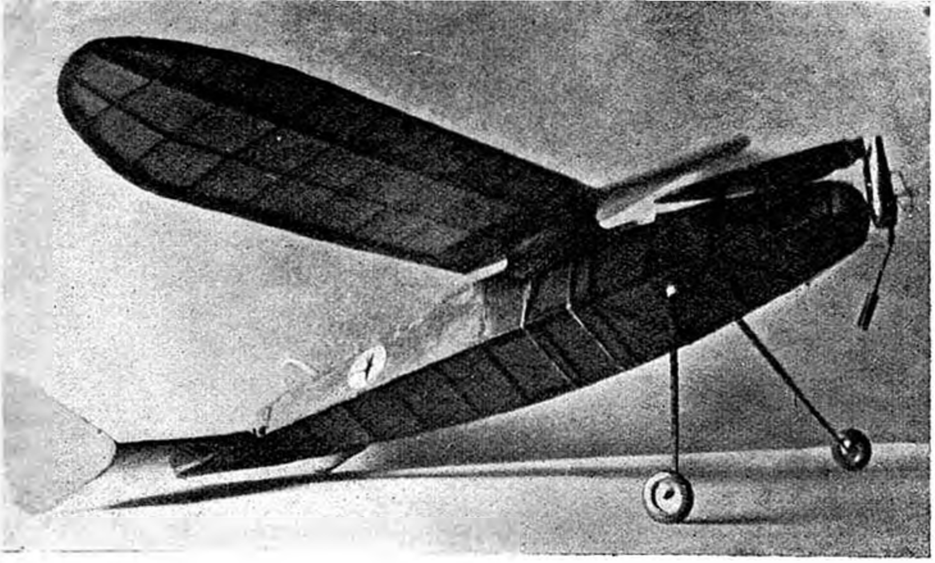
The war has unfortunately prevented wind tunnel tests being carried out on bodies fitted with such turbulators, but certain practical results that have been obtained seem to indicate that a good increase in efficiency is possible by their use.

Wind tunnel tests on bodies with rough and smooth surfaces show that at low values of R.N. the *rough* surface has the *lower drag*. The reason for this is the increased turbulence in the boundary layer. Thus it may be possible to obtain nearly all the advantages of full scale characteristics with a gratifying increase in performance.

However, much work in this direction still remains to be done and further development has, in my case, been definitely precluded, as " active service " and research work do not go hand in hand. Perhaps some interested readers may be tempted to forward their views and the matter may be discussed still further. Certainly anything liable to result in increased model performances is worthy of consideration.

"PETE"

By ROBERT BURNS



THIS 'plane was built in an attempt to solve the problem of " to streamline or not to streamline " and whilst it did not decide that at all it did prove that by careful arrangement of the parts it is quite possible to get an excellent performance out of a box model. The use of a folding propeller was contemplated from the onset and, since this involves a low thrust line position in order to counterbalance the C.G. shift, it was decided to see if any advantage was to be obtained in the way of reduced interference drag by putting the wing on a short pylon mount above a diamond fuselage.

In practice, this worked surprisingly well. The model was flown all last summer—and incidentally, had extremely bad luck in the way of " tree-top perching " ! The usual duration without thermals is in the neighbourhood of two and three-quarter minutes on 1,100 turns.

Building the model is quite easy, but I propose describing the folding prop. and wing mount in some detail. The wings themselves are quite conventional. One point to bear in mind here is to pack up the front of the trailing edge about 1/32 in. when building to avoid a flat bottom here. The tailplane is built up " Air Cadet " fashion with the centre-section sheet covered for additional strength. The fins are built flat, covered and doped and then cemented to the tailplane end ribs. The fuselage is reinforced here shown with 1/16 sheet and the undercarriage system is similar to that introduced by Mr. Rippon and fully described in the ' Aeromodeller ' in connection with his model ' George.'

Carve the prop. blades from soft balsa—if obtainable—and sandpaper to final shape. Put the bearing in place temporarily, and then take a 3 in. length of 18 s.w.g. wire and push it through the hinge line. It ought to be 1/10 in. nearer the hub and 1/10 in. nearer the leading edge on the one side of the blade than the other. Hold the ends of the wire, with the blade erect so that you can see through the hole in the bearing, and allow it to fold without moving your fingers until it is pointing straight away from you. It should be flat and in line with your eye, not lying to one side or the other. If necessary, move the wire to a new position in the blade and try again to get this right.

The hinge wire must duplicate the position of the 3 in. wire exactly, so cut a notch in the blade to expose the wire and take it out. Now bend it to occupy the slot while the two ends are in contact with the blade faces and opposite one another. The short length which lies in the notch must be kept straight during this operation so hold it in the jaws of a pair of pliers whilst doing any bending near it. The wire must not be an easy fit and should not be sprung into place as this will probably lead to the blade angle being altered when it is finally cut loose.

The hinge is completed by cutting a diamond shape from a tin can (scissors will do this) and folding this over the straight part of the wire, clamping it with pliers. Rub the straight piece of the wire with blacklead and solder the two ends of the tin together—the blacklead will prevent the whole thing soldering up solid. Now put the hinge in position and lay a piece of wire along the back of the hub which should project an inch or so beyond the end stump. Solder this to the hinge. Later this is bound and soldered to the balance arm itself to give it greater rigidity. The wire should be placed in a groove in the hub and this and the hinge wires bound and cemented in place.

To complete the job the entire hub is covered with .8 mm. ply, which is allowed to project a little at the hinge, thus forming a socket into which the blade roots will be a firm fit—but not so firm as to prevent them folding. Failing plywood, thick celluloid may be used. Thread bindings complete the assembly.

The balance weight can now be cast onto the 18 s.w.g. arm which is driven into the hub under the plywood at the leading edge and bound with fuse wire and soldered to the other wire. During balancing operations, the blade is held erect by an elastic band or a small spot of cement. I have had a prop. made on this system that is still in service after 18 months flying and still as rigid and vibrationless as ever.

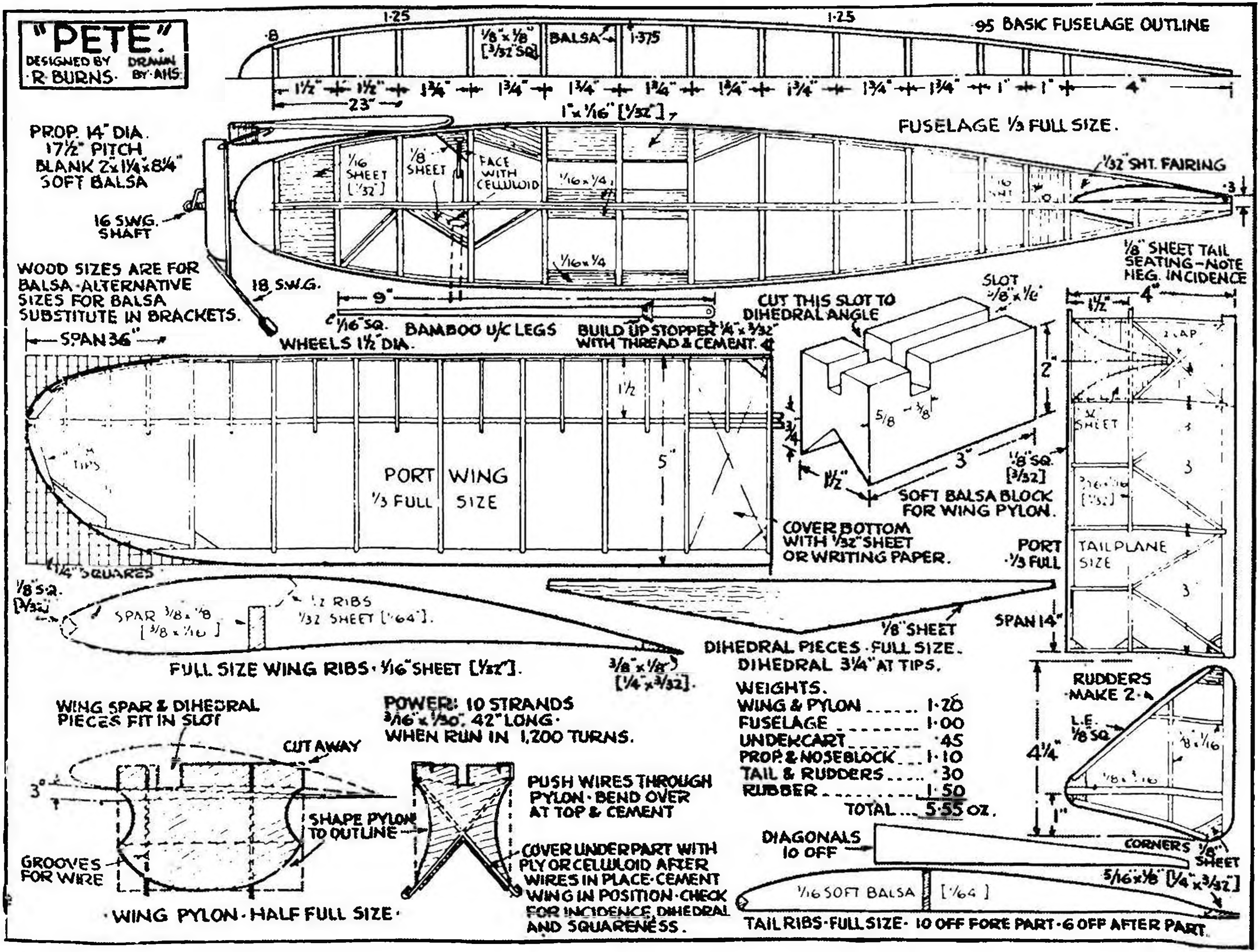
The wing pylon is built from a block of balsa 2 in. by 1½ in. by 3 in,, marked as shown on the drawing. A " V " notch is cut from the underside and fitted to the fuselage for shaping. Now cut a ⅛ in. notch out of the top, taking care that this is central. A transverse slot is needed to take the wing spars and the two dihedral pieces. Trim and fit to the actual components.

The top corner of the rear of the block will project and must be cut off. When this is done fair and streamline the whole to a pleasing shape and fit the wire hooks. These are placed approximately ½ in. from the front and ¾ in. from the back of the block. Grooves are cut in the faces of the " V " and lengths on 22 s.w.g. wire pushed through the pylon. Where it emerges it is bent to follow the shape of the sides and fit in the grooves. The end is then cut off and formed into a hook. Finally, cover the whole pylon with thin ply or celluloid and cement the wing in place, checking for incidence and trueness.

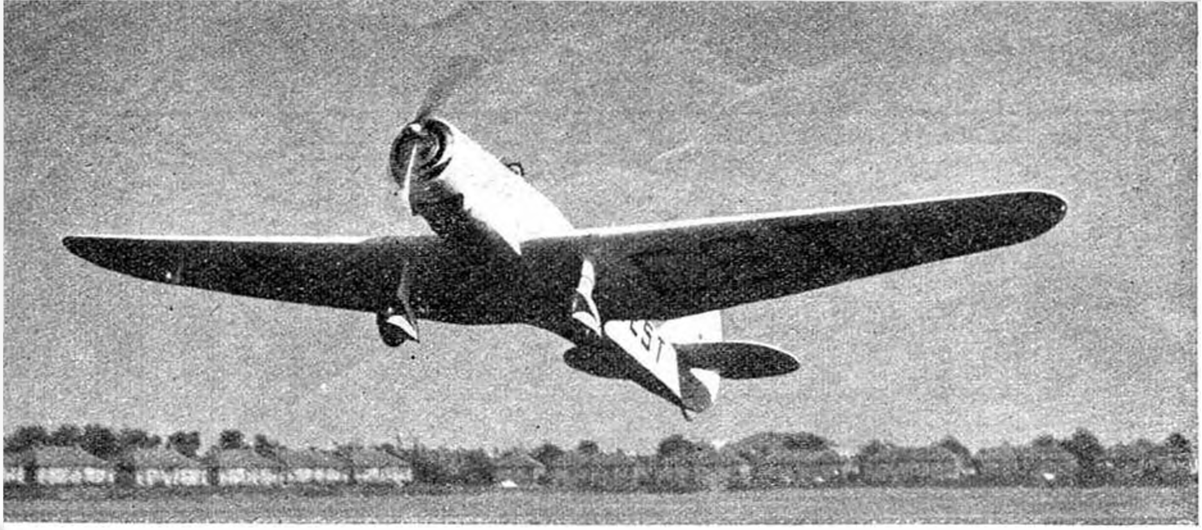
The motor is 10 strands of 3/16 by 1/30 rubber, 42 ins. long, and it is recommended that bobbins be used. This when well run in will take 1,200 turns giving a power run of 75—80 secs. The model should balance near the mainspar and adjustment is by small movements of the wing position or tailplane setting. Adjust for glide first and then add downthrust if necessary to cure any stalling on the power flight.

This model can quite well be built of balsa substitute, and, in fact several have, and the following table is appended as a guide.

Component		*Balsa size*	*Substitute size*
Fuselage ..		Longerons and spacers, ⅛" × ⅛"	3/32" × 3/32"
		Reinforcing 1/16" sheet	1/32" sheet
		Gussets, ⅛" sheet	1/16" sheet
		Nose panels 1/16" sheet	1/32" sheet
Wing		Ribs 1/16" sheet	1/32" and 1/64"
		Spars, ⅛" × ⅜"	1/16" × ⅜"
		L.E., ⅛" square	3/32" sq.
		T.E. and tips, ⅛" × ⅜", tapered	T.E. 3/32" × ¼", tips bamboo
Tailplane	Spar	1/16" × 1/16"	1/16" × 1/64"
	Ribs	1/32nd sheet or 1/16th soft	1/32nd sheet
	L.E.	⅛" sq.	3/32" sq.
	T.E.	⅛" × ⅜" taper	3/32" × ¼" taper
Noseblock ..		As needed	Soft pine
Pylon ..		3" × 2" × 1½"	Built of ⅛" ply



"PETE."
DESIGNED BY R. BURNS.
DRAWN BY AHS
·95 BASIC FUSELAGE OUTLINE
1/8" x 1/8" [3/32" SQ] BALSA
FUSELAGE 1/3 FULL SIZE.
PROP. 14" DIA. 17½" PITCH BLANK 2" x 1¼ x 8¼" SOFT BALSA
16 S.W.G. SHAFT
1/16 SHEET [1/32]
1/8 SHEET
FACE WITH CELLULOID
1" x 1/16" [1/32"]
1/16 x 1/4
1/32" SHT. FAIRING
1/8" SHEET TAIL SEATING - NOTE NEG. INCIDENCE
WOOD SIZES ARE FOR BALSA. ALTERNATIVE SIZES FOR BALSA SUBSTITUTE IN BRACKETS.
18 S.W.G.
1/16" SQ.
BAMBOO U/C LEGS
WHEELS 1½" DIA.
BUILD UP STOPPER 1/4" x 3/32" WITH THREAD & CEMENT.
CUT THIS SLOT TO DIHEDRAL ANGLE
SLOT 1/8" x 1/16"
SPAN 36"
PORT WING 1/3 FULL SIZE
1/4" SQUARES
SOFT BALSA BLOCK FOR WING PYLON.
1/8" SQ. [3/32]
COVER BOTTOM WITH 1/32" SHEET OR WRITING PAPER.
PORT TAILPLANE 1/3 FULL SIZE
SPAN 14"
1/8" S.Q. [3/32]
SPAR 3/8 x 1/8 [3/8 x 1/16]
12 RIBS 1/32 SHEET [1/64].
FULL SIZE WING RIBS · 1/16" SHEET [1/32"].
3/8" x 1/8" [1/4" x 3/32"].
1/8" SHEET
DIHEDRAL PIECES · FULL SIZE.
DIHEDRAL 3¼" AT TIPS.
WEIGHTS.
WING & PYLON ...... 1·20
FUSELAGE ...... 1·00
UNDERCART ...... ·45
PROP. & NOSEBLOCK ... 1·10
TAIL & RUDDERS ...... ·30
RUBBER ...... 1·50
TOTAL ... 5·55 OZ.
RUDDERS MAKE 2.
L.E. 1/8 SQ.
CORNERS 1/8" SHEET
5/16" x 1/8" [1/4" x 3/32"]
WING SPAR & DIHEDRAL PIECES FIT IN SLOT
CUT AWAY
POWER: 10 STRANDS 3/16" x 1/30", 42" LONG · WHEN RUN IN 1,200 TURNS.
PUSH WIRES THROUGH PYLON · BEND OVER AT TOP & CEMENT
SHAPE PYLON TO OUTLINE
GROOVES FOR WIRE
COVER UNDERPART WITH PLY OR CELLULOID AFTER WIRES IN PLACE · CEMENT WING IN POSITION · CHECK FOR INCIDENCE, DIHEDRAL AND SQUARENESS.
WING PYLON · HALF FULL SIZE ·
DIAGONALS 10 OFF
1/16 SOFT BALSA [1/64]
TAIL RIBS · FULL SIZE · 10 OFF FORE PART · 6 OFF AFTER PART.



The tops of the civilian registration letters are adjacent to the leading edge of the wing as on this photograph of the Mosscraft. Letters are four-fifths of the wing chord in height, width two-thirds of the height and thickness one-sixth of the height.

By
E. J. Riding.

CIVILIAN AIRCRAFT MARKINGS.

AFTER the last war, with the resultant conversion of thousands of service aircraft to civil use, it soon became obvious that some system of identification would be necessary. The first method to be adopted consisted of a single letter followed by a numeral, in this case the letter K followed by three identifying figures. Thus the first machine to be registered under this system was a D.H.6 and it was given the number K.100. The second was K.101 and so on up to about K.175 when the series was abandoned in favour of new suggestions put forward by the International Conference held in Paris in 1919.

The outcome of this Conference was that a Convention was set up whereby all civil aircraft were to bear nationality and individual identification markings. The British Empire adopted the symbol G for its national marking, France adopted the letter F, Holland adopted H and so on followed by a hyphen and a succession of four letters denoting (*a*) the registration prefix and (*b*) the individual registration letters of the aircraft.

In the case of Great Britain the letter G was at first followed by the prefix EA followed by two letters. Thus the first machine to be registered under the revised scheme was G-EAAA a D.H.9, which, incidentally, had seen service with the R.A.F. where it bore the service number C.6054.

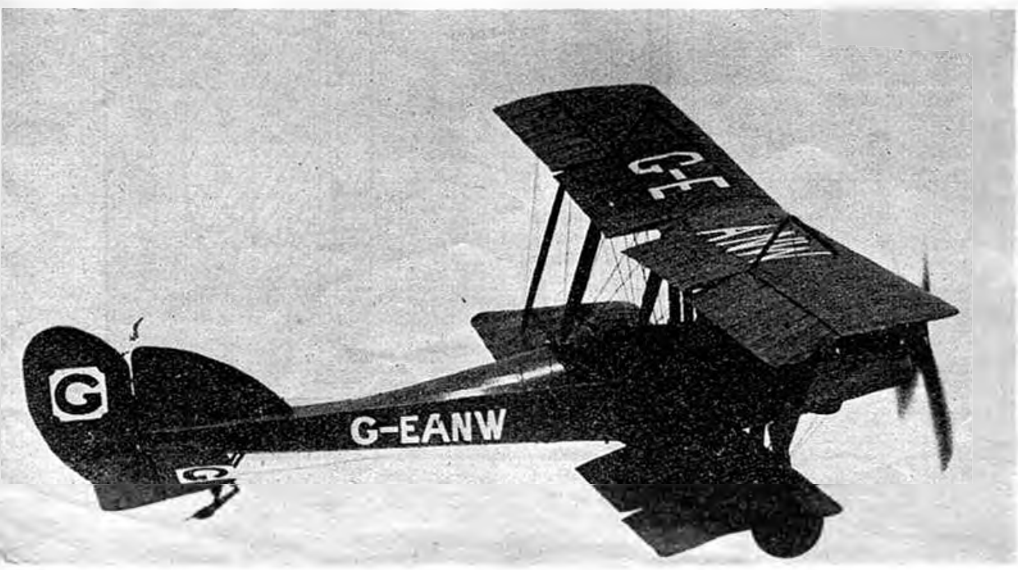
The second to be registered was our old friend the D.H.6, K.100 which, of course, had to be re-registered and became G-EAAB. The third was G-EAAC and so on up to G-EAAZ, when a fresh start was made with G-EABA to G-EABZ and so on right through the alphabet until G-EAZZ was reached.

After the issue of G-EAZZ, a new series came into use beginning with the prefix G-EB followed by two letters. The first machine to be registered in this series was G-EBAA, the second G-EBAB and so on as in the first series right up to G-EBZZ. Now at this point, instead of starting with G-ECAA to G-ECZZ, the prefix G-E was dropped and an entirely new series beginning with G-AAAA was adopted. Incidentally G-AAAA was the first D.H. Moth to be marketed with the D.H. Gipsy engine and at the outbreak of war was still doing good service as a training machine with the Yorkshire Aero Club at Yeadon, near Leeds.

G-AAAA to G-AAZZ was followed by G-ABAA to G-ABZZ, then G-ACAA to G-ACZZ and so on until at the present moment we are about half way through the G-AGAA to G-AGZZ section. A rough-estimate of the age of an aeroplane can be gauged from its registration letters. Briefly, the G-EAAA—G-EAZZ section lasted from 1919 until the latter half of 1921,

G-EBAA	to G-EBZZ	from	1921	to	1928
G-AAAA	,, G-AAZZ	,,	1928	,,	1930
G-ABAA	,, G-ABZZ	,,	1930	,,	1932
G-ACAA	,, G-ACZZ	,,	1932	,,	1933
G-ADAA	,, G-ADZZ	,,	1933	,,	1935
G-AEAA	,, G-AEZZ	,,	1935	,,	1937
G-AFAA	,, G-AFZZ	,,	1937	,,	1939
G-AGAA	,, G-AGZZ	,,	1939	,,	—

At the outbreak of war there were no G-EA's and only nine G-EB's possessing current Certificates of Airworthiness. Seven of these were D.H. Moths, one a D.H.53 (unfortunately since destroyed in a fire) and the other a Westland Widgeon, now believed to be in service with the R.A.F. One of these seven Moths (G-EBLV—the eighth of its type to be built) has been acquired by the De Havilland Aircraft Co., Ltd., for perpetuity. The D.H. Co. once carried out an experiment to see exactly how long an aeroplane would last under normal flying conditions. One of their school machines, a D.H.9, was selected—G-EAAC, the third machine to be registered under the revised scheme—which had seen service with the R.A.F., where it bore the service number H.9227. The machine was finally withdrawn from service in December, 1933, after a life of over 15 years. Another machine in this series which lasted for a long time was G-EASF, an Avro 504K, late D.5858 in the R.A.F. This machine was registered in 1919 and was owned by the Berkshire Aviation Tours, Ltd., and their successors until the company's disbandment in 1933. By this time, Avro 504Ks were getting a trifle out of date even for their trade—joy riding, and as aircraft having only single ignition were to be prohibited from flying for hire or reward it looked as if SFs time was drawing nigh. Luckily she fell



This photograph of a B.E. 2E was taken in 1928 and shows the "Gs" on tailplane and rudder. The prefix G—E was dropped in 1928 and the "Gs" abandoned in 1929.

The photograph on the opposite page is of a D.H. 94 Dragon, and shows the dispositions of the registration lettering on the top surfaces and fuselage sides.

Photographs by courtesy of "Flight."

into the hands of Capt. L. J. Rimmer, the last bastion of the organised air circus and she lived to a ripe old age of eighteen, finishing her days as a dual-control privately-owned machine in 1937.

Of course, in both these cases nothing of the original aircraft remained, since the annual overhaul for renewal of the Certificate of Airworthiness often calls for replacement of wings, undercarriages or engines until at length only the original registration letters remain. If an aircraft is scrapped, its number dies with it as it cannot be re-issued to a new machine

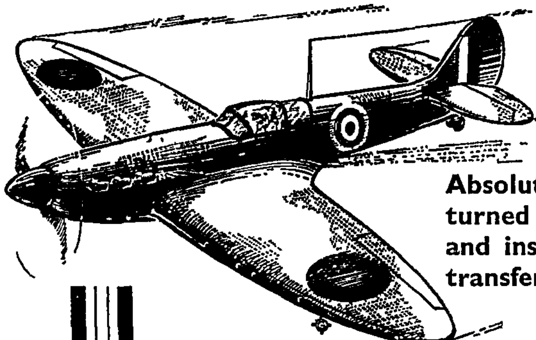
Many aircraft on the Civil Aircraft Register at the outbreak of war have been impressed into the R.A.F. It is a common sight to see D.H. Dragons and Rapides and Percival Q.6s and other types going about their lawful business on communication duties or as ferry craft with the A.T.A.

The few civil aircraft in operation still bear their original identification letters, usually in black outlined with white upon a camouflaged background and underlined with thick red, white and blue bands on wings and fuselage. The fins carry vertical red, white and blue stripes similar to those carried on service aircraft.

The size and positioning of registration letters was also defined by the Paris Convention but the regulations governing the size of the letters was apparently not very strictly adhered to. The rules stated that the letters were to be carried on the top surfaces of the upper wings with the tops of the letters adjacent to the leading edge of the wing and in a similar fashion on the under surface of the bottom wings. The national symbol was to be carried on both upper and lower surfaces of the tailplane, port and starboard, and on each side of the rudder.

The registration letters were to be 4/5ths of the wing chord in height, the width 2/3rds of the height and the thickness 1/6th of the height. Those carried on the sides of the fuselage were to be 4/5ths of the depth of the narrowest portion of the fuselage in height.

Later on, however, several concessions were made and in 1929–30 the G on the tailplane and rudder were abandoned and the letter Q omitted owing to the risk of mistaking it for O, although there seems to be far more likelihood of mistaking D for O. Certain registration combinations, e.g. G-ADUD, and others liable to misconstruction were never issued.



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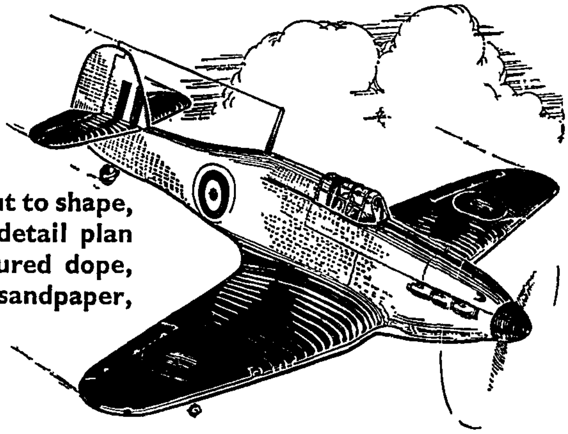
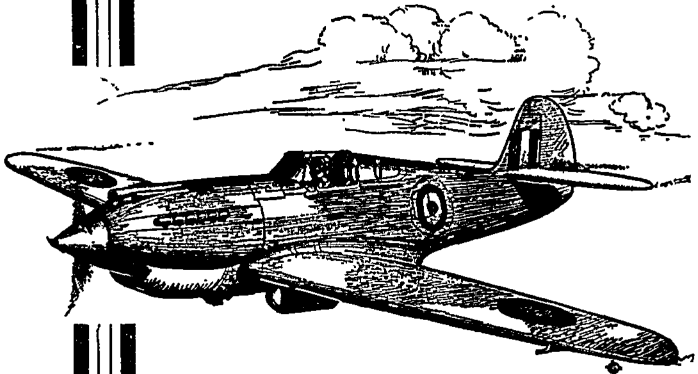


HAWKER "HURRICANE"



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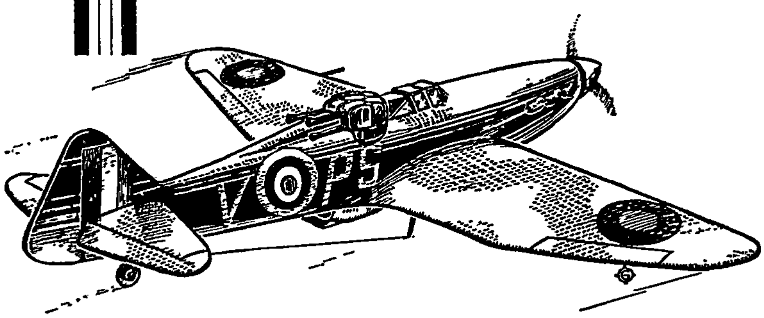

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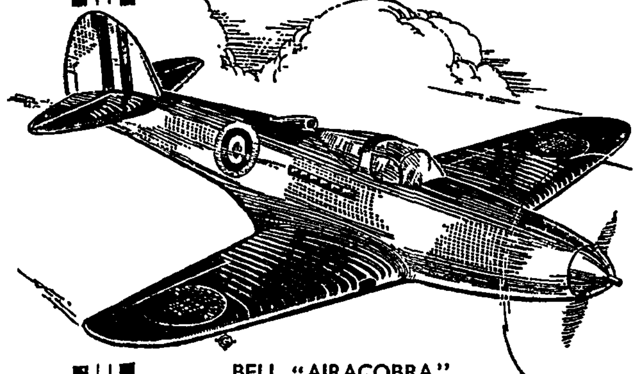
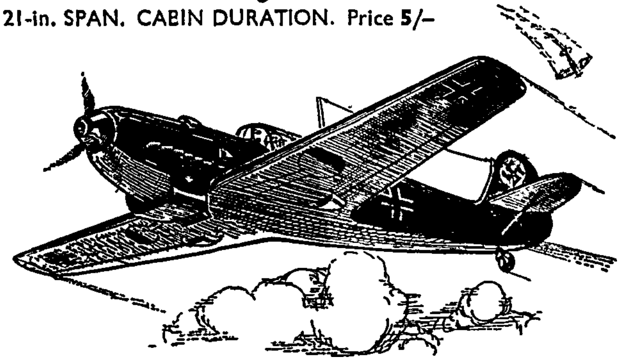


BELL "AIRACOBRA"



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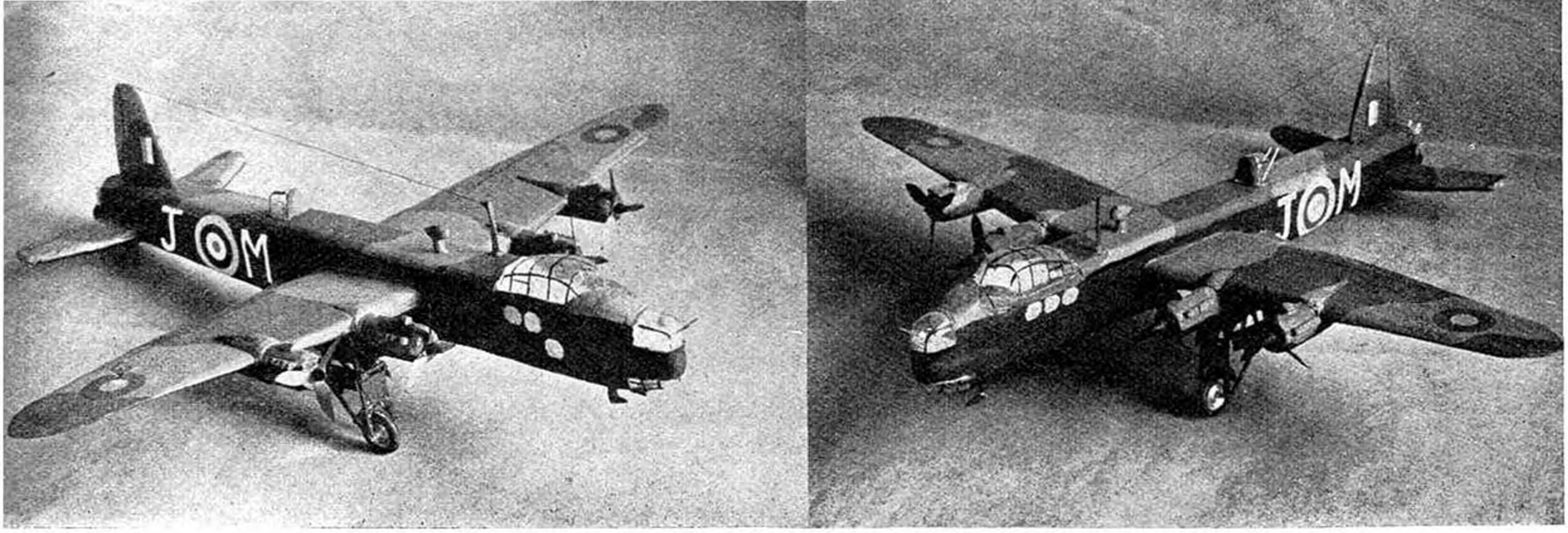


The 1/72 solid scale "Stirling" shown above was built by J. L. Clapham, age 15 years, of Hendon. Allowing for his age, we consider this a good model, but from an older modeller we should expect a considerably better finish.

MONTHLY MEMORANDA

No. 5 of Series

By O. G. THETFORD

Equipment of U.S. Air Forces—cont.

Training in the U.S. Navy was carried out on replaced first-line aeroplanes in pre-expansion years, but since 1940 a number of specialised types have been developed and produced in large quantities.

Primary instruction takes place on Navy versions of the Ryan Monoplane known in the U.S. Army as the PT–22 (formerly PT–21), but a goodly number of the veteran Stearman NS–1 biplanes are still to be seen at Pensacola. These aircraft are the equivalents of the PT–13s in the Army.

Intermediate and advanced training is carried out on the new Curtiss SNC–1 combat trainer built at the St. Louis factory. It bears a close resemblance to the CW–21B export fighter sold to the Dutch East Indies just prior to the outbreak of war in the Pacific theatre.

A number of medium size twin motor transports are used for navigational training, including the Beechcraft 18 and the Cessna Douglas DC–2s, and the Lockheed Model 12s are employed in the utility category.

U.S. Army and Navy Insignia.

The national markings carried on U.S. Army and Navy aeroplanes have undergone several changes since America entered the War, but the following are now standardise :

Army : Star insignia on both sides of the fuselage, above the port wing and below the starboard. No marking above the starboard wing or below the port wing. No stripes are painted on the rudder as formerly, except for certain heavy bombers (i.e. B–17E) used in the Hawaiian Command.

Navy : The star insignia is disposed as on Army aeroplanes but a special rudder marking is carried. This takes the form of alternate red and white horizontal stripes and is similar to the old Army rudder stripe, except that the vertical stripe is absent.

German Winter Camouflage.

It is now learned that throughout the winter months aircraft of the *Luftwaffe* on the Eastern Front have been painted entirely white as were the Russian aircraft in Finland. All-white machines have often been mentioned in Russian pilots' combat reports.

Libyan Camouflage.

German aeroplanes in Libya are now adorned with a special desert camouflage not unlike that devised by the Italians. It is of a mottled leopard-skin pattern, employing several hues of sandy-brown, terra-cotta and stone. The white fuselage band formerly carried just ahead of the tailplane is now painted level with the black cross, for which it forms a background.

Italian markings have also been modified. The white cross on the rudder now has its horizontal component painted across the fin to the leading edge.

A white band is painted on the fuselage midway between the cockpit and the tail assembly, a feature which was first noticeable on the Macchi C202 fighter.

Norwegian Northrops.

The squadron of the Royal Norwegian Air Force equipped with Northrop N–3PB seaplanes is now operating in Iceland with the Coastal Command, and the aircraft are painted slate-grey and sea-grey on the upper sides and "sky" beneath, including the floats. In addition to standard R.A.F. roundels the squadron letters "GS" are painted in black on the fuselage ahead of the roundel on port and starboard.

Prior to the issue of code identification letters each machine had an individual number (1 to 24) in white in the position now occupied by the squadron letters. This number is now painted in small figures just above the "flash" on the fin. An individual letter is painted behind the roundel on the fuselage.

New "Mediums."

Until early in 1942, the Blenheim IVF was the only type of medium bomber used on the daylight "Sweeps," but it has now been reinforced by the American Douglas Boston III.

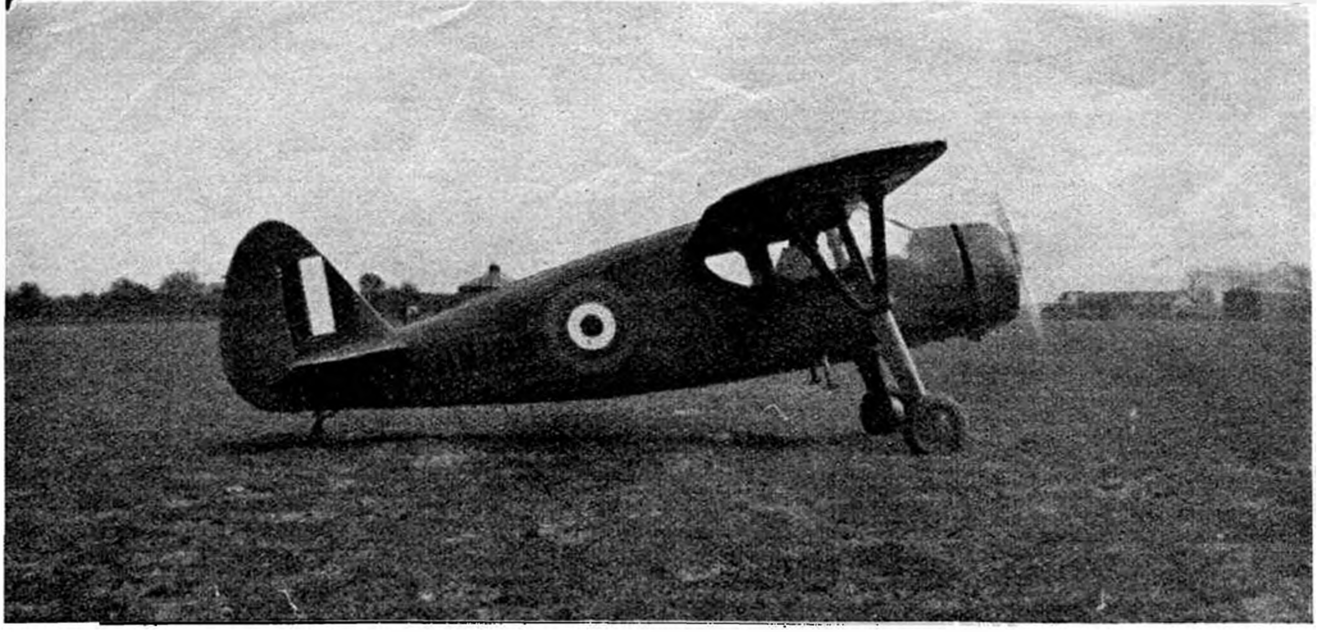
One unit carries the letters "OM" ahead of the roundel and an individual identification letter on the nose. Machine "F" of this squadron has the serial number AL702.

The De Havilland Ninety-Ones

Four D.H. 91 Albatross four-motor monoplanes are flying in this country, and are often seen on various duties. Two long-range versions, the *Faraday* and the *Franklin*, were built for the Air Ministry, and five of the "F" or *Frobisher* class for Imperial Airways. The *Franklin* is the only one of the long-range versions extant (the *Faraday* (G-AEVV) was lost abroad some time ago), and instead of its civilian registration letters (G-AEVW), now carries squadron code letters BJ aft of the roundel on each side of the fuselage. Its individual letter is W, painted ahead of the roundel. The word FRANKLIN is painted in white capitals below the pilot's cabin. Sides and upper surfaces are camouflaged green and brown, and the undersurfaces are yellow. Roundels above the wings are red and blue, while none are carried below. The fins bear red, white and blue vertical stripes, not, however, in the usual small rectangular form, but occupying the whole area. The serial number, AX 904, is painted in black on the fuselage just ahead of the tailplane.

The *Frobisher*, G-AFDI, and the *Fingal*, G-AFDL, which were owned by Imperials, have been written off, and the remaining three machines, *Falcon*, G-AFDJ, *Fortuna*, G-AFDK, and *Fiona*, G-AFDM, are similarly camouflaged, but retain their original civilian registration letters, which are underlined on the upper surfaces of the wings and on the fuselage with horizontal red, white and blue bands.

H. J. C.



FIGHTING AIRCRAFT OF THE PRESENT WAR—XIX

THE FAIRCHILD F24-W-41 (C61) *By* H. J. COOPER

THE Fairchild 24W is one of the lesser-known types of aircraft engaged on communicatory duties in this country, although a good number are in service with the R.A.F.

The Type 24 first appeared about five years ago and has been fitted with various types of radial and inline motors of approximately similar power. The 24W is powered by a 145 h.p. Warner Super-Scarab seven-cylinder radial. When fitted with the 165 h.p. Ranger six-cylinder inverted inline motor, the type is known as the 24K. In the U.S. Army the Fairchild 24W is known as the type C-61, the prefix C indicating that it is in the " Cargo " category and used for transport work.

In general appearance the Fairchild resembles the other types of enclosed high-wing monoplanes which have been produced in America and confusion is easy. Also in this country are Stinson SR-6s, Porterfield 70s and Cessna C-34s, which are all of similar appearance to the Fairchild.

The fuselage of the Fairchild is a rectangular welded-steel-tube structure and is covered with fabric. The wing is of wooden structure built in two sections attached to the top fuselage longerons and braced with steel-tube struts. Covering is of fabric with a plywood leading-edge and wing-tips. Metal-framed split flaps are fitted to the trailing-edge between the ailerons and the fuselage. The fin and tailplane are of wooden framework and covered with plywood; the movable surfaces are metal framed and fabric covered. Trimming tabs are fitted to the elevators.

The spacious cabin seats four in two pairs; dual controls are fitted.

Fairchilds in service with the Training and Ferry Commands are camouflaged with green and brown on the sides and upper surfaces and are training yellow underneath. Roundels above the wings are red and blue; on the fuselage they are red, white and blue surrounded by yellow, and underneath are red, white and blue. Vertical stripes are painted on the fin in the standard form. The serial number is painted in black on each side of the fuselage and below the wings. In the latter position the initial letters are nearest the roundels, so that the number can be read under the starboard wing as the machine is approaching and on the port wing when it has passed over. Some Fairchild 24Ws are registered from HM 165 to HM 175. Two others are EV 725 and EV 776.

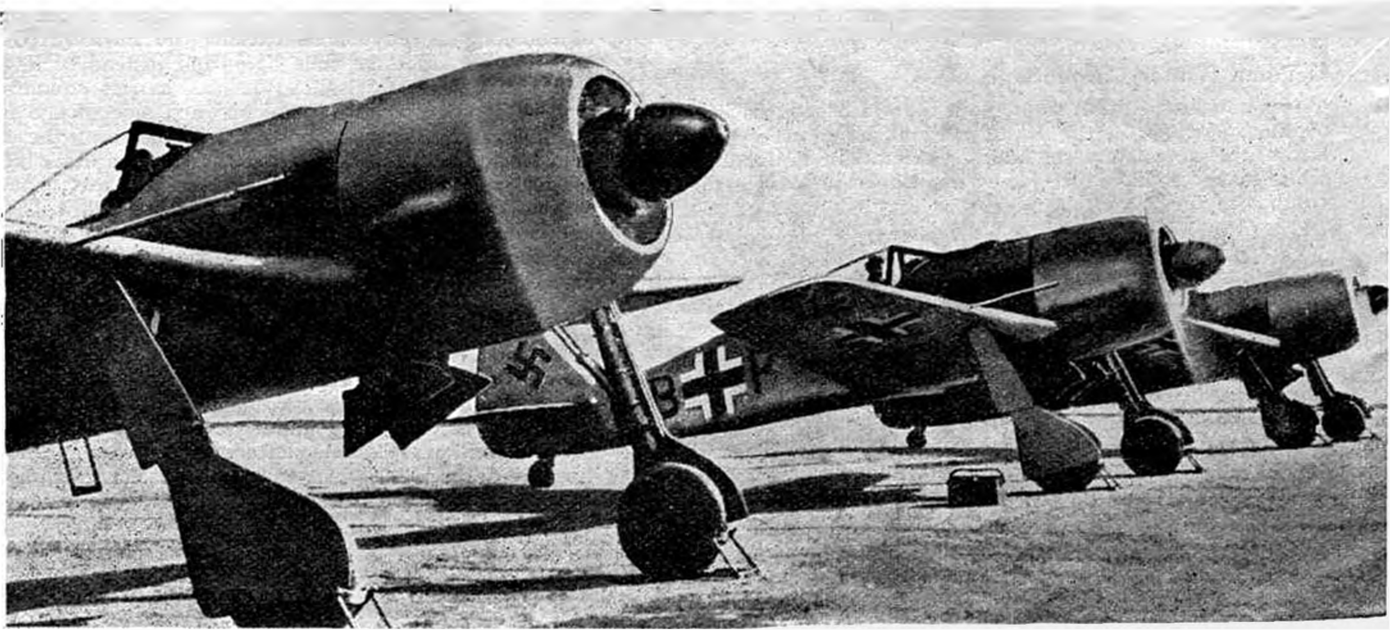
American sources give the specification as under :—

Dimensions : Span: 36 ft. 4 in.; length: 23 ft. 9 in. (24 ft. 10 in. with Ranger motor); height: 8 ft. 0 in.; wing area: 174 sq. ft.

Weights : Tare: 1,482 lb.; loaded: 2,550 lb.

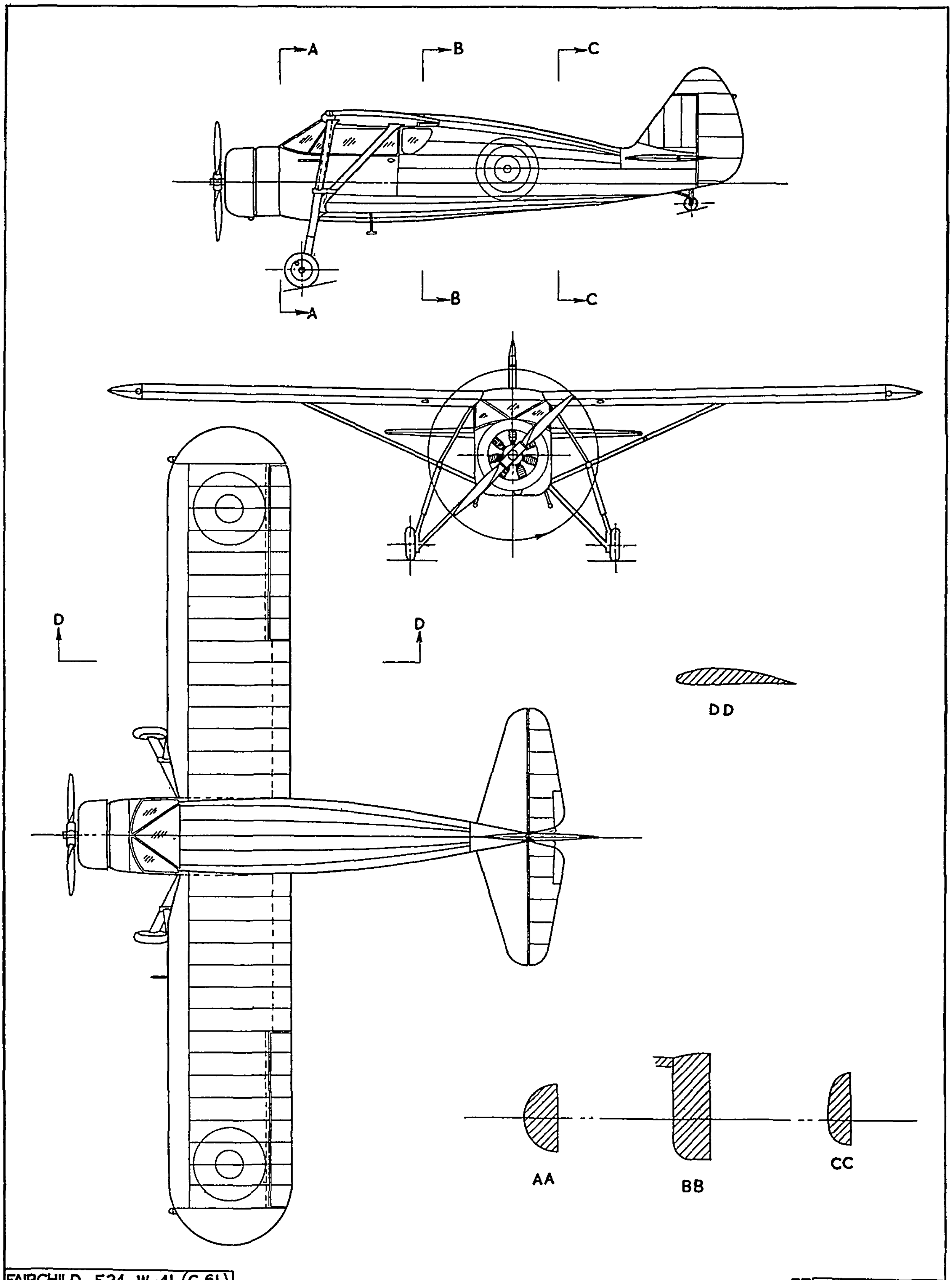
Loadings : Wing: 14.65 lb./sq. ft.; power: 17.58 lb./h.p.

Performance : Max. speed: 130 m.p.h.; cruising speed: 122 m.p.h.; landing speed: 48 m.p.h.; climb: 720 ft./min.; ceiling: 15,700ft.; range: 720 miles.

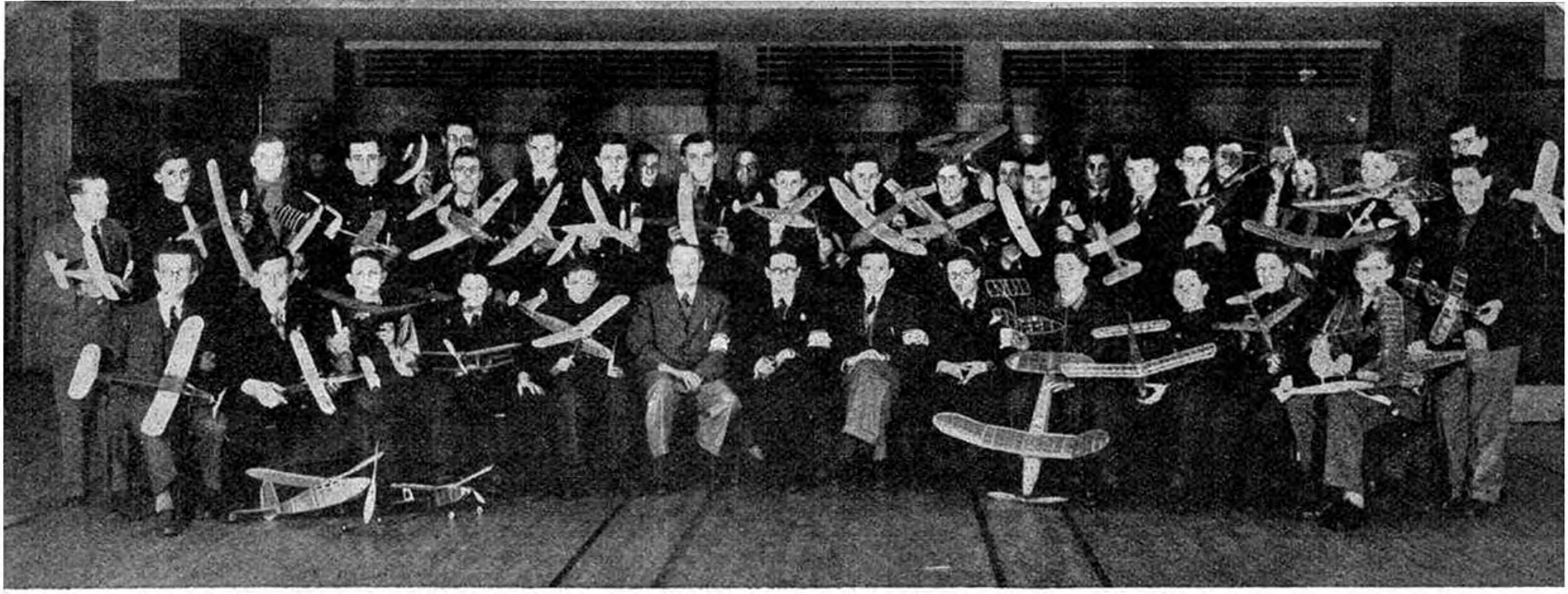


Next month: **The Focke-Wulf Fw 190H**

Reproduced from "Flight."



FAIRCHILD F24-W-41 (C 61.)



CLUB NEWS

By "CLUBMAN"

ALTHOUGH by the time you are reading this both the "National Cup" and the "Western Cup" competitions will have been decided, at the time of writing I am only able to give the details of the first competition of the year, namely, the "Gamage Cup."

As in the past, this has proved a most popular contest and 162 chaps competed for this well-known event. From all accounts, the conditions obtaining all over the country were anything but ideal, there being a high wind reaching gale force in most places, with the addition of rain in some districts. It says much for the tenacity of present-day aero-modellers to find that so many braved the elements, and in view of the conditions the times set up were extremely good.

Altogether 13 Clubs sent in entries for this event, and Brighton lead the field at present with 417 "Plugge Cup" points, followed by Halifax with 414, Northern Heights 413, Blackheath 407, Birmingham 394 and Bristol 386. There is not much point in giving a full list of scores at the present moment, as naturally the positions in scoring change to a much greater extent later on as other competitions are decided.

You will note from the separate panel the first six placed men, and full results will appear in the next issue of the "S.M.A.E. Journal."

It is interesting to note that the "Isis" nearly pulled off a treble, Mr. Houlberg losing his model after over 6½ minutes o.o.s. and missing the Cup by only .6 seconds. This is extremely hard luck, and I understand that a certain amount of blame lies on timekeeping, but it is no use crying over spilt milk or lost seconds, and nobody will grudge S. Collins his win.

There is no doubt that this type of contest is most popular and it was a very wise move of the Council to introduce other contests on a similar basis for the 1942 season. Lack of both time and material are handicapping the building of specialised models to a certain extent, and I am sure these "free for alls" are the best type of event to run under present circumstances.

The "Isis," which has proved an outstanding success via the Aeromodeller Plans Service, is only one of many satisfactory designs which are giving service all over the country, as the following extract from a letter recently received will verify :—

"*I am writing this letter in appreciation of your Plans Service, especially the sailplane and glider division. My friend and myself have had some remarkably good flying with two models made from the plans of your 'King Falcon,' the best flight to date being 15 minutes o.o.s. This model, when last seen, was flying steadily at about 200 ft. in the direction of the Essex side of the Thames estuary, having been launched from the Isle of Sheppey. If by chance this model has been picked up we shall be very pleased to hear of it. (The model was coloured white fuselage, black nose block, yellow wings, tail plane and fins, with N.G.A. transfers on either side of both fuselage and fin.)*"

If any of my readers have come across this model or have any news of it, will you please write me, c/o The Editor, and I will pass on the necessary information to the owners.

The model aero section of the KODAK SOCIETY OF EXPERIMENTAL ENGINEERS & CRAFTSMEN staged an ambitious indoor meeting at the Concert Hall of their recreation centre, and were pleased to welcome a number of visitors from neighbouring clubs. Some 50 to 60 'planes were in competition, and two classes were catered for—R.T.P. for models up to 36 in. span, and Free Flying for microfilm jobs up to 24 in. span. Really "hot" r.t.p. models were scarce, but nevertheless, some good flying was witnessed. Models were graded according to span, and the winners were :—

R.T.P. Class "B"	N. Gregory (Harrow)	45	secs.
	K. Meyer (Kodak)	33	,,
,, Class "C"	H. Walker (Edgware)	56.5	,,
	R. Wallace (Edgware)	48.5	,,
,, Class "D"	L. Dowding (Harrow)	31.8	,,
	A. Pizer (Edgware)	29.0	,,
,, Class "E"	N. Gregory (Harrow)	52.0	,,
	A. Gow (Sudbury)	31.0	,,
,, Microfilm	N. Gregory (Harrow)	74.0	,,
Free Flying Microfilm	H. Walker (Edgware)	20.0	,,

The high spot of the LEICESTER M.A.C. report is the 8½ minute o.o.s. flight by M. Stafford, the model being a "Condor" built from A.M. plans. The model flew across country for approximately three miles, and landed practically on the club's old flying field. (Homesick, huh !)

BURY & D.M.A.C. are to hold an "Open Day" on August 16th, and clubs and unattached members in the surrounding areas are asked to get in touch with the secretary.

Lone hands in the Kendal district seem to fight shy of the local club, the KENDAL M.A.C., but the secretary wishes them to rally round and help the club to better activities. The club record is held at the moment by D. Barrett at 2 : 20, the model being subsequently lost after a flip of over 10 minutes.

Several members of the PENN M.A.C. are experimenting with tricycle undercarts, while several gliders are under construction. Mr. Ward of this club recently set up a time of 2 : 4 o.o.s., and raised the club record.

Will all interested aero-modellers in the Eastbourne district get in touch with Mr. H. J. Towner, at "Trencom," King's

GAMAGE CUP RESULTS

S. Collins (Northern Heights)	**499.0**	**secs.**	**agg.**
A. F. Houlberg (Oxford)	**498.4**	,,	,,
M. Wright (Bushey Park)	**470.7**	,,	,,
J. North (Blackheath)	**466.5**	,,	,,
D. Piggott (Blackheath)	**456.3**	,,	,,
H. Austwick (Halifax)	**442.2**	,,	,,
F. N. Boxall (Brighton)	**413.65**	,,	,,
C. S. Wilkins (Bristol)	**412.6**	,,	,,
P. B. Jones (Northern Heights)	**352.6**	,,	,,
D. G. Lee (Halifax)	**351.2**	,,	,,
E. H. Ladd (Thames Valley)	**326.8**	,,	,,
J. L. Pitcher (Croydon)	**301.4**	,,	,,

Wow . . . don't you let go, Percy ! Strenuous work, winding up a large model at the Leicester M.A.C. new ground. · Model is 6 ft. 9 ins., and built by Mr. Tailby.

Drive, Eastbourne, as it is hoped to get the EASTBOURNE M.A.C. in operation once again. Evacuation, etc., led to the breaking up of the old group, but the success of the Wing opened at the Youth Centre augurs well for a resumption of activities. The Stafford House Wing put in some good work at a local exhibition, and worked hard at continuous r.t.p. flying throughout.

I'm told the wind howls round the houses round Streatham way . . . but the members of the STREATHAM AERO-MODELLERS still turn out, if only to talk of the days when shopkeepers tried hard to sell you balsa, and rubber was a bob a box ! L. Pribyl had a fine flight with his modified 1936 Bendix, clocking 5 : 30 o.o.s.

The membership of the LUTON & D.M.A.S. has soared to around the 80 mark in recent months, but some of the senior chaps find it difficult to get time for flying, especially in the decentralised events where finishing time is 7 p.m. (What about approaching the S.M.A.E. for special extension in such cases ?) This club has one of the best flying grounds in the South, and welcomes other clubs for a spot of flying. Please give notification, however, so that suitable arrangements can be made with the Wardon Tavern for extra supplies of milk ! (By the way, if anyone has a surplus supply of plate powder, the Farrow Shield needs a brush up ! It's like keeping Big Ben clean.)

The BRENTWOOD SCHOOL M.A.C. has had a new record set up by P. N. Bullivant, whose "Northern Arrow" flew for 1 : 40. This time is not high, but the ground is very restricted, and members are not able to get the best out of their machines. News is given of a new club, the Marden Ash M.A.C., but no details of secretary, etc. Within half-an-hour of the club's formation a record was set of 5 : 30 o.o.s. by R. Wheelhouse's "Northern Star," this model already having flown for 3 and 4½ minutes the same day.

Quite a bit of flying has been done by the LEEDS M.F.C. during the past month, but wind cut down the durations for the Gamage Cup entries. H. Vauvelle won a Wakefield contest with an aggregate of 3 : 35.2 and now holds the club record with a time of 1 : 19.2 r.o.g.

The DERBY M.A.C. has been recognised by the Derby Education Committee as a suitable group for Youth activities, and as a result have the use of a large schoolroom for one night a week. A nice little sum was raised for the R.A.F. Benevolent Fund at an exhibition, where T. Hill won the senior prize, and W. Goodchild the junior section. Over 300 models were on show, and r.t.p. flying attracted a great deal of attention.

With the coming of Spring (such as it is), some of the WALTHAMSTOW M.A.S. hard work is appearing. The results, ranging from a sesqui-plane, the bottom wing of which was so "sesqui" that it improved the performance considerably . . . when left in the box . . . to a "Clodhopper" with 48 yards of quarter (where did 'e get it ?), have not met with the approval of the local populace, judging by the number of trodden-on-by-clumsy-people wings that are put away at the end of a Sunday's flying !

The WALTON & D.M.F.C. season having started on May 3rd, the Lightweight Cup was won for the first time by a junior, J. Garley, who clocked 1 : 32. They don't seem to have had much luck with the A.T.C. in this district, having lost half-a-dozen members to them . . . and gained none in return ! New members are welcomed, and are asked to meet the boys on Chobham Common (the home of thermals).

The OXFORD M.F.C. have fixed up a comprehensive programme for the season, and have filled in their time during the winter with lectures and indoor flying. Records are held by M/s. Houlberg, 7 : 2.2 H.L., and Courtney, 11 : 38.9 R.O.G. and 0 : 5.2 winch launch glider.

An "under 14" contest staged by the RIPON M.F.C. was won by B. Holey, who clocked 30.2 secs. in the "nearest to 30 secs." event, and was only 8 feet out in the "Spot Landing" contest. Most activity here seems to be tree-climbing, and stamp licking for letters to firms pleading for even some balsa dust and a few elastic bands !

The HEALEY & D.M.A.C. are planning an open Gala day, further details to follow. K. Simpson won a recent r.o.g. comp. with an average of 1 : 21.

The EXETER M.A.C. has suffered both financially, loss of property, and membership owing to the recent raids, but are carrying on in spite of this, and have had their application to the S.M.A.E. accepted. A large number of 150 sq. in. class models are being built as a result of an offer to donate a handsome prize by Mr. C. Garraway. M/s. Potts, Garraway and Smith were the winners of a recent "nomination" event, but unfortunately the times are not available, having been blitzed.

H. Boys, of the NORTHAMPTON M.A.C., won a speed r.t.p. contest with a scale He 112, the model zipping round four laps in 5.63 secs. W. Bailey won the club Shield for consistent competition flying during 1941, and also the N.M.E. Cup for Workmanship and Duration, averaging 88.5 secs.

After waiting all day for the rain and wind to drop, the BRISTOL & WEST M.A.C. got started on the Gamage Cup about 6 p.m. M/s. Wilkins, Pollard and Harris scored 412, 237 and 199 secs. respectively. (The opinion is expressed that members should fly their models more often in windy weather in order to get used to the winds usually abundant on competition days !)

Conditions restricted the first outdoor Rally of the HALSTEAD & D.M.F.C., and no spectacular times were recorded. The final positions were:—1st, P. Hewitt; 2nd, J. Greenfield; and 3rd, Miss B. le Messurier. One or two of the 'planes which were left in one piece by the wind were smashed by over-enthusiastic spectators who beat the owners to the point of landing !

At the request of the local military authorities solid models have been made and presented to the local troops for training purposes.

An exhibition of solid models in a local shop window aroused a great deal of interest and resulted in several enquiries regarding membership. One of the most interesting models on view at this exhibition was a 1/72nd scale Dornier Do 215, made by P. Hewitt. This model had hollowed fuselage which contained a miniature set of controls, seats, and instrument panel. It also incorporated a fully retractable undercarriage and the glazed nose piece and cockpit cover were built up with small sheets of celluloid.

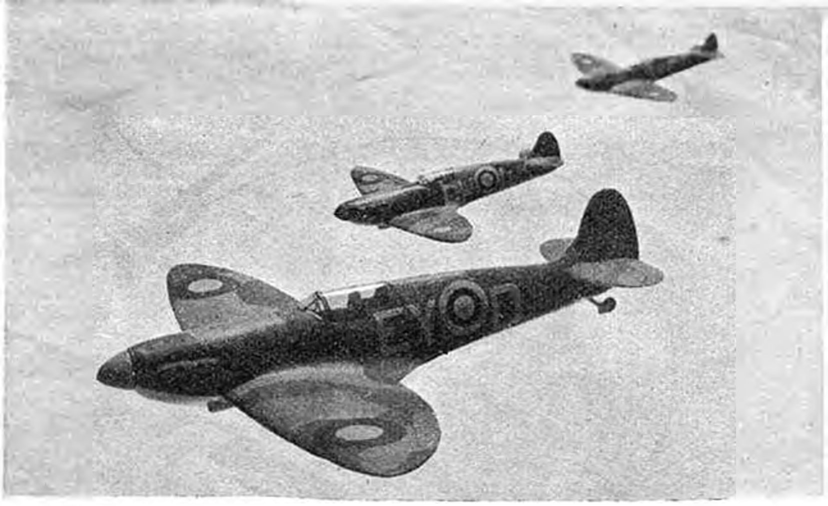
Nineteen entries, with sixteen actual starters, were received for the BRADFORD M.A.C. "Cripps Cup" contest, a H.L. all-type glider event. A perfect day enabled flying to continue

BEDFORDSHIRE MODEL AERO SILVER CHALLENGE CUP

August 2nd. (Decentralised event.)

Rules as for 1941. Applications for entry forms and further details should be addressed to the Hon. Sec. of the Igranic Social & Sports Club: Mr. R. B. Hill, Model Aero Section, Igranic Works, Bedford.

Last date for applications : July 27th.



Hard job to tell these models from the real thing. Solid "Spitfires" constructed by Weston Johnson of Monkseaton.

till dark, and Mr. Scarth carried off the honours with an aggregate time of 170 secs., Mr. Beanland (1940 and 1941 winner) placed second with 149.5 secs., and Mr. Ellison third with 136.

G. Hatcliffe holds the KIRKE-WHITE (Lincoln) M.A.C. duration record with a time of 9 : 25 o.o.s., the model being an Aero-modeller "R.A.H. 37." A. H. Taylor won a recent solid comp. with a beautifully detailed Hurricane, with sliding cockpit, controls and retractible undercart. Membership is now 74, and still rising.

The BRITISH AIRWAYS M.F.C. are pleased to accept members from outside the organisation, and intending members should note the following committee members at the different bases :—

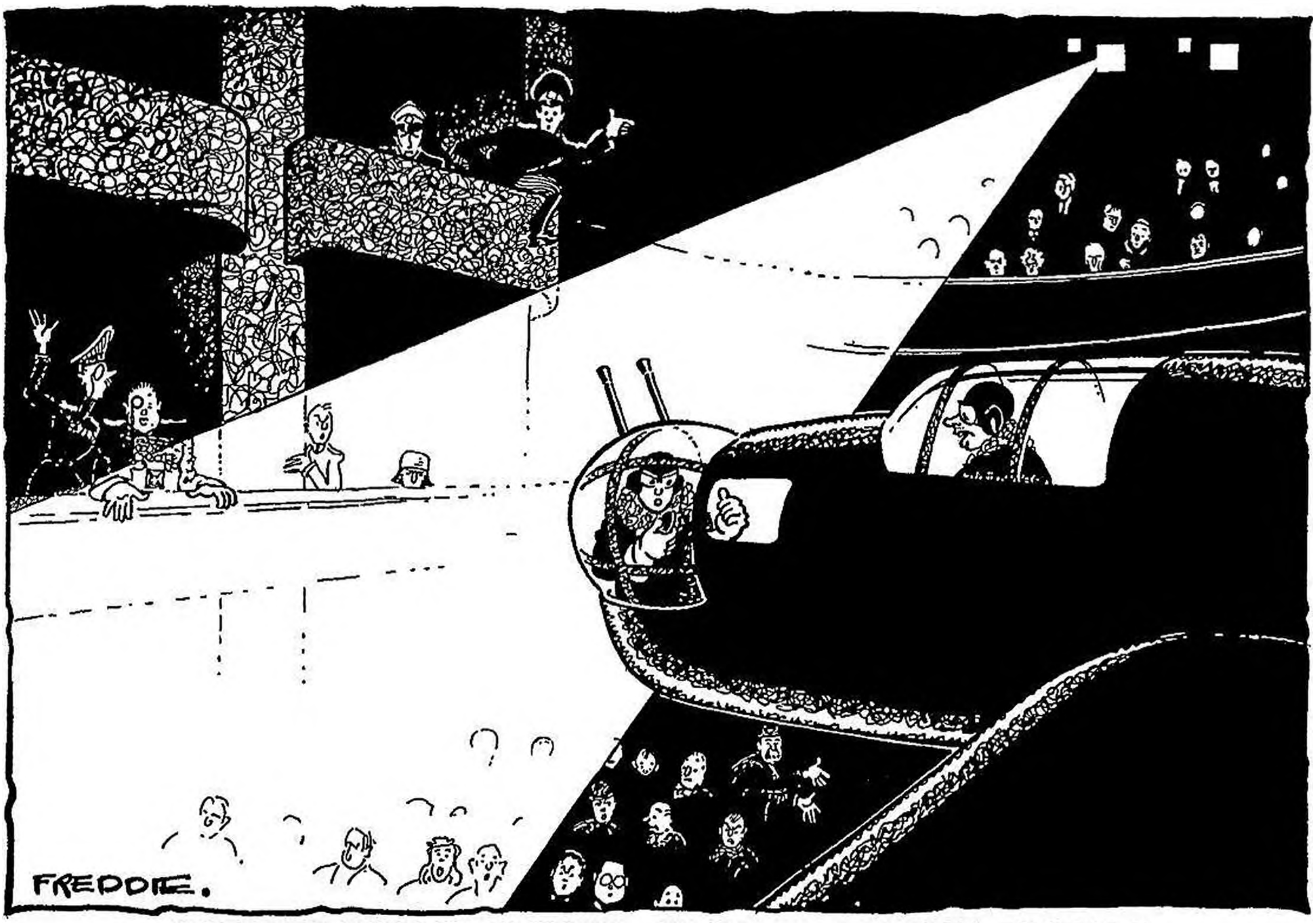
British Airways, Hythe, Hants. Mr. H. A. Adam.
,, ,, Whitchurch, Bristol. Mr. S. Hayes.
,, ,, Treeforest, Cardiff. Mr. R. Holland.
,, ,, Bramcote, Birmingham. Mr. H. G. Rogers.

A new club is being formed in the Peckham district, and will be known as the PECKHAM & DISTRICT M.A.C., the secretary being L. F. Edmonds, of 21, Lavanor Road, Peckham, S.E.15. The club has use of a large school with a fully equipped woodwork centre, and a large hall for indoor flying. Meetings are held every Tuesday night.

Another new group is the CHESTFIELD M.F.C., secretary P. Reeves, of "Deepdene," Teynham Road, Tankerton, Kent. One asset is an excellent field, almost devoid of trees, and the current record of 1 : 27.5 should not stand for long.

BLACKHEATH M.F.C. "OPEN DAY"
Epsom Downs. July 19th.
General Duration. (Any type rubber-driven R.O.G.)
Gliders.
Team Glider Contest. (Teams of 3. Any number of teams may be entered.)
Cash Prizes.
Further particulars :
M. W. White, 81, Manor Avenue, Brockley, S.E.4.

And yet another is the BROMLEY SOLID MODEL AERO CLUB, with headquarters at 36, Mosul Way, Bromley Common, Kent. Secretary is Mr. E. A. Walker. The club was originally formed after an exhibition, and meetings are held every Thursday and Saturday.



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And, to finish up with, a few more "sales" and "wants" items. E. S. Bassett, of 39, Buckingham Road, Doncaster, has a petrol-engined model for sale; N. E. Lamb, of 33, Zion Street, Salford, Lancs., wishes to obtain a copy of the October, 1941, AERO-MODELLER; and P. A. White, 48, King George Road, Minehead, wishes to purchase a copy of Zaic's Year Book, also copies of the AERO-MODELLER and American or Canadian model magazines prior to December, 1940.

What do you think of this little ditty by K. McHale, of Crewe?

Here is a tale I have to tell
Of a 'plane that once did fly so well!
Up and up, and round and round,
Would it never come to ground?
Then up and spoke th' excited timer:
" Coo, that 'plane ain't arf a climber."
The 'plane heard not its master's cries,
Who followed it with tearful eyes.
O'er hedge and field the model flew,
And well the weeping owner knew
To chase it were to hope in vain—
He'd never see his 'plane again.
Suddenly the 'plane flew low,
The owner kept on running though,
And when he reached the place of landing
He saw a man with a bag there standing.
Said Bill (that was the owner's name),
" Has anyone here seen my new 'plane?"
He saw it then, with wings all bashed,
Looking just as if it had crashed.
Then Bill saw a boy with a cut-up face,
Which was dripping blood all over the place.
Three weeks later a note came to say
That Bill had got £10 to pay
To the doctor, who tended the little boy
Whose face got foul of Bill's new toy.
Said Bill: " Oh! Curse the day
That I didn't join the N.G.A."

Well, that's all for another month, and let's hope the wind starts to fade away for once in a while, and let us get in some decent flying for a change. I'm fed up with chasing wings and pieces all over the place, and am thinking of crossing my models with a homing pigeon in order to save my poor old legs being worn down to stumps. Bungho, fellows, and here's to next month.

The CLUBMAN.

New Clubs

PECKHAM & D.M.A.C.
L. F. Edmonds, 21, Lavanor Road, Peckham.
CHESTFIELD M.F.C.
P. Reeves, " Deepdene," Teynham Road, Tankerton.
BROMLEY SOLID M.A.C.
E. A. Walker, 36, Mosul Way, Bromley Common.

Secretarial Changes

EAST BIRMINGHAM M.A.C.
V. H. Phillips, 32, Farnol Road, Yardley, Birmingham.

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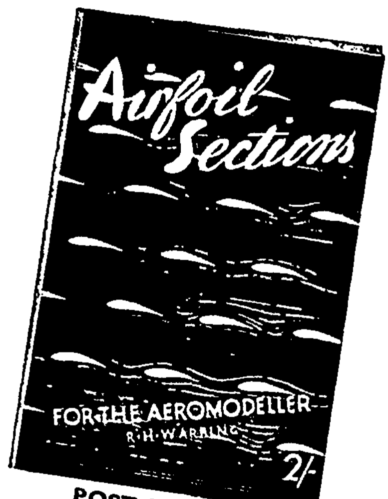

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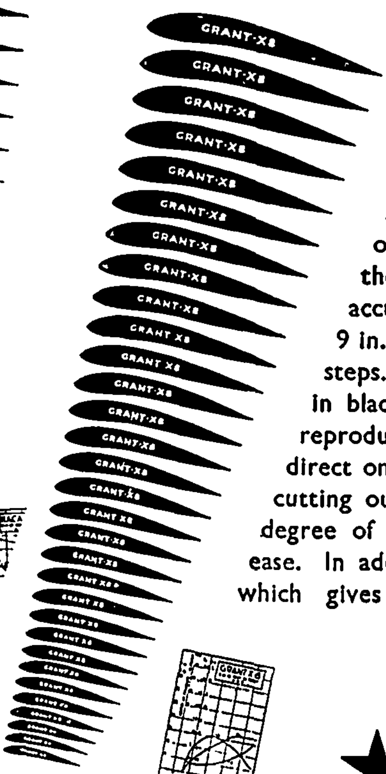

Complementary to AIRFOIL SECTIONS are sheets of each of the 36 airfoils dealt with in the book. Each sheet gives 31 accurate profiles, ranging from 9 in. chord to 3 in. chord by 1/5 in. steps. The sections are printed in black on thin white paper, as per reproductions at side, and may be pasted direct on to balsa sheet, or thin ply for cutting out as templates. Wings of any degree of taper may thus be built with ease. In addition, each sheet has a graph which gives the chief characteristics of the section from zero lift to the stalling angle. Size of each sheet is 30 x 10 in.

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