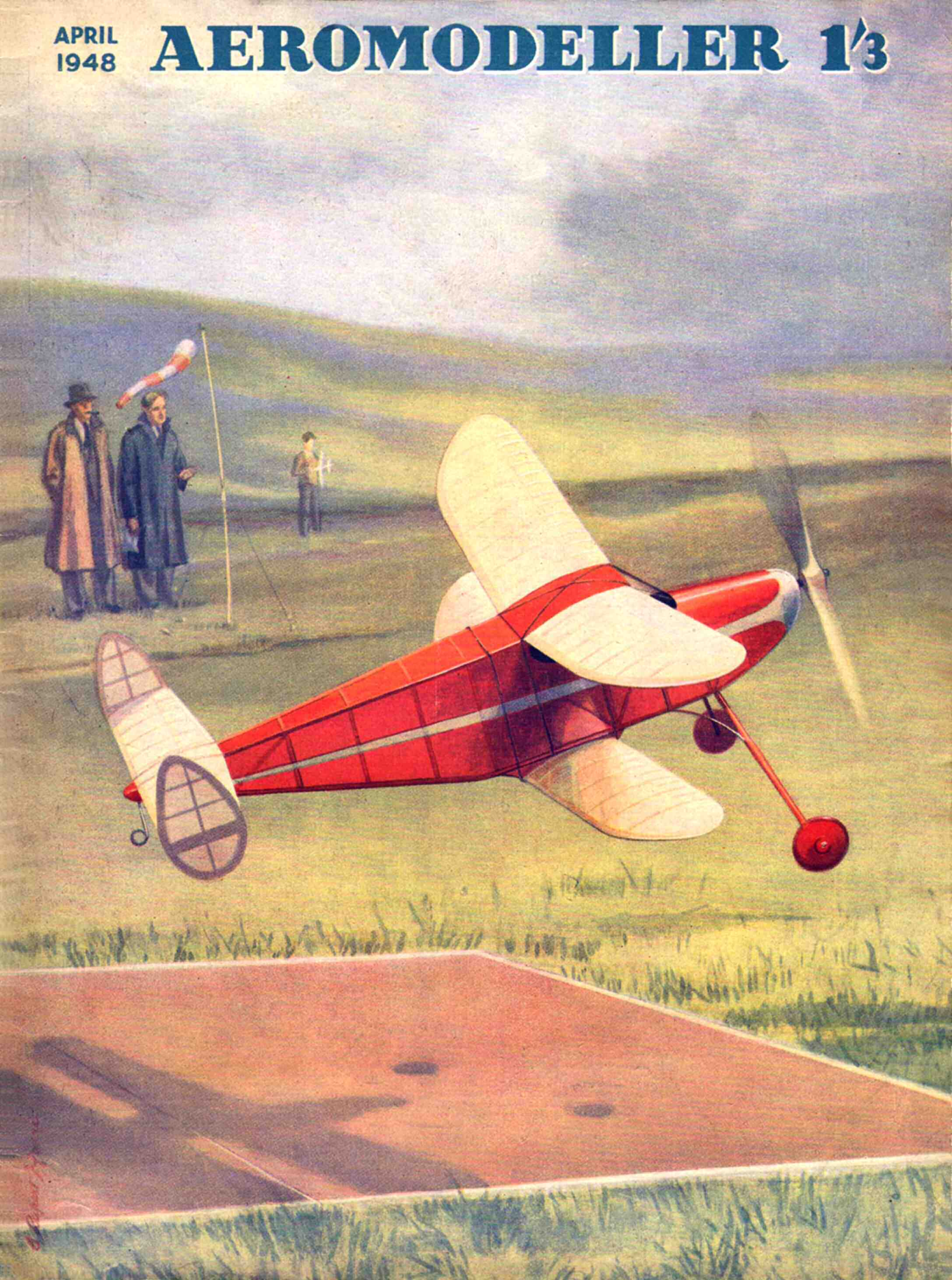


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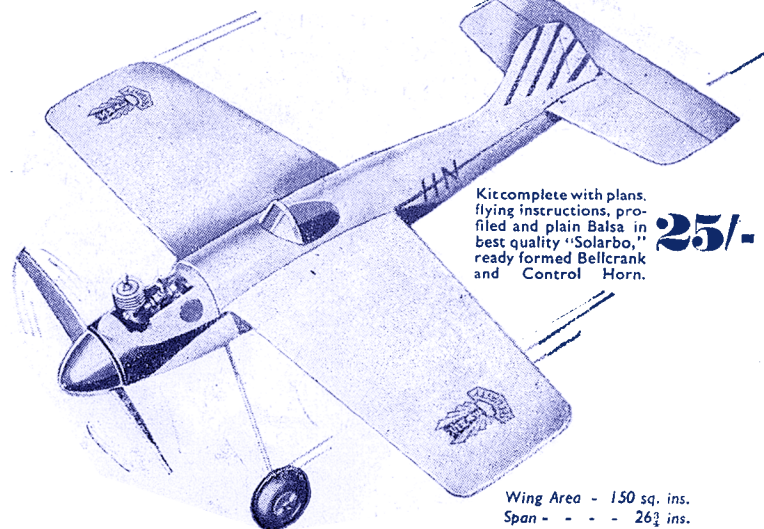
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Wing Area - 150 sq. ins.  
Span - - - 26 1/2 ins.  
Airfoil Section - NCL472  
Total weight (with E.D. Comp. Spec.) - 16 ozs.

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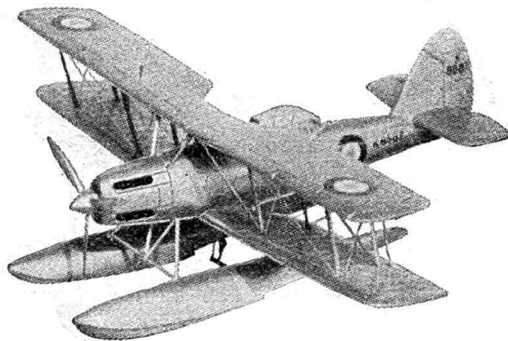
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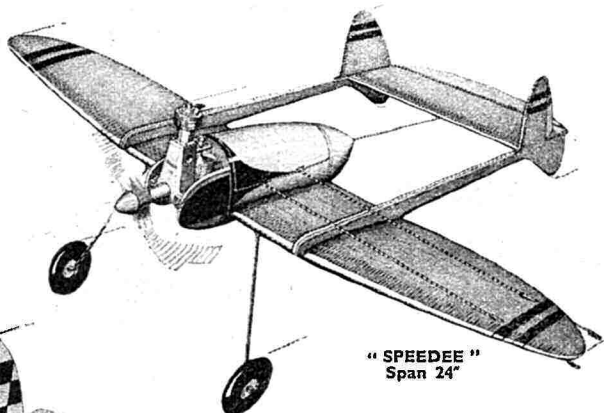
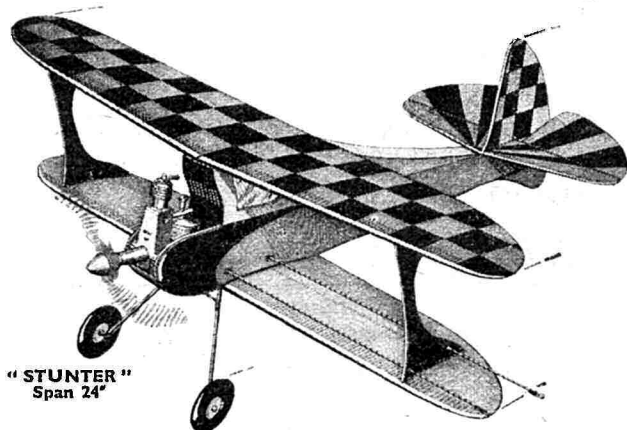
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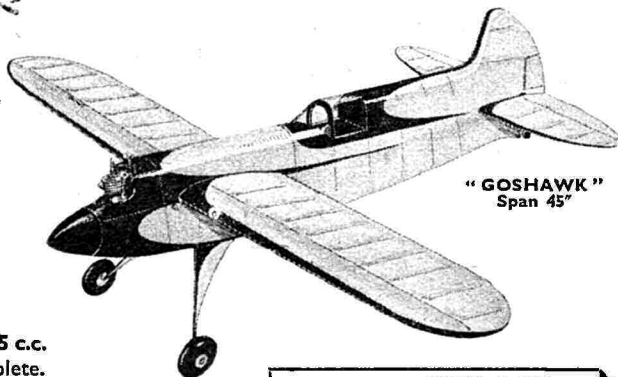
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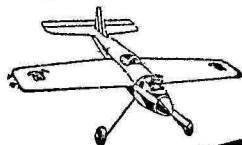
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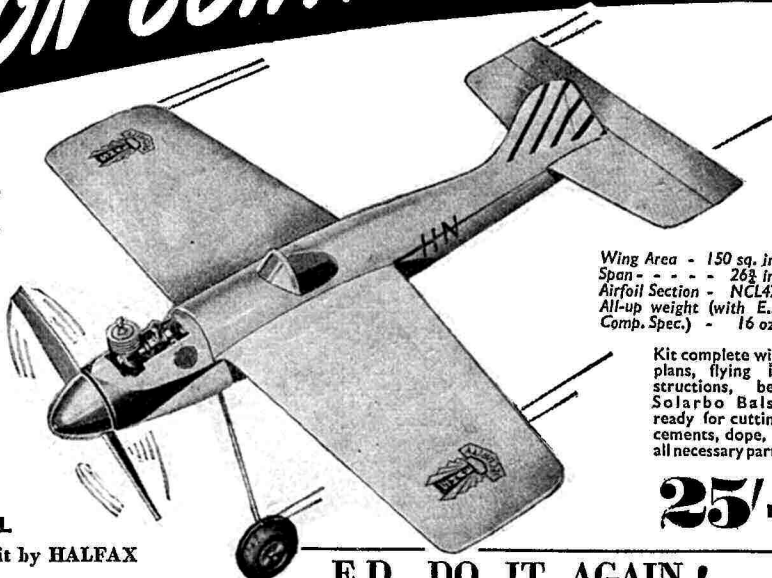
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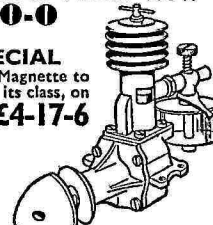
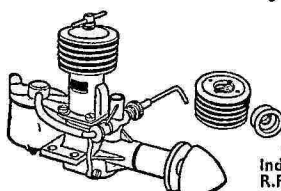
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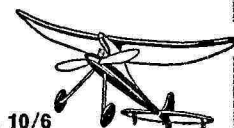


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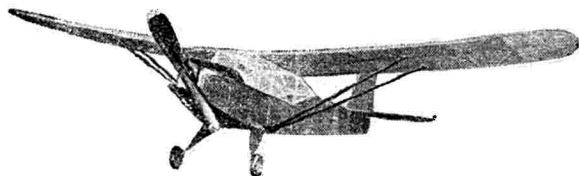
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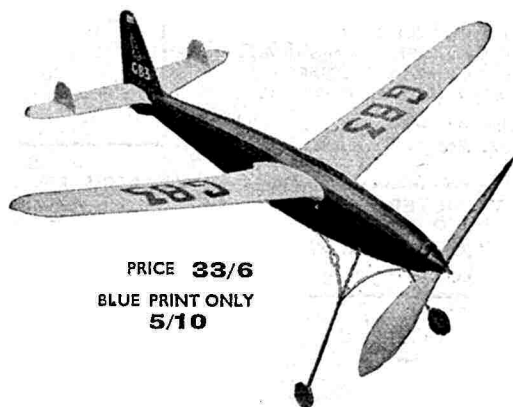
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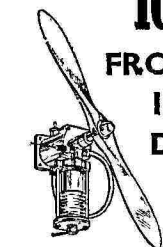
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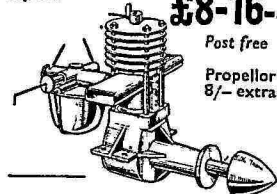
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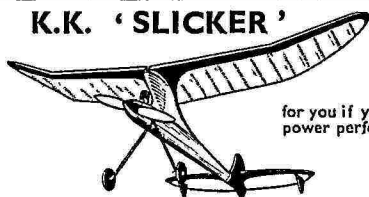
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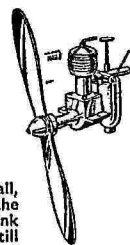
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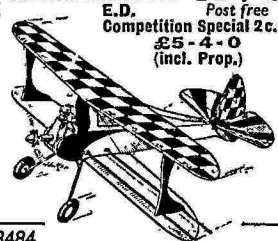
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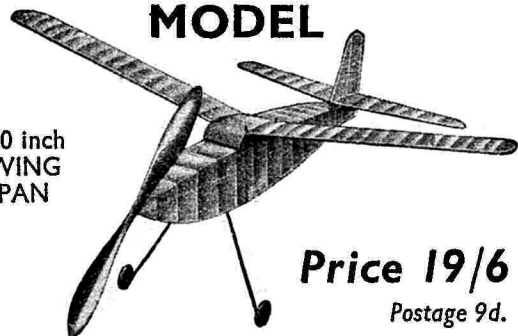
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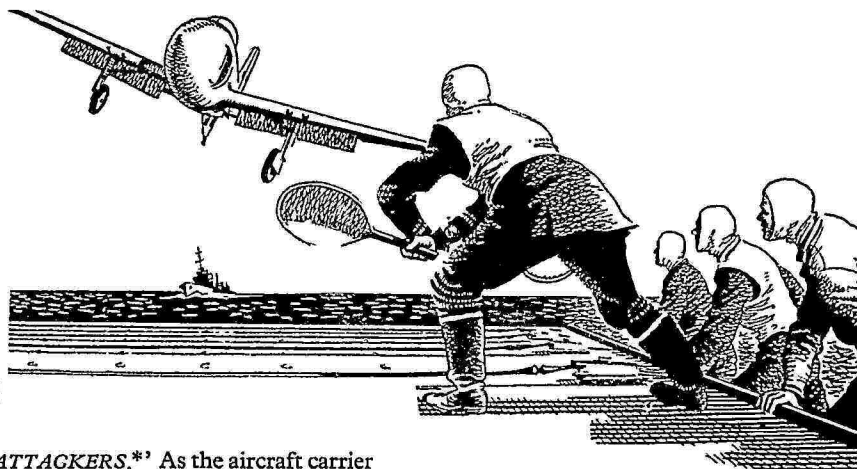
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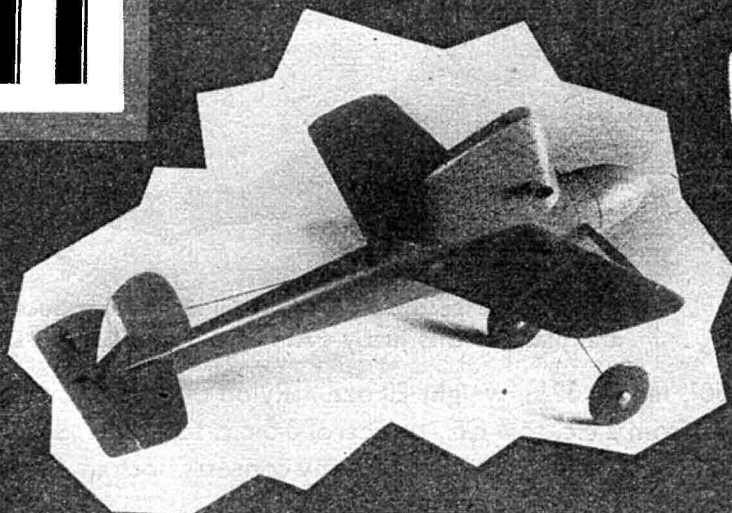
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*Law's  
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Wings, Tailplane, Fin and Fuselage base cut to shape. 3 tubes cement, wire, tissue, ply parts cut to shape; streamlined hardwood wheels, spinner, nuts, bolts and washers. Fully detailed plan. Designed for Mills 1.3 c.c. Diesel.

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The  
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the country.

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FAR EASTERN AEROMODELLING—American influence becomes apparent from a study of this scene in Tokio Park and it is now evident that control lines have completely encircled the globe!

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APRIL, 1948

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# EDITORIAL

## THE "WAKEFIELD"

**L**ATEST advice from our American Correspondent indicates that strenuous efforts are being made to revive the "Wakefield" this year. That the revival of this most popular competition will be welcomed throughout the aeromodelling world goes without saying, and with a view to further stimulating interest, we publish in this issue of the AEROMODELLER a somewhat novel design for a "Wakefield" which is a combined effort by several staff members.

Full particulars of the method to be adopted by the S.M.A.E. for selecting the team to represent Great Britain were published in our last issue. However, no particulars have as yet been published as to how the team will travel to and from America. It would seem appropriate that they should fly, and we suggest that here is an excellent chance for B.O.A.C. and the American Trans World Airline to co-operate by the provision of suitable aircraft. We suggest that an aircraft of the Constellation type might well accommodate all the teams who would travel from Europe, and were B.O.A.C. to fly these teams to America, and Trans World Airline to return them, a valuable contribution to the aeromodelling movement would have been made.

It is to be hoped that the S.M.A.E. will take the lead, and that as soon as a definite announcement has been made confirming that the "Wakefield" competition will be held in America this year, we hope that an early announcement will be made as to how the European contestants will make the journey to and from America.

### The Balsa Situation.

Recently there appeared in the daily press a reference to a deputation from the Toy Traders' Association visiting the Board of Trade "to ask for the ban on balsa for model planes to be lifted". As this announcement is not strictly correct, and taken literally might cause some alarm throughout the aeromodelling movement, we have recently made a number of enquiries of the Board of Trade, Toy Traders' Association, and the Model Aircraft Trade Association, which lead us to suppose that the position is not so alarming as the notice would indicate.

The facts are, that close on a year ago the Board of Trade made an order the effect of which was that the importation of balsa from *dollar* countries for all purposes was suspended.

However, there are certain sterling areas from which balsa has been imported, and we understand that only a short while ago the Board of Trade indicated to the balsa importers that they could continue making their trade arrangements in the anticipation that in due course licences would be forthcoming.

Meanwhile our enquiries throughout the Trade indicate that not only is there no shortage of balsa in the retailers' shops, but that fairly good stocks are held by wholesalers.

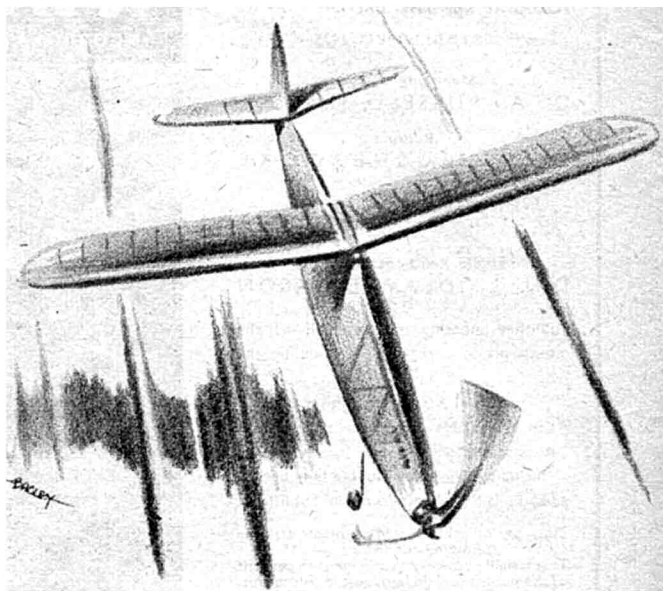
The matter of balsa supplies was under active consideration at the A.G.M. of the M.A.T.A. held in London on Sunday, March 7th, and undoubtedly the Council will continue its strong representations to the Board of Trade for the continuity of balsa wood supplies to the model aircraft industry.

### Bound "Aeromodellers."

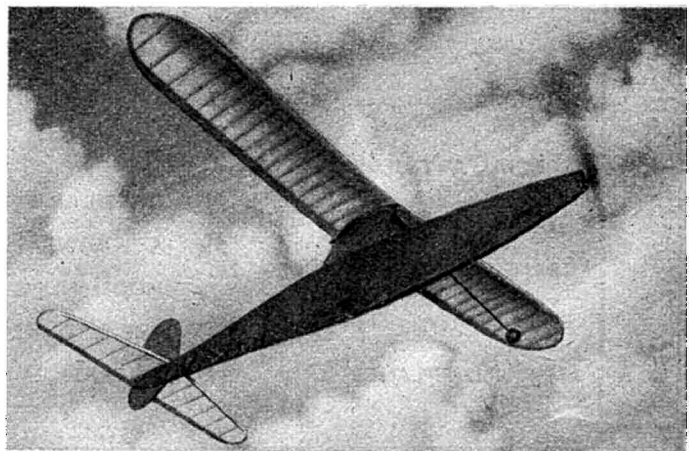
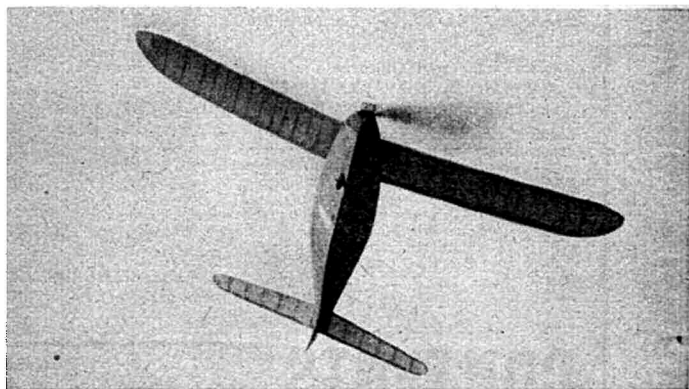
In accordance with our usual practice, we announce the current prices for bound volumes of the AEROMODELLER and binding charges for those readers who have kept their copies and would now like them bound.

Small supplies of volumes 9, 10 and 11 are still available, price 25/-, post free. Copies of the last volume, No. 12, are now available price 27/6d. post free. Orders for bound volumes should be sent direct to our offices at Allen House, Newarke Street, Leicester.

Readers who wish to have their own copies bound should send them to the North London Bookbinding Co., The Aerodrome, Billington Road, Stanbridge, near Leighton Buzzard, Beds., including cheque or postal order 10/6d., which covers the binding charge and return postage. All bound volumes and binding work is carried out in good quality red cloth on stiff boards, the spine being gilt blocked with the name of the magazine and the volume number.



## The AEROMODELLER All-weather WAKEFIELD





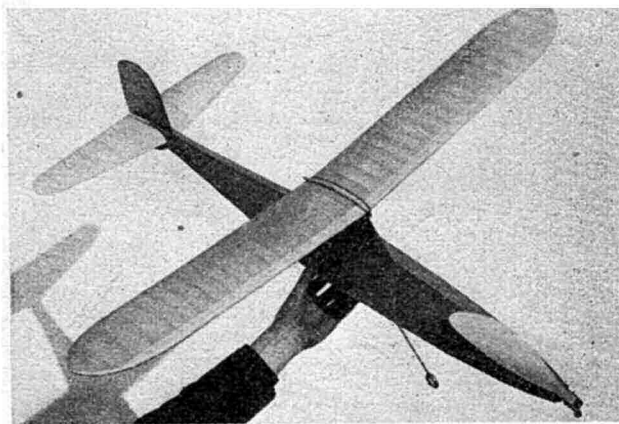
THE Editorial ears passed in and out the 1947 rumours of the return of the Wakefield, but they genuinely pricked up at the first intimation of a definite decision. There was a stir and a bustle and tight-lipped staff members were seen carrying large rolls of paper or waving pencils and compasses with the air of men with secrets. On paper our motley modellers produced a motley of models—until it dawned that time was short and the best solution was the pooling of ideas. So pooled they were—and after the inevitable series of arguments a somewhat unusual hybrid was evolved. It was decided, perhaps a little late, that it should be functional rather than classical, and as the plan and photos show, this is undoubtedly the case. The designing was made more interesting by the fact that only one staff member was an all-time rubber enthusiast; all the others being ardent power fiends of duration, flying scale, or control-line tendencies! However, it was found that in some ways this had a good effect rather than otherwise, as right from the start there was nothing stereotyped about the Aeromodeller Wakefield other than the necessary Wakefield formula.

Stability and performance were the two goals and a start was made after much controversy from an entirely new direction, influenced undoubtedly by the power experience of those concerned. Thus, there was evolved an undoubtedly new type fuselage. Most noticeable was the incorporation of a high pylon almost *half-way* back along the very long fuselage. This was designed to allow the use of maximum power without stalling (due to the long nose and consequential long "thrust moment" of the motor), to place the C.G. of the rubber at the C.G. of the whole machine in case of accidents, to allow the maximum length of rubber for the all-important motor run consideration, to put the C.L.A. in the best possible relation to the C.G. and to ensure the greatest possible stability in both climb and glide. All of which, to the gratification of the people concerned, it did! The undercarriage is from the flying point of view quite unnecessary, as the model will scream off the deck lightweight fashion and even when an orthodox launch is adopted there is practically no take-off run at all.

The wing is very light but strong, and the section was decided after several wings of different sections had been built and tried. NACA 6712, Eiffel 400, Davis, SI series, were all tried, and it became obvious that the best performance was undoubtedly being put up by the turbulent, or laminar-turbulent flow type of section. Further experiment evolved the section shown on the plan, which is most satisfactory. It will be noted that the incidence setting seems remarkably high. To explain this we would mention that the average model with its 4 degrees or so of incidence almost invariably adopts a much greater angle (according to section) when in flight with a resultant increase in drag. Whereas the "Aeromodeller Wakefield," by virtue of its long nose moment counteracting any tendency to stall under full power, and the pylon mounting of the wing, flies at its *designed* attitude with the minimum of drag. Six degrees of incidence are shown on the plan but it is possible to increase this according to model and weather conditions to as much as 10 degrees with even more beneficial results. It is a well-known fact that a wing is more efficient at higher settings, and this accounts to some measure for its pleasing performance.

The tail is orthodox, and the fin also except for a small trim tab. Note the small size of the fin—another result of using a pylon learnt the hard way from power duration models. The lessening of interest in rubber models with the advent of the diesel is I suppose the reason that nobody seems to have thought that the benefits of high pylons might be attached to their use in rubber jobs. However, our power enthusiasts here thought of it straight away, and also as the most useful and efficient way of cutting down the drag whilst retaining the Wakefield cross-sectional area.

A single-bladed folder, a double-bladed rectangular folder, and an orthodox double-bladed free-wheeler, were all airscrew combinations that were tried. Most of the preliminary testing was carried out with the single folder, but the most successful performance to date was with the free-wheeling airscrew, and we are inclined to agree with Bob Copland in this respect.



"Aeromodeller" Photographs.

Construction of most of the components is rather original, the fuselage in particular being of unusual design. With the amount of rubber we intended to use and the small cross sectional area, except at the pylon, absolute rigidity of the fuselage structure under full turns was imperative. This was obtained by the use of only the hardest balsa, with cross members diagonalised on a semi-Warren girder principle. In addition the fuselage was covered and doped before the pylon was built on, which again contributed a fair proportion of extra strength.

The wing is built in one piece for greater strength, full rigidity being obtained by dihedral braces and a large solid trailing edge spar and a hollow box leading edge built up with sheet on a 1/8 in. sq. false leading edge. Tips are laminated 1/32 in. sheet, extremely strong but light. Although the wings will flex fairly easily in their uncovered state, by sticking the covering to each rib top and bottom and doping, the whole becomes absolutely rigid. The original has been flown in all weathers without any mishap to the structure. The tail is light, but strong enough, as it is a very unfortunate prang indeed that will damage it.

There, then, you have the Aeromodeller Wakefield. We make no lavish claims for it, and it is still undergoing modification as more flying hours are packed in. It has turned in flights of a varying number of minutes on 400 turns, and we have lost it once on 800, recovering it later from a considerable distance—ask the office boy who chased it! We didn't lose it o.o.s. on its first flight as so many tales go, but it did turn in 2 mins., which we considered satisfactory. It is very easy to trim, the wing position making it far less sensitive than the ordinary machine, and both climb and glide have satisfied us completely. We'll be glad to hear reports from readers who sample this break-away from the orthodox duration model, and we can promise them that they'll find it difficult to find a more stable and consistent flier. We aren't boasting when we say that we think it's pretty good. Oh! and by the way, you will need a dethermaliser!

(Continued on page 262)

# AEROMODELLER WAKEFIELD.



DESIGNED BY  
THE AEROMODELLER STAFF.

3/6

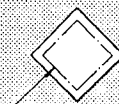
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THE AEROMODELLER PLANS SERVICE.

ALLEN HOUSE, NEWARKE STREET, LEICESTER.

ALL WOODS UNLESS OTHERWISE STATED ARE BALSA.

COVER FUSELAGE & DOPE BEFORE CEMENTING ON F3, F4 & F5.  
COVER PYLON WITH P1 CEMENTED IN PLACE BEFORE ATTACHING R2.

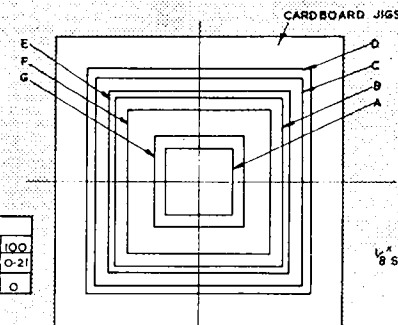


FORMERS F1 & F2  
MAT 1/8" PLY

CUT OUT THIS SQUARE  
ON F2 ONLY & MAKE  
PLUG FROM 1/8" PLY TO  
FIT INSIDE.

MATERIALS REQUIRED:	
STRIP:	MISCELLANEOUS:
2 STRIPS OF 1/8" x 1/8" x 36" BALSA	1 BALSA BLOCK 17" x 1 1/8" x 1 1/8"
10 " " 1/8" x 1/8" x 36" "	2' OF 3/32" DIA DOWLING
5 " " 1/8" x 1/8" x 36" "	HARD 3' OF 1/8" SQ SPRUCE
1 " " 1/8" x 1/8" x 36" "	3' OF 18 SWG PIANO WIRE
SHEET:	24" " 16"
2 SHEETS OF 1/32" x 3/32" x 36" BALSA	1 PIECE OF 1/16" PLY 3" x 3"
1 " " 1/16" x 3/32" x 36" "	1 " " 1/8" x 7/8" x 7/8"
1 " " 1/8" x 3/32" x 36" "	1 " " 1" x 1"

ORDINATES FOR A.M.T.F. 29	
STATION	0 2.5 5.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0
UPPER SURFACE	0 3.68 5.57 7.77 9.87 9.98 9.77 8.93 7.77 6.20 4.52 2.52 0.21
LOWER SURFACE	0 -5.31 -4.21 -3.32 -1.68 2.52 2.73 2.52 2.31 2.0 1.37 0.63 0



4 LAMINATIONS OF 1/32" SHEET 1/8" WIDE.

1/8" SQ

1/8" x 1/8" RIBS

1/8" SHEET

THIN ALUM HINGE

1/8" SHEET

3/32" DIA BIRCH DOWEL

PAPER TUBE

1/8" SHEET

1/8" SHEET

18 SWG WIRE BIND & CEMENT TO SHEET.

NOTE: 2 SIDES ARE MADE AS PER  
PLAN BUT BEFORE JIGGING  
REVERSE ONE BASIC SIDE SO THAT  
DIAGONALS RUN IN OPPOSITE DIRECTIONS

PART	WEIGHT
WING	1.0 OZS
TAIL PLANE	0.25 "
FUSELAGE INCLUDING 1/8"	2.25 "
FIN	0.125 "
PROP ASSEMBLY	0.75 "
RUBBER 16 STRANDS 1/4" x 1/24" x 50" LONG	3.9 "
TOTAL	8.275 "

1MM PLY ON INSIDE OF  
1/16" SHEETING

3/16" DIA BIRCH DOWEL  
FOR RUBBER MOTOR

18 SWG WIRE BIND & CEMENT  
TO SHEET.

ALL LONGERONS FROM  
1/8" SQ HARD BALSA

ALL DIAGONALS & UPRIGHTS  
FROM 1/8" SQ MEDIUM BALSA

FORM SINGLE LEG 1/8"  
SHAPE FROM 18 SWG  
& BIND & CEMENT TO  
LONGERON & DIAGONAL

1/8" SHEET GUSSET

1/8" SHEET

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### Fuselage.

Select the requisite lengths of first quality hard balsa for the longerons, making sure that they match in strength and resilience. Build the two basic sides on the plan in the normal way inserting the upright members first and then the diagonals. Remember that the diagonal members are more difficult to cut accurately than normal vertical members and a little extra care and precaution spent in cutting is well worth the extra strength derived.

Remove both sides from the plan and on no account forget to reverse one of them so that the diagonals on one side run in opposite directions to those on the other. Cut the seven jigs from stout cardboard, accuracy again being the keynote if you require a true fuselage shape. Slide on the central jig D and cement in position the cross members. Then carry out the same procedure with jigs C and E inserting the cross members that occur at the pylon position. Jigs A, B, F, and G are then positioned and once again the various cross members, not forgetting the nose and tail sheeting, are cemented in position. You can now carry on and cement the various diagonals in position and the top longeron can be cut away at the rear as shown on the plan. The basic fuselage structure being now completed.

Whilst this is drying the pylon formers F3, F4 and F5 and the underfin can be cut to shape. *It should be noted that the pylon formers are not added until the fuselage has been covered and doped*, although the underfin can be cemented in position at this stage.

As stated, after the fuselage has been covered and doped, cement pylon formers F3, F4 and F5 in position, also the  $\frac{1}{8}$  in. sheet underplatform P1. Here again take note that the  $\frac{1}{8}$  in. sheet wing platform P2 should not be added until the pylon covering has been completed and doped; this covering is by the way a comparatively simple job providing the pylon is tackled in separate panels. When finally glueing the platform P2 in position do not forget the  $\frac{1}{8}$  in. spruce attachment pegs.

To complete the fuselage, bind and cement the 16 s.w.g. undercarriage leg in position as shown on plan and add the necessary gusset of  $\frac{1}{8}$  in. sheet. The wheel is built up from two laminations of  $\frac{1}{8}$  in. sheet and a centre lamination of 1 m.m. ply bushed with copper or celluloid tubing. Finally bind and glue rear paper tube as shown for fin attachment.

### Wing.

Cut the trailing edge from the hardest  $\frac{1}{8}$  in. sheet balsa obtainable and sand to shape. Notch for ribs and position on plan with a strip of  $\frac{1}{8}$  in. packing under the front of the trailing edge. Shape the leading edge and position on plan. The ribs can now be cemented in place. Note that the centre rib should not be inserted until the dihedral keepers have been inserted. Add the top spar and then build up the laminated wing tips *before* removing the wing from your building board. Remove wing from board and cement lower spar in position before sheet covering.

Crack the wing through its exact centre and jig up the wing tips with  $1\frac{1}{2}$  in. blocks. Finally cement the dihedral keepers in position and flood the cracked joint with cement. Add the centre rib and complete the wing by cementing the  $\frac{1}{8}$  in. sheet webbing between each rib. The centre section is, of course, sheet covered and the whole sanded smooth.

### Tailplane.

Shape and pin down leading and trailing edges then cut out ribs and cement in position. Make sure that the two root ribs are set at an angle of 45 degrees so that they fit flush against the fuselage side. Bind and cement the birch tips in position and glue in the  $\frac{1}{8}$  in. sheet gussets at the centre ribs. A small piece of  $\frac{1}{8}$  in. sheet should now be cemented between the centre ribs as shown on the plan and the centre section is covered with  $\frac{1}{8}$  in. sheet. A piece of 1 m.m. ply is then glued on the top of the  $\frac{1}{8}$  in. sheeting and is drilled to take the 18 s.w.g. wire peg in the fin.

### Fin.

Build up the outline with  $\frac{1}{8}$  in. laminations and cement the main spar in position. Cut out the pieces of  $\frac{1}{8}$  in. sheet as shown and stitch and cement a length of 18 s.w.g. wire to the rear piece, finally glueing both pieces in position. Add the ribs and the  $\frac{1}{8}$  in. dowel and finally finish off by sanding.

### Propellor Assembly.

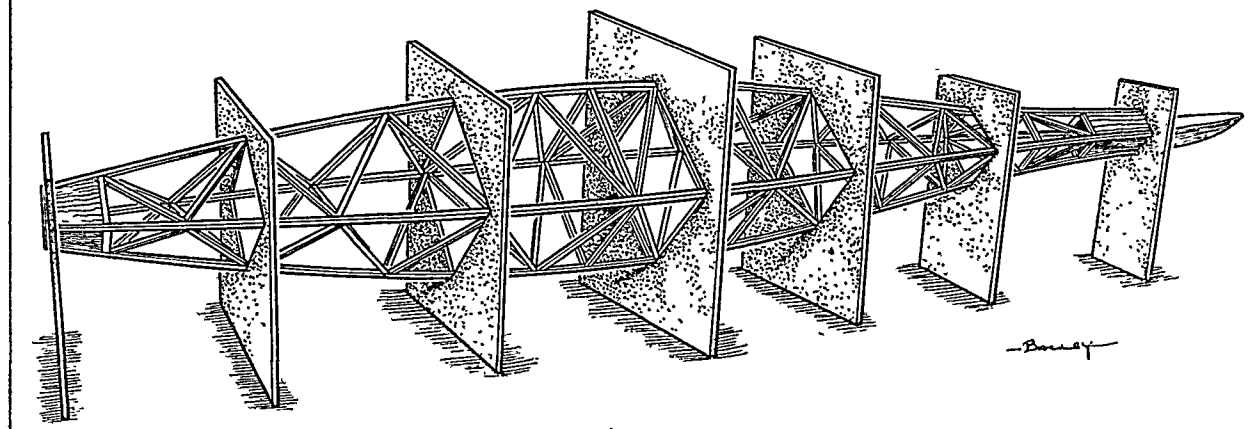
Carve the propellor to shape as shown, remembering to drill the blank before carving. Bush with 16 s.w.g. brass bushes as shown on the drawing. Cut out F1 and F2 and the  $\frac{1}{8}$  in. ply plug. Cement F2 to the fuselage and then pin and cement the plug to F1, finally bushing with a 16 s.w.g. brass bush. Bend a length of 16 s.w.g. wire to take the motor bobbin as shown, then slip on F1, the thrust race and finally the propellor itself. Bend the front end of the shaft to take the winding hook and instal the 18 s.w.g. clutch. Do not forget to solder the rear end of the clutch.

### Covering and Doping.

Those fortunate enough to possess Jap tissue are recommended to use same throughout, the alternative being rag tissue for the fuselage and good quality English tissue for the wings and tail surfaces. Covering is according to usual practice the pylon being the only tricky spot. As already mentioned this should be covered in separate panels always working from bottom to top. All surfaces are water sprayed. The wing and tail assembly are then sprayed with one coat of clear dope and the fuselage two coats. Do not forget to pin down the flying surfaces whilst the dope is drying. The colour scheme on the original model was a red fuselage with green flying surfaces, this being obtained by the use of ordinary commercial dyes in the water spraying. These dyes provide good bright colour with the advantage of no appreciable increase in weight.

Full-size plans are available, price 3/6, from the Aero-modeller Plans Service Ltd., Allen House, Newark Street, Leicester, see 1/3 scale reproduction overleaf.

JIG SET-UP FOR FUSELAGE CONSTRUCTION —





# TRANSPARENT MOULDINGS

BY E. V. PULLEN

SINCE just before the war, transparent mouldings have become increasingly popular. I suppose it all started with the boom in solid model aircraft, for in quite a short space of time the mouldings were extended to model wheels, airscrews, and all small pieces of detail work and have become more and more popular chiefly because of their lightness, rigidity and smooth surface.

The only drawbacks to these mouldings is that too many modellers are content to buy them from their usual dealers and their scope is generally limited to the type of mouldings obtainable. The prospect of making one's own mouldings has never been encouraged and most people do not appear to have any idea how to even start. I did read one article that had something to do with painting dozens of coats of varnish on to a piece of shaped candlewax and then peeling them off—but there are better methods.

As a professional model maker I first started making my own mouldings about eleven years ago and quickly realised the enormous possibilities. Since then I have used my process not only for small moulds, but also for entire model engines, boat hulls, car bodies, etc.

There are of course a few simple rules to observe. Provided they are kept to, it is possible to make mouldings of any shape or size far superior to those offered for sale by dealers.

It is rather confusing these days because there are several types of transparent sheet to be bought. They all look exactly alike but have different ingredients; the following, however, having good moulding qualities:—perspex, cellastoid and acetate sheet. Please don't try to use celluloid, mica, or rhodoid or you'll merely waste hours.

For all models where the moulds are up to about 2 ins. in length use sheet from about 1/16th to 1/32nd thick. Try to avoid very thin sheet unless the mould is very simple.

Carve the fuselage or body in the usual manner, paying particular attention to the parts to be moulded to get the various flats just right and clearly defined, and sandpapering very smooth. Mark out clearly just where the mould is to begin and end, and then cut neatly away from the fuselage and mount on a strong piece of wood. (Fig. 1.)

Cut the handle away if necessary so that it doesn't project over the edge of the pattern. Incidentally it is as well to add to the length, breadth, and height of the pattern by gluing on some more wood about 1/4th thick to the sawn surfaces and fairing them in. This is because the sheet follows the pattern very closely and probably would not cover the gap caused when sawing the pattern away from the rest of the fuselage.

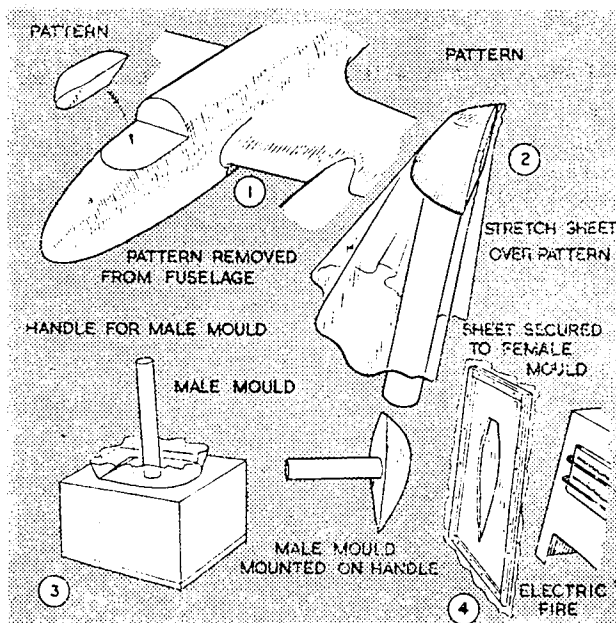
Mount the pattern in a vice or alternatively nail it firmly on to the edge of the table (making sure no one is looking) so that the pattern is at least six inches high. Place an electric fire as close as possible.

Cut off a piece of sheet at least 2 ins wider than the length of the pattern and of sufficient length to cover the mould and allow for a good hand hold on either side.

Before we commence, remember that the heated sheet cools and sets in about 3 seconds, hence the reason for having the fire so close. It is as well to practise swinging from the fire to land squarely on the pattern. When everything is ready hold the sheet about 5 ins. from the fire and gently pull and twist it. Watch it closely and as soon as it begins to give slightly, move the hotter parts away by tilting it so that the whole area is heated evenly. In a matter of seconds it will be ready: whip it straight on to the pattern until it covers all the edges, see Fig 2.

This sounds rather complicated, but after one or two attempts it becomes ridiculously simple. One or two points to remember are, should the sheet commence to bubble whilst heating, it is getting too hot, and if the finished mould has white blishes these are due to being too slow in pulling.

The above process applies to most shapes provided they are not too large. It sometimes happens that the pattern is



very deep in section, such as large gun turret, long bomb aiming noses, etc., and it may be found that with some types of sheet, long creases mar the shape of the finished mould.

These may be overcome by making a female pattern to match the male and using slightly thicker sheet. The simplest way to make the female pattern is to cut the head-on view of the shape on a piece of timber already planed down to the width, making the hole about an 1/4th of an inch oversize all round. Nail or screw a piece of ply on to the bottom, make up a mixture of alabastine or plaster with water and fill the hole up. Wax up the male and press it firmly into the female and leave to set. Just before it is really hard, waggle the male pattern about slightly to give sufficient clearance for the sheet. Leave it to set hard.

Heat the sheet as before and when it is ready hold it by one hand and lay it over the female, quickly ramming the male pattern home. Figure 3 shows this arrangement.

Don't forget to practise the movement of the patterns because a miss will certainly spoil the mould.

Thirdly, there is the very large type of mould, where the pattern is an entire fuselage or hull or any simple shape of more than about 5 ins. long. Experience will prove that the normal methods are inadequate because it is impossible to pull evenly on all sides. Use 1/16th in. perspex to get the best results. Cut out the outline of the male pattern on a piece of 3 ply allowing enough clearance for the thickness of the sheet. Round and smooth the edges of the hole and nail the sheet over, preferably nailing some slats of scrap wood around the edges of the ply so that the sheet is held evenly.

Hold the ply up to the fire and gently push the male pattern through the hole as the sheet gives. Do not force it as this may cause the sheet to blush.

That is all there is to the making of transparent moulds. There is of course a certain knack to be mastered, but when this is overcome the limits to this fascinating part of modelling are endless. Windscreens, canopies, landing lights, all are simple by these methods. In fact I have recently made a set of mudguards for a model car by the simple pulling over method.

Exceptionally large or difficult sections are best made in separate pieces, trimmed to overlap by about 1/16th in. and stuck either with a solution of Amyl Acetate and pure celluloid or possibly Durofix. There is also a special preparation on the market for sticking perspex only. It is as well to try the glue on two pieces of scrap sheet first because an adhesive for one material may dissolve another.

# AERODYNAMIC DESIGN

## PART SEVENTEEN

BY JOHN HALIFAX

### Longitudinal Stability.

Last month saw the introduction of the new longitudinal stability criteria adopted as standard by the L.S.A.R.A. We may briefly summarise this as follows:

If a model's Centre of Gravity is moved back (by lightening the nose or adding weight at the tail) it will become less stable: that is to say it will take longer to recover its normal attitude when upset from it. If the C.G. is moved far enough back the stability will eventually become zero and the model will wander all over the place. The C.G. position at which this occurs is called the "Neutral Point."

With the C.G. in its correct position for normal flight, the distance between it and the Neutral Point is a direct measure of the model's stability, and for ease of comparison it is usually given divided by the mean chord of the wing: this is the "Static Margin", and we saw how it could be calculated last month.

### Dynamic Instability.

A model is stable because the tailplane checks and corrects any rotation about the C.G. That is to say, it exerts a correcting force: thus if the model's rotation is very sudden and fast it is quite conceivable that the correcting force will not be large enough to halt it before the tailplane stalls. In practice, several variations of this phenomenon can be observed, and these are shown in Fig. 1.

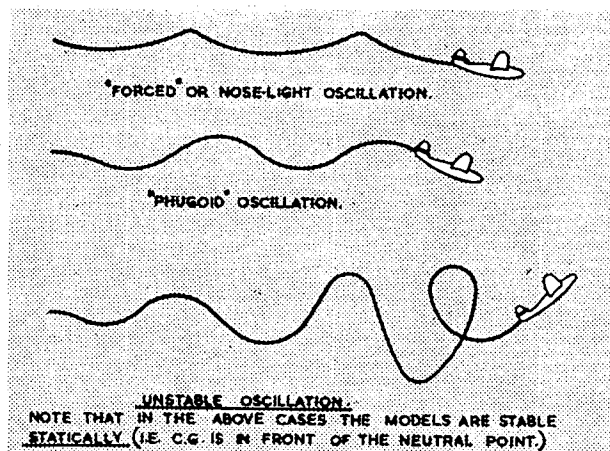


FIG. 1

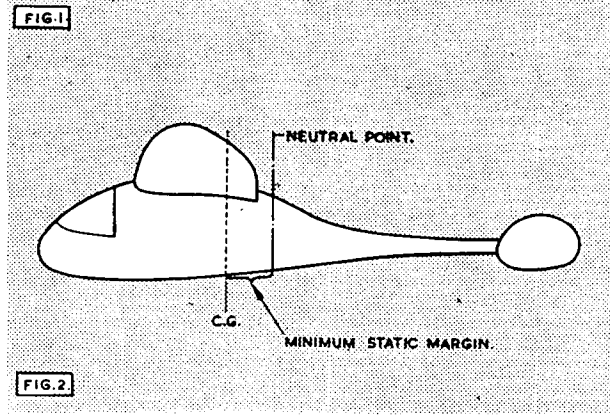


FIG. 2

This effect is directly related to the model's longitudinal ("Fore and Aft") Moment of Inertia: in other words, a model with a heavy tail will be more prone to Dynamic instability than the converse. We shall see below the precise effect of this in relation to the position of the Neutral Point, but as a general rule it should be remembered that a light tail will result in the following improvements:

1. Low Moment of Inertia, resulting in improved longitudinal stability characteristics: conversely a smaller tailplane may be used.
2. In the case of a glider less dead weight will be needed in the nose, resulting in a marked reduction in all up weight. This is not important if the wing Aspect Ratio is in accordance with the theory given in part X of this series.
3. In the case of a tailless model, keeping the "tail" (i.e. the wing tips) light, improves the lateral stability characteristics.

Dynamic effects can be allowed for in design by stating the minimum distance which must exist between the C.G. and the Neutral Point (Fig. 2). This can be calculated, and if the answer obtained is greater than the normal distance between these two points, the model will obviously be unstable.

### Calculation of "Minimum Static Margin".

With the exception of some early work several years ago by Mr. R. Burns, the L.S.A.R.A. is responsible for nearly all our present knowledge in this sphere, both theoretical and practical. As a result of this work, Walker gives the M.S.M. (in mean chords of the wing) for models as:

$$\text{M.S.M.} = 0.025 \frac{C_L}{C_D} \cdot K$$

where  $C_L$  = wing coefficient of lift for normal flight.  
 $C_D$  = total drag coefficient of the model, based on wing area.  
 $K$  = radius of Gyration of the model.  
 $c$  = mean chord of the wing.

$K/c$  is normally about 2.0 for rubber driven models, 1.0 for tailless and 1.5 for ordinary gliders. Power machines vary from 1.2-2.0. It should be noted that  $K$  can be accurately calculated or measured—although this is not necessary for normal purposes—and the relevant information can be found in L.S.A.R.A. Report No. 13 by J. H. Maxwell. It is, however, a good idea to measure  $K$  for successful models in order to obtain more accurate values of  $K/c$  for future designs.

Typical values for the other variables are given on the Nomogram.

### Example.

Suppose that we have found the Neutral Point of a typical tailless glider to be 0.5 mean chords behind the Quarter Chord. The machine is of clean design, and the wing span is 5 feet: thus comparing with machines for which we know the drag coefficient we see that it will be about 0.05, with a lift coefficient of about 0.4. Taking  $K/c$  as 1.0, we find that the minimum static margin;

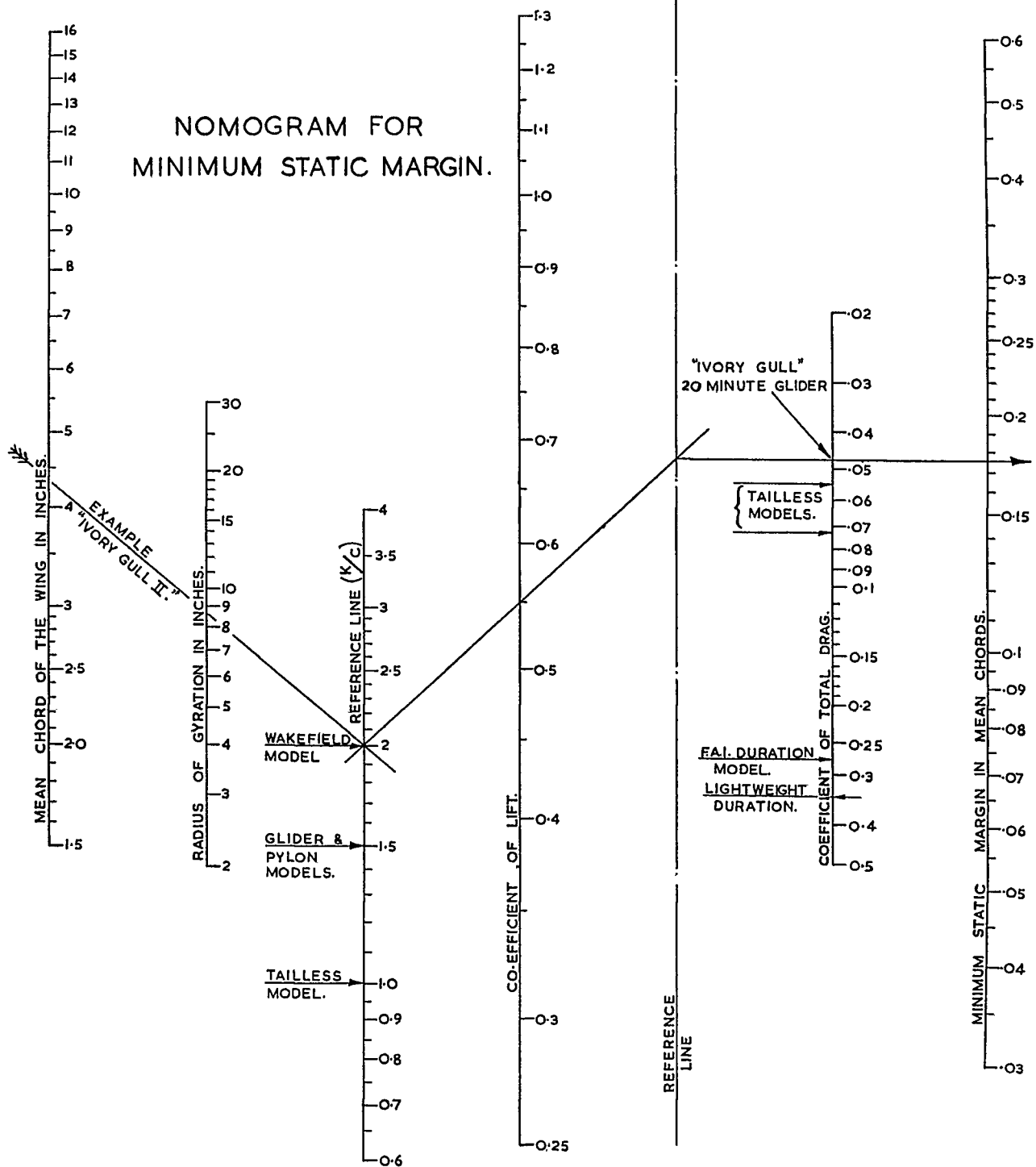
$$\begin{aligned} \text{M.S.M.} &= 0.025 \times (0.4)^2 \times 1.0 \\ &= 0.08 \text{ mean chords.} \end{aligned}$$

Thus, in the case of this model the C.G. can be moved back to within 0.08 mean chords of the N.P. That is, it can be situated 0.4 mean chords behind the quarter chord.

(Continued on page 266)

<sup>1</sup> L.S.A.R.A. Report No. 2, Longitudinal Stability, Part I. By N. K. Walker, B.Sc.

# NOMOGRAM FOR MINIMUM STATIC MARGIN.





## Aerodynamic Design (continued)

Suppose we now design for a lift coefficient of 0.8. Then we shall get (neglecting the increase in drag) :

$$\text{M.S.M.} = 0.025 \times (0.8)^2 \times 1.0$$

$$= 0.32 \text{ mean chords.}$$

This means that the C.G. can now only be placed only 0.1 mean chords behind the Quarter Chord, and it is obvious that the higher the lift coefficient—i.e. the slower the model is trimmed to fly, the less its reserve of stability. This is illustrated in Fig. 3, which is drawn for the A.P.S. "Ivory Gull" II, and here the variation in the drag coefficient is allowed for. We can, of course, improve the stability at high lift coefficients by moving the C.G. right forward in front of the wing Quarter Chord, but this is a very inefficient way of flying because the tail must be trimmed to provide a strong "down" load. Practical proof of this may be obtained by flying a "Phantom" with a 2 c.c. engine!

### Fuselage Effect.

So far we have only considered the two horizontal surfaces in finding the N.P. position: in practice, however, we find that the fuselage has a small de-stabilising effect. That is to say, it moves the N.P. slightly forward of its calculated station. Since the movement is small, empirical corrections are almost always sufficient, and these may be summarised as follows :

Short-nosed, streamline fuselages—2 per cent. mean chord.

Long, slab-sided fuselages—5-7 per cent. mean chord.

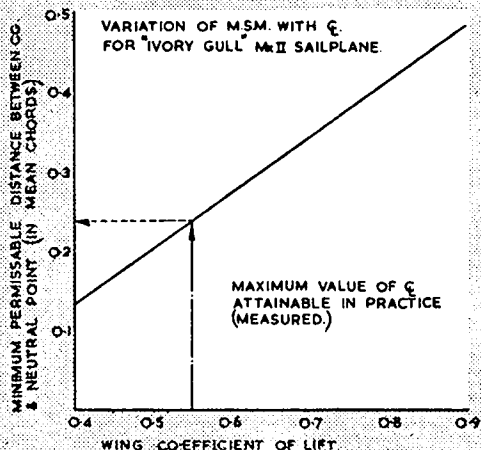
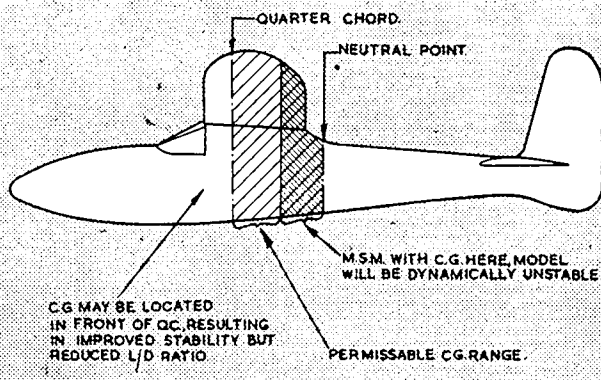


FIG. 3



## BOOK REVIEW

DIESEL MODEL ENGINES by C. E. BOWDEN.

Percival Marshall. 5/-.  $7\frac{1}{2} \times 4\frac{3}{4}$  ins. 172 pages. Illustrated.

FIRST of all we must peg the point that Col. Bowden's latest work provides a lot of reading for the money. It is a book to browse over rather than consult for quick reference, and will be a source of endless joy to those who have mastered the author's sometimes rather baffling changes of subject. Presumably for ease of handling it has been divided into five chapters, the headings of which do not necessarily bear any relation to the contents. For example, Chapter IV, "How to Operate a Diesel and Stop it by Timing Device", contains paragraphs on Propellor Carving. No attempt has been made to re-draw for publication the author's own very rough sketches, and these contrast unfavourably with the only two "professional" diagrams in the book copied from a French manufacturer's box label and an early number of *The Model Mechanic*. Many of the half-tone illustrations show want of skilled retouching; Fig. 54 is quite the worst illustration we have seen for a very long time in this respect. Another distressing omission is the complete lack of any index. Surely technical publishers should realise that this is essential to their works? Captions in many cases are inaccurate, as for example in describing the Delmo as a "Belgian" diesel, or playing safe by unduly short descriptions such as "Two Italians". Poor production takes much from the pleasure of handling this book, but by keen collectors of "Bowdeniana" much will be forgiven for the joy of reading once again of old friends in new guise like the Porlock Puffin and many another Bowden triumph. Jottings on fault finding and starting will be particularly valuable to juniors and not a few older flyers for that matter! As we remarked before, there's a lot of reading in it, a lot of pictures old and new, and a wealth of practical advice.

ABC OF BRITISH AIRCRAFT MARKINGS by O. G. THETFORD.

Ian Allen. 2/-.  $6 \times 4$  ins. 64 pages. Illustrated.

THE migration of large numbers of youngsters from railway junctions where they had formerly collected engine numbers to airports where they follow a similar hobby gathering registration letters of aircraft is a sign of the times that we find particularly pleasing. Any publication that can encourage this movement from the necessarily dingy surroundings of the average railway station into the bright open spaces of an aerodrome will enjoy not only our support but also, we feel, the hearty co-operation of parents wherever they may be! The author of this truly pocket size book is by no means unknown to our readers, being none other than O. G. Thetford, who has probably been responsible for more successful aeronautical works than any other writer in the present decade. Aircraft have rather more personality than locomotives or cars in that the publication of civil aircraft registry particulars gives a year by year picture of their ups and downs through an eventful life history. The handsome "last word" private plane of some playboy millionaire becomes through the years the hard flown hack of an export traveller, to end its days perhaps, the much patched, dearly treasured, "fleet" of a single-aircraft private charter line or aerial circus. Then too, for the youthful enthusiast, there is a brighter future ahead of them piloting such aircraft as they learn to appreciate in their "registration" outings than would ever be theirs as engine drivers. Most of us grow out of that wish with the years, but no enthusiast ever loses the urge to fly somehow, some day. In addition to comprehensive notes on civil aircraft registration letters, owners and base aerodromes, there are particulars of modern service machines, and a number of brilliantly clear illustrations on white art insert sheets, numbering nearly forty in all. Many of these bear the A.T.P. credit line and appear to be the work of his former co-author Eddie Riding, who still retains his early zest as a collector of aircraft markings. At 2/- this little book should soon be in everybody's pocket who pretends to more than a casual acquaintance with flight.



**A**USTERITIY Model News this month so quickly to our photos.

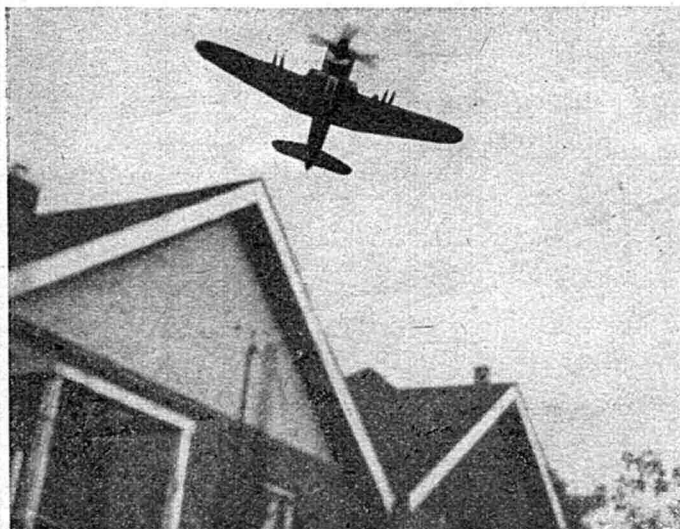
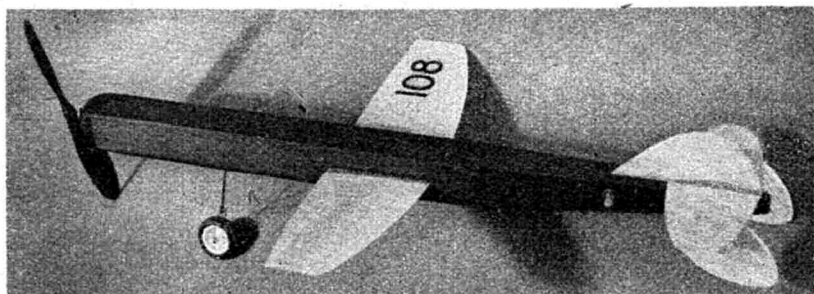
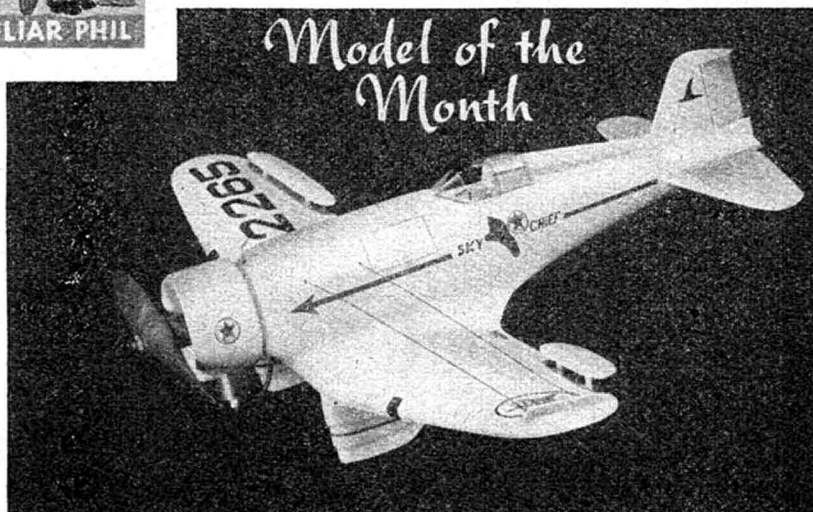
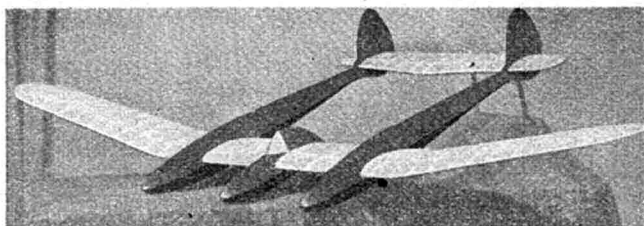
First, our Model of the Month, once again a perfect specimen of its class. Our American control-line correspondent Walter Musciano built this beautiful control-line Northrop Gamma—which shows why his finishes are well known over there! What's more even after flying it he manages to retain its pristine condition.

Novel glider top right is the design of C. E. Mayes of South Wales who found it to be extremely stable both on and off the towline. Simple diamond booms and knock-off wings make a robust model.

Belgian modeller Guy Ramaekers' designs have often found a place in M.N. and centre right is his fine example of a beautifully finished free flight rubber driven speed model. Span is 12 ins., length 17 ins. and model flies 60-70 yards at high speed about 12 ins. up.

His friends laughed at Willie Emberton's first attempt at a flying model after building 112 solids (bottom right) and a little unkindly called it "Willie's Wonder". However, it looks to Flair Phil very like a King Falcon so it may yet be wonderful. Anyway, Willie, even if it doesn't have another bash and don't waste time on the armchair critics!

Lastly we come to our old friend Cyril Spray in Canada, who contrived this very tasty shot of a solid Firebrand cunningly posed against a realistic background.

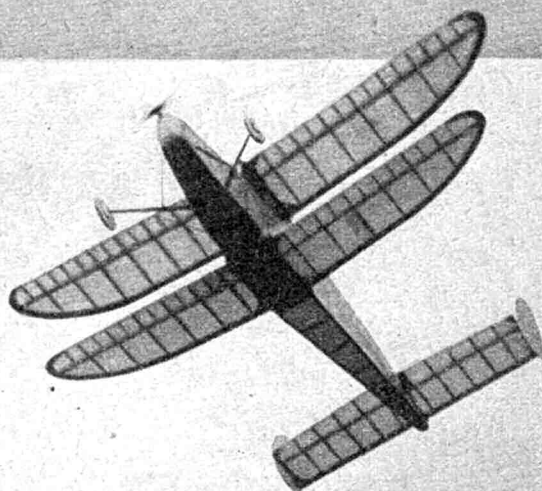






# Ladybird

by  
H. J. Pridmore



## A STURDY, SIMPLE TO BUILD SPORT OR CONTEST BI-PLANE

**I**N these days when model design seems sometimes to be stagnating, it is always refreshing to sample any model that is a little out of the ordinary run of things, and it is especially satisfying when such a model is capable of a performance to gladden the most exacting of sport fliers. As readers will see from our cover painting this month and the accompanying photographs, the designer has delivered a most elegant little free-lance biplane which is just the right model to keep handy for flying at any time when the weather offers a useful spot of fine.

Construction is very strong but straightforward, and the machine is rugged enough to stand up to all-weather flying while being easy enough for the less experienced to build and fly. Altogether the model can be thoroughly recommended to all who appreciate a different kind of design with a pleasingly orthodox performance.

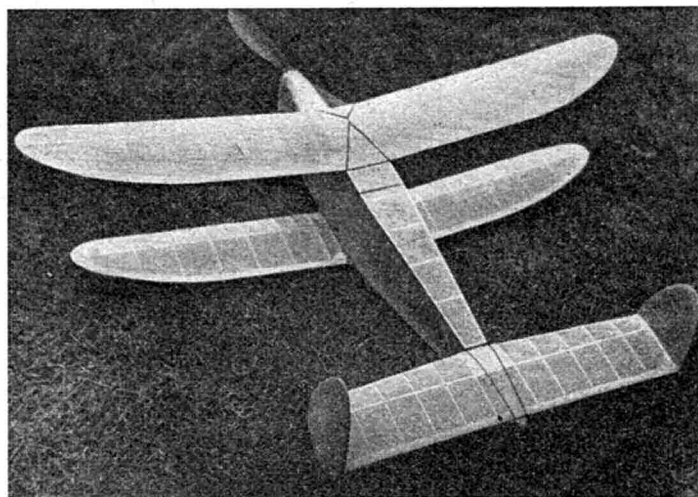
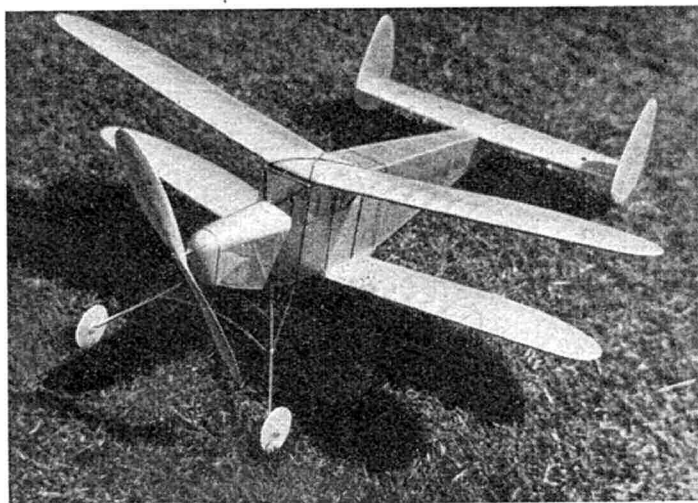
**Fuselage.** This is of the slab-sided type, and care and accuracy should be taken during assembly to ensure correct alignment of the wings and tail surfaces. Build two sides on the drawing in the usual way, then cement in bulkheads 1 and 2, nose formers, and finally the top and bottom spacers.

**Wings and Tail Unit.** Build top and bottom wings in one piece, and incorporate dihedral by cracking through leading edge and trailing edge spars where shown, inserting the reinforcing pieces of 1/8th in. sheet at the main spar joints. Construction of the tail unit is straightforward but a medium or even soft grade of balsa should be used to reduce weight. Cement the twin fins securely to the tailplane end ribs, checking for alignment.

**Aircrew.** A twelve-inch diameter airscrew was used on the original. This may be purchased or carved by the builder as desired. Apply several coats of clear dope sanding lightly between each.

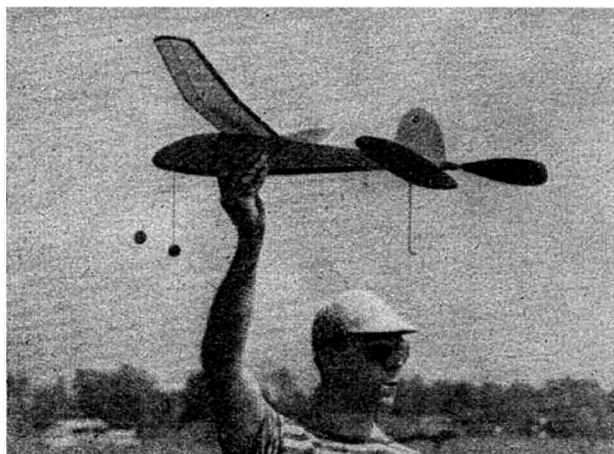
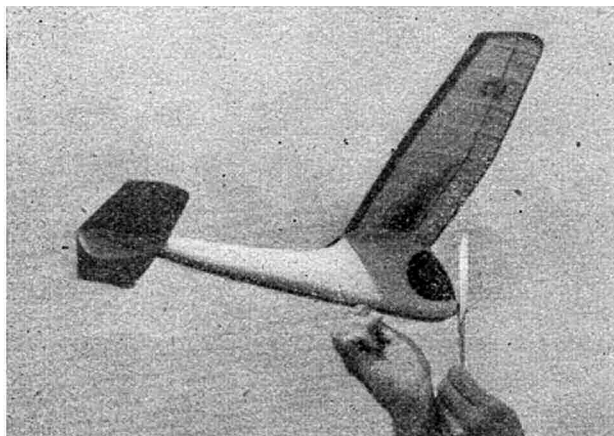
**Flying.** First check model and C.G. position. Obtain right-hand circle flights by adjusting side-thrust and amount of rudder. No down-thrust or packing under the tailplane should be necessary. Once adjusted, Ladybird is a stable and consistent flier.

**Full-size Plans.** As usual these (see 1/4 scale reproduction opposite) may be obtained, price 3/- post free, from Allen House, Newarke St., Leicester.





BY JIM NOONAN



WE have just returned from Chicago, where the Model Airplane Trade Show occurs annually. Besides the usual hazardous winter driving (it was about 0°) and the heavy traffic, there was a little excitement and little to see. Many of the very large and some of the small manufacturers and kitters have folded up; the market is in such a bad way now that few care to invest in new items, so that everyone continues to make and sell what he is tooled up for and the mad pace of price cutting continues. (The Pierce motor dismantled is now 4 dollars .95—£1. 4s. 10d. about !). It is a good motor, but will not break records, although just yesterday a little kid nearly (14 years old) did 93 m.p.h. with a beat-up Pierce.

Met Carl Goldberg, Frank Nekimken, Wallace Simmers and Leon Schulman but the guy who had the most to say (and show) was Ray Arden, who said he has sent you pictures of his unbelievable motors (to be published later, Ed.). He had a showcase full of motors the size of your thumbnail with bores of  $\frac{1}{8}$  in. and up, and the climax, a small flat box dug from his briefcase which, when opened, revealed a 12-in. span free-flight model with a special glo-plug motor.

The biggest trend in model building is of course U-control, but some are beginning to see some of its more foolish aspects and quit it, while others continue to improve the breed so that 150 m.p.h. probably will be surpassed this summer. The latest gadget produced by two local geniuses (must I have a Latin plural?), Hank Czerwinski and Gordon Wisniewski (Wake team, Paris, 1938), consists of two McCoy .29 motors, in tandem, working as one motor, alternate firing. It turns 12,500 r.p.m. (25,000 pops per min.) and will drown out a Dynajet.

Thirty miles per hour has been obtained with CO<sup>2</sup> motors on indoor U-control. A tiny CO<sup>2</sup> motor of  $\frac{1}{8}$  in. bore and stroke is available now and flies 24-in. models free indoors. Eight charges can be taken from a standard CO<sup>2</sup> cylinder.

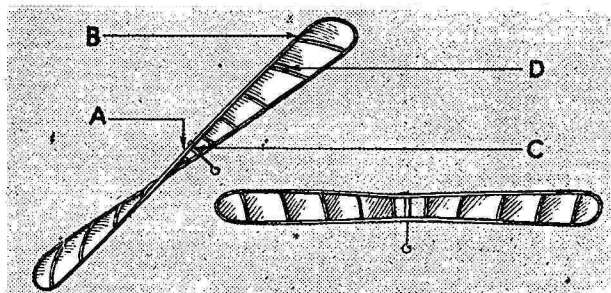
Some microfilm work is being done. It seems that this "lost art" is reviving to some extent. Here we have only a 20-foot ceiling to work with but have done 7 mins. 28 secs. with a 30-in. stick model, 4 mins. 50 secs. with a cabin model, 3 mins. 58 secs. with a 30 sq. in. R.O.G., and 19.3 secs. with all balsa glider. The R.T.P. indoor flying of England seems somewhat repulsive to us. Do they not have gymnasiums, halls or auditoriums in England? (I have flown in a church without anyone's knowledge.) It is a simple matter to adjust a model to fly in any sized room or hall. Some fellows here do a minute in the living room at home (9-ft. ceiling, 15x12 ft.).

I can pin it only on one thing; the propeller, the prop on Bob Copland's indoor model was not just right. It lacks blade area at the tips, true or helical pitch, and the whole model was much too heavy. I show a prop that can be built up in your hands of two spars ( $\frac{1}{4}$  in. dia.),  $\frac{3}{32}$  in. round at centre (A),  $\frac{1}{32}$  in. sq. at (B). A  $\frac{3}{32}$  in. sq. hub (C) joins them and two  $\frac{1}{32}$  in. sq. curved ribs form the helix tips and ribs as at (D) ( $\frac{1}{32}$  in. sq.) are added to finish the prop.

Cover with microfilm or Jap superfine tissue (extinct here!). Of course the blade width, pitch and diameter are carefully

Top, Ed Lidgard's C.O.² powered model that is capable of a rocket-like climb. Centre, the same builder's pusher fuselage model, an excellent all-rounder weighing  $3\frac{1}{2}$  ozs. Bottom, Bob Wood with his scale Sopwith Triplane control liner. In this photo the author wearing clear glasses is standing on the right.





worked out by mechanical drawing before construction.

These props show marvellous efficiency and are easy to build (three hours compared to eight or ten hours for carving).

Credit for the development of these props belongs to Merrick Andrews of Philadelphia who holds the record of over 27 mins. at Lakehurst Air Dock. There are several of these Air Docks around the country left over from the days of dirigibles, and their size is indiscernible, the ceiling being well over 200 ft.

Outdoor rubber-powered models are seen occasionally but it is much the same old stuff. Little development has taken place since the last Wakefield contest in 1939.

We envy the British and Continental modellers (and admire, too!) the excellent organisations and competitions. Here, everyone is too busy chasing the almighty dollar; sponsors are few. With the exception of the Plymouth-Chrysler Contest in Detroit last summer, most big contests are a bedlam of unorganised confusion, bad locations, and frequently modellers who have driven a thousand miles to them will take one look and take off for home.

Jet motors are conspicuous by their absence. The idea never took hold, though spectacular and noisy, they do not seem to give any exceptional thrust.

The glowplug is king. All motor manufacturers are developing, or have developed, glo-plug versions of their motors and many have yet to learn about detonation (pre-firing) caused by the fact that there is *always* a spark on the plug. Even the Champion Co. is bringing a glow-plug out!

We note with interest the "American" trend in England (and all Europe). Pylons and screaming motors and now U-control! Probably the net result of fraternizing of European and American. Most certainly we need more interchange of ideas throughout the world, but must we have a war to bring us together? My travels (mostly A.W.O.L.) throughout Africa and Europe convinced me that the British Tommy, the French, Italian and German modellers were a swell gang; my only hope is that I can compete in some contest in the future in Europe.

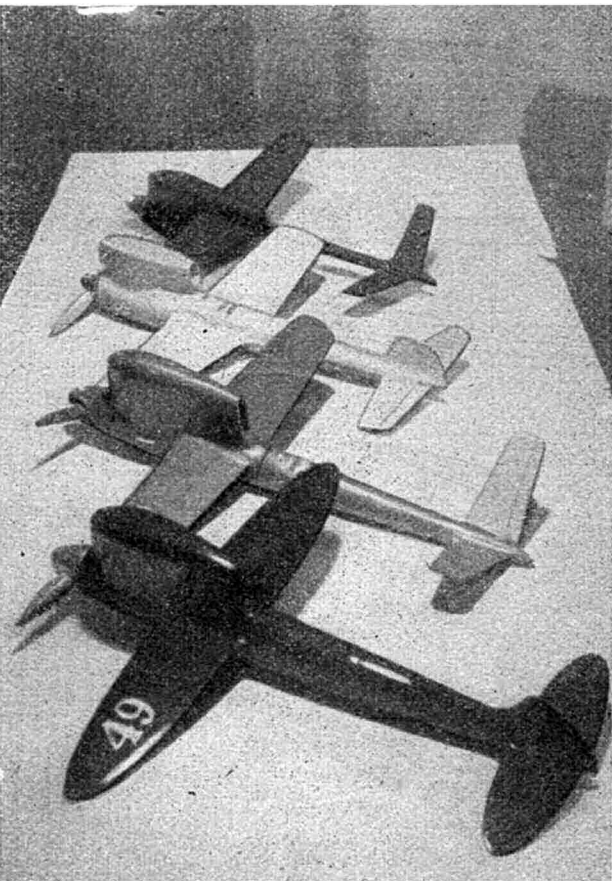
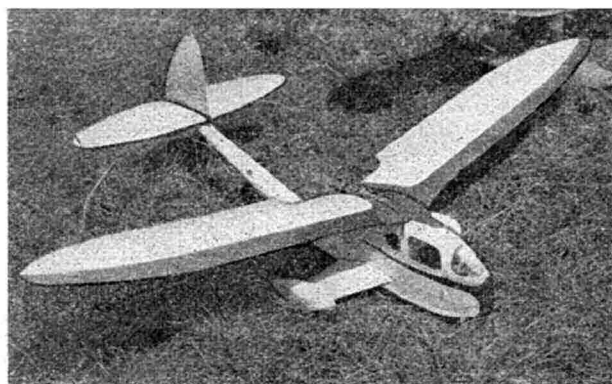
First post-war contest in Germany was held in Stuttgart in September, '47. Sailplane, rubber and motor events were run off. One pathetic but brave effort made from paste-board and inner tube rubber strand took second place with 2:16. I know of many here who could not do that with the world's best materials. Since then the U.S. military government has banned the flying of power models in U.S. sector of Germany. It is O.K. in all other zones.

**New Rules. 1948 changes.**

Rubber, outdoor: Weight 4 oz. per 100 sq. in. of wing area. Power models: No fuselage cross section required. 100 oz. per cubic inch of motor displacement (ex Ohlsson 23 must weigh 23 oz.).

Landing wheels required only if contest director insists!

Seems Piero Gnesi's model had a hand in setting up these rules. The sky's the limit boys! It is now possible to use tiny European diesels in competition here. My 210 sq. in. model of 4.5 oz., powered with a Micron .8 cm. (0.44) was just right; its performance was phenomenal.



Top and centre are two successful flying boats seen at Chicago. The lower model being powered with an Ohlsson 23. Right is a group of speed control line models. Note the engine cowls and the absence of fins in favour of dihedralled tails on two of them.

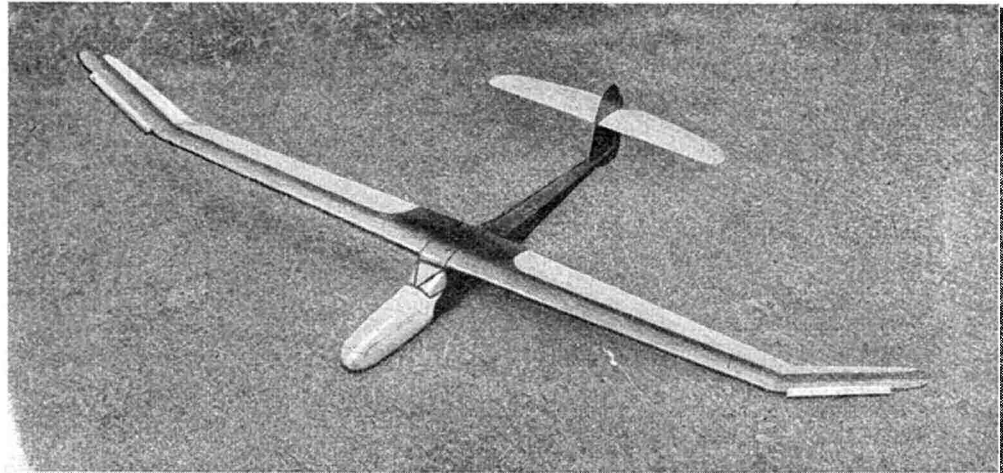
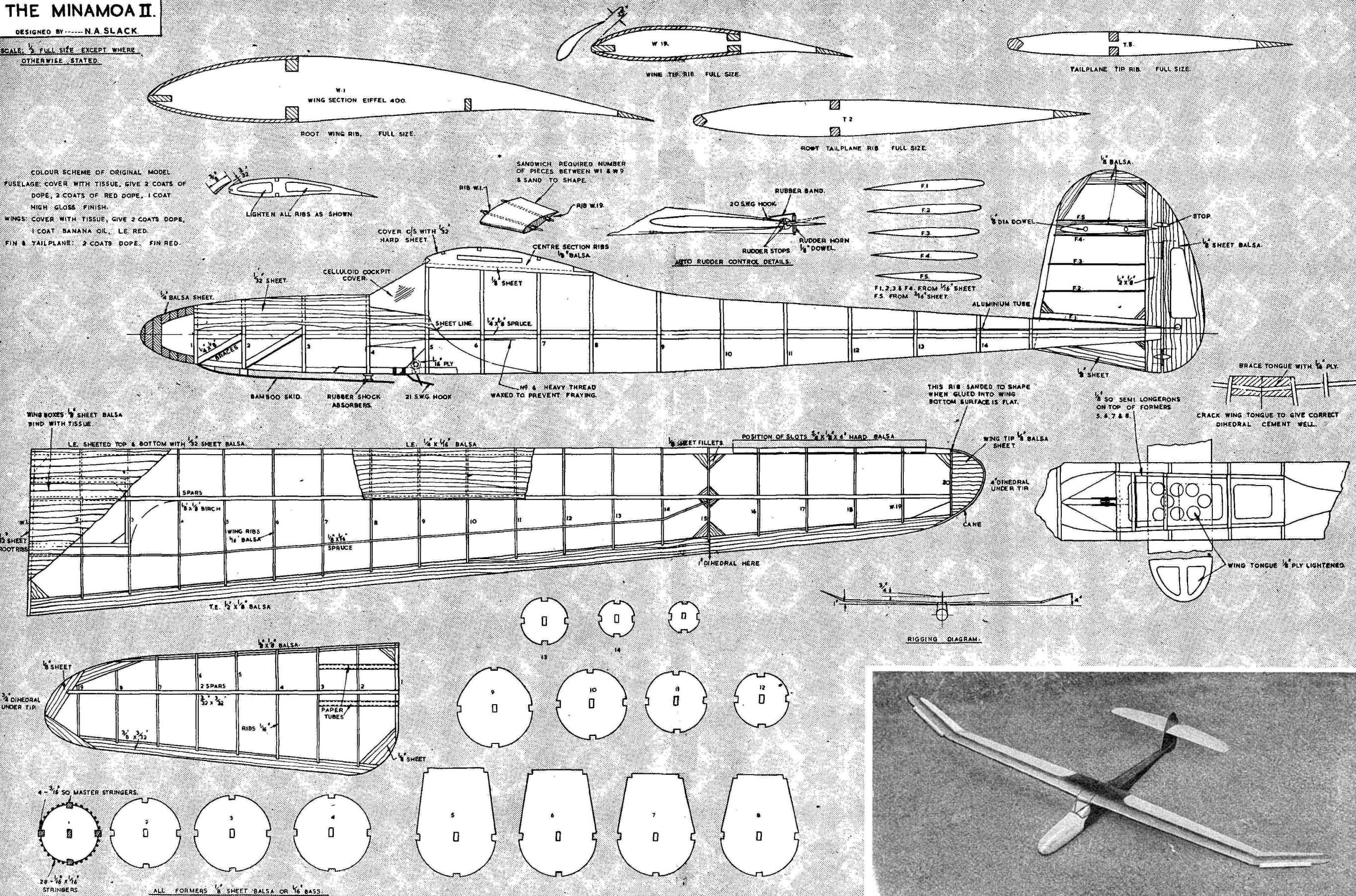


# THE MINAMOA II.

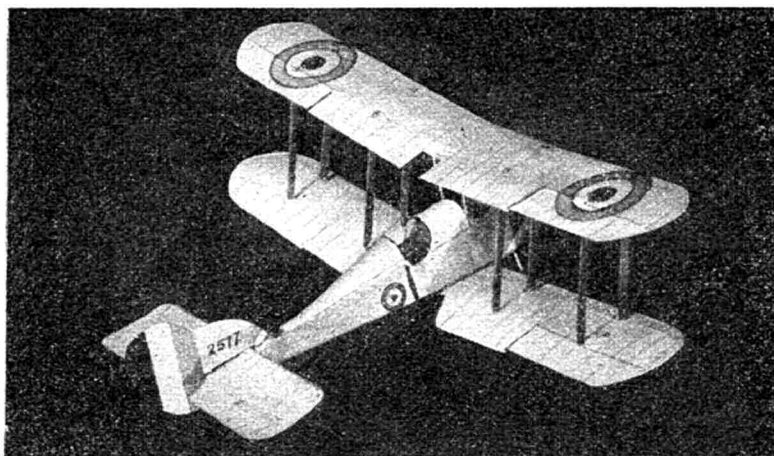
DESIGNED BY N.A. SLACK

SCALE: 1/2" = 1' FULL SIZE EXCEPT WHERE OTHERWISE STATED.

COLOUR SCHEME OF ORIGINAL MODEL  
FUSELAGE: COVER WITH TISSUE, GIVE 2 COATS OF DOPE, 2 COATS OF RED DOPE, 1 COAT HIGH GLOSS FINISH.  
WINGS: COVER WITH TISSUE, GIVE 2 COATS DOPE, 1 COAT BANANA OIL, 1 COAT RED.  
FIN & TAILPLANE: 2 COATS DOPE, FIN RED.







# The FLYING SCALE MODEL

PART — TWO

by C. Rupert Moore, A.R.C.A.

THE two things I stressed in last month's article which I believe essential to the development of flying scale models were—an honest attempt by every scale modeller to get as near to scale as he can in contrast to the all too common "how far will the competition rules allow me to stray from true scale," and, even more important, a clear conception of the problem of designing scale models in contrast to the adaptation of solutions to other branches of model flying.

To be honest my outlook has been "scale" from the beginning and for that very reason I heartily endorse the common advice not to make your first attempt at model building a complicated scale model. As a matter of interest I have rebuilt the type of model my brother and I developed towards the end of the 1914-18 war. This is a six inch span 1/72nd scale gliding scale model B.E.2.C. The weight is 1/10 oz., the gliding angle one in eight and the model is capable of simple aerobatics. Balsa, of course, was unknown to us then, and the materials which were forced upon us by lack of more suitable, were exercise book paper, veneer wood, iron wire and cork. Varnish diluted in petrol was used in some case as an attempt to protect the paper from humidity. We must have built hundreds and unconsciously learnt the art of making models with scale areas and rigging angles glide perfectly.

The natural development of this type of model was to try and make one fly and a wash drawing (top right) is shown of my first successful flying model. The drawing is done from a photograph which, owing to amateur efforts, is too poor for reproduction. This model started out as a twenty-fourth scale D.H.2. complete with nacelle and twelve struts and had a span of 14 inches. Naturally the short nacelle could not accommodate a long enough motor to give a reasonable power run so a boom was substituted. This boom slotted on to two prongs on the bottom wing where it was held by rubber, which allowed it to move in case of collision. Also, the boom could be removed for winding and the centre section struts were removed so that the propeller could pass between the wings. On the front end of the boom was a tiny wheel which was most effective. The structure of the machine was simple. The top tail booms and two wing spars were made and glued together. No wing ribs were used. Next the bottom booms and spars were assembled. These frames were bound together and the dihedral steamed into the wing spars. They were then separated and wings simply cut from cartridge paper glued in place and the model assembled. The airscrew was simply a piece of veneer  $\frac{3}{4}$  inch wide cut away at the centre and steam bent. These old airscrews were surprisingly efficient. The prop shaft was iron wire wrapped round the hub reinforcement. The motor was rubber unravelled from the shockcord of a "Shorthorn Maurice Farman" lubricated with goose grease. The corrosive effect of animal fat was of no consequence as no motor ever lasted one afternoon. Maximum turns were 300. With this modest power the model flew R.O.G. a distance of over 100 feet rising to between four or six feet.

I used to fly this model by the side of the Rifle Range at the Doncaster Grammar School and on the rare occasions when

it flew straight, it out-flew this range. As the Rifle Range was measured it gave me a good check.

Quite rightly the good duration model maker uses the simplest solution and naturally places his wing in such a position that its centre of lift is slightly behind the natural C. of G. (Centre of Gravity) of the total model. With the ordinary rubber-driven model, which has the skein reaching from nose to tail, the C. of G. position is about  $\frac{1}{4}$  of the distance back from the nose to tail. Few are the real aircraft with the C. of G. so far back and unless one is content only to model these few some solution must be found. In the same way the duration modeller chooses the simplest solution, so the scale modeller chooses the simplest too and wherever possible he makes whatever complication is forced upon him pay for itself, either directly or indirectly.

The centre of gravity problem must be solved before anything further is attempted.

It should be understood clearly that the C. of G. of an ordinary rubber motor, whether single or multi skein, is always halfway between the nose and tail hook and the effect of installing a rubber motor to the total balance of the model is the same as if the total weight of the motor was suspended from a point halfway between the nose and tail hooks.

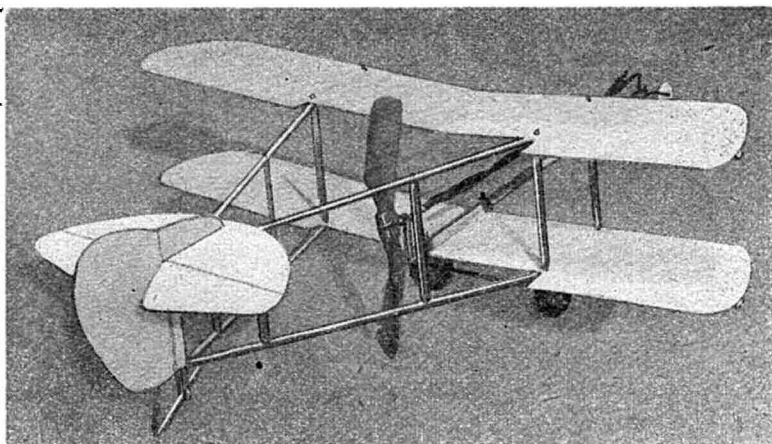
More often than not a rubber driven scale model balances very near its correct C. of G. position until the rubber is put in. Say the motor weighs 3 oz. and the skein runs from nose to tail, it is the same as putting a 3 oz. weight halfway down the fuselage. If the desired C. of G. position is  $\frac{1}{4}$  of the distance from the nose, or halfway between this weight and the nose, an equal weight of 3 oz. will have to be added to the nose as ballast to counteract the motor's weight. If the C. of G. of the motor can be made to coincide with the model's C. of G. no ballast will be required, but in the above example where the C. of G. is  $\frac{1}{4}$  back, the tail hook will be exactly halfway along the fuselage. This short skein would not accommodate enough turns to fly the model. Where conditions are not so extreme, the tail hook can be moved forward a little and a little ballast used, but this compromise is strictly limited. The thickness of a rubber motor determines its power and also the number of revolutions which can be accommodated on a given length. Thus, if the motor is divided into two skeins of  $\frac{1}{2}$  the thickness, but still the same length, both being geared together we get the following :—

1 Skein of 18 strands 30 ins. long, takes 600 turns, weighs 3 ozs.

2 Skeins of 9 strands each 30 ins. long, takes 840 turns, weighs 3 ozs.

Each revolution of the single skein represents  $\frac{1}{600}$  of the total power stored in the skein, whereas each revolution of the 2 skein motor only represents  $\frac{1}{840}$  of the power. The power must be the same per revolution and it has been found that the addition of a third skein is about right, or conversely the reduction of each skein to  $\frac{2}{3}$  the thickness instead of  $\frac{1}{2}$ , now we get :—

Right shows the author's first flying model made from paper and veneer whilst our heading picture portrays his neat little B.E.2c of similar construction.



3 Skeins of 9 strands each 30 ins. long accommodates 840 turns and weighs  $4\frac{1}{2}$  ozs.

2 Skeins of 12 strands each 30 ins. long accommodates 750 turns and weighs  $4\frac{1}{2}$  ozs. Returning to our original 600 airscrew turns we get :—

3 Skeins of 9 strands each  $21\frac{1}{2}$  ins. long, takes 600 turns and weighs 3.15 ozs.

2 Skeins of 12 strands each 24 ins. long, takes 600 turns and weighs 3.6 ozs.

Thus, the C. of G. of the 3 skein motor is  $10\frac{3}{4}$  ins. from the nose and the 2 skein 12 ins. instead of 15 ins.

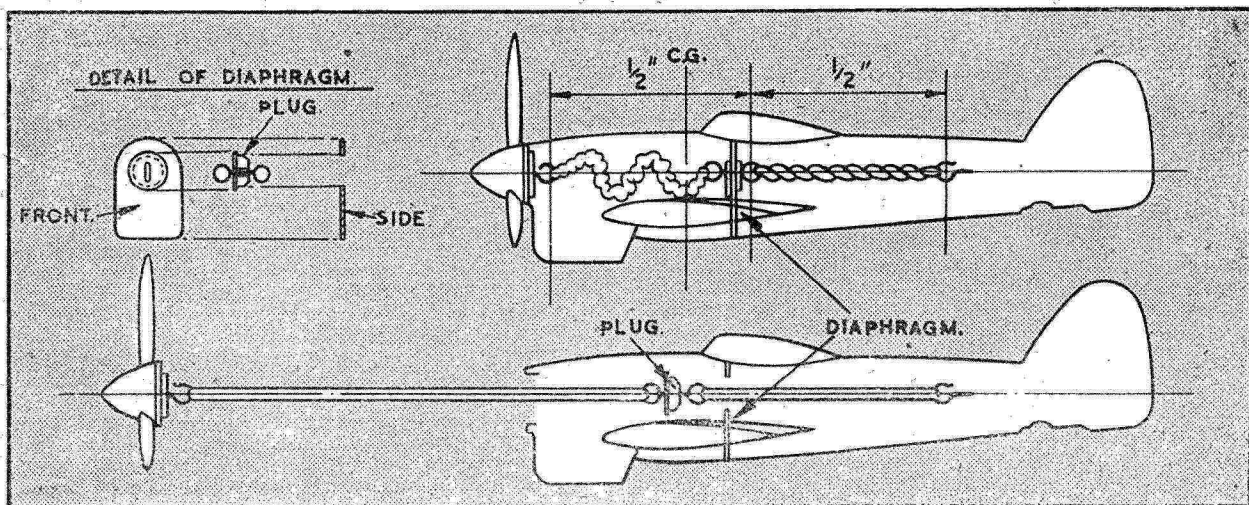
A three-gear gear box weighing about 1 oz. is *useful ballast*. By using a gear box weighing 1 oz. and adding 1.15 oz. of rubber the 3 oz. balance weight can be removed thus saving 1.85 ozs. Under these conditions flight had become possible at the price of 1.15 oz. instead of 3 ozs.

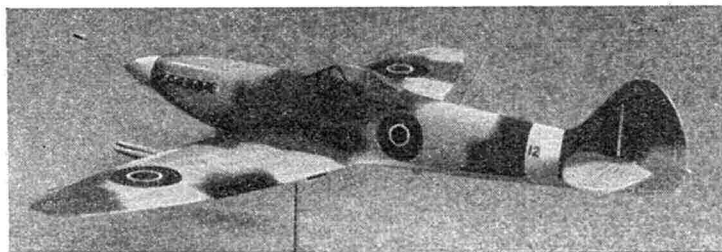
In certain cases another solution is possible. A short thick skein motor can be used accommodating comparatively few turns and the airscrew having a step-up gear in order to give the desired number of airscrew turns. The efficiency of this solution is greater on very small models and the reason is not far to seek. A tiny  $1/48$ th scale model as a rule flies at much the same speed as  $1/4$ th scale model. This means its scale speed is eight times that of the larger model. The tiny airscrew has either to be eight times the pitch or revolve eight times the speed of the larger (or a compromise of both). As pitch ratios above  $1\frac{1}{2}$  are not very efficient then speeding up is the *only* solution. It must be remembered that adding a step-up gear without increasing the thickness of the rubber skein will not speed up the airscrew but will slow it *down*. This is because each rubber revolution has now to turn the airscrew, not once, but several times. Each airscrew revolution now absorbs a proportion of power equal to the inverse ratio of the gearing (or nearly so). Thus, in the Jackdaw II which has a step-up ratio of 2 to 1, each airscrew revolution absorbs one half of the power of each rubber revolution. In practise this means the time taken for this motor to unwind is about three times what a direct drive would be.

It struck me one day while "winding a motor in" after stretch winding, that as one could stretch a fully wound motor longitudinally almost how one liked with no ill effects, there might be another approach to the problem. If somehow

the rubber could be kept bunched in the nose instead of going back evenly into the rear of the fuselage, the C. of G. of the rubber would no longer be halfway between the rubber hooks but *much closer to the nose*.

The solution was easy, a bulkhead, or diaphragm, was placed halfway between the nose and tail hooks, in which there was a hole, central with the line of the rubber. Into this fitted a plug just like a circular nose block with bush and shaft. The shaft had hooks both ends. A rubber skein 50 per cent. (or more) longer than the distance between the hooks was divided in *length only* into two, the portion connected to the front of the plug being  $\frac{2}{3}$  the total length and the rear portion  $\frac{1}{3}$  the length. This was now a divided single skein thus,  $\frac{2}{3}$  of rubber—plug— $\frac{1}{3}$  of rubber. This should be carefully pretensioned and then installed as a single skein. When wound in, because the bulkhead is halfway between the hooks and the plug is only  $\frac{1}{4}$  of the distance from the tail hook along the skein,  $\frac{2}{3}$  of the rubber is kept bunched in the front half of the motor space, thus forcing the C. of G. forward. This was so successful that I patented it and christened it the "Moore Diaphragm". This completely revolutionised flying scale models as it abolished ballast and gears at the same time. Such types as the following were thus made practical: "TYPHOON," "TIGER MOTH," "BRISTOL BULLET," "BRISTOL MONOPLANE," "BLERIOT CIRCUIT" and "S.E.5.A.". All these large scale models are in Plans Service. This very difficult C. of G. problem has been the chief reason for scale models being abandoned by most modellers in the past. The diesel engine cuts this difficulty right out of scale modelling at one go.





Two very pleasing models by Dutch reader P. Van de Dyke. They are above, a Spitfire Mk. 22 and right, a Messerschmitt 109F. Both are built to 1/40th scale and show a remarkable degree of accuracy and finish.



## AIRCRAFT IN MINIATURE

PART X BY W. O. DOYLEND

**I**N Part IX we dealt with in-line types of engines that are completely enclosed by cowlings. In single-engined types, as we have seen, they are simply reproduced by suitably shaping the nose of the fuselage block. In multi-engined aeroplanes using these types of engines, the nacelles are constructed so that they form the engine cowling shapes as well. See Fig. 2 A in Part IX.

In many of the older types of aeroplanes however, we find that in-line engines are not always completely cowled in. If the aircraft being modelled has an air cooled engine, each separate cylinder will be shown exposed to the airflow and even with some of the early water-cooled types, the cylinder blocks were left open to the atmosphere and no attempt was made to streamline the engine by covering it in with cowlings. This latter point is particularly noticeable on such types as the Napier "Lion" engines fitted in the Supermarine "Southampton" flying boats, and many of the early types of twin-engined bombers and air liners. These open water-cooled types do not present much of a problem from the modelling point of view. They were usually of the "Vee" or "Broad Arrow" type, the designation referring to the arrangement of the banks of cylinders. The "Vee" type consisted of two banks of enclosed cylinders set on a crankcase, whilst the "Broad Arrow" type made use of an additional bank of cylinders set vertically between the arms of the Vee. See Fig. 1. Both these types were usually set behind massive car-type radiators to which the cylinder blocks were connected by large water pipes. Details of the form of these engines will normally be shown clearly in the general arrangement drawings of the aircraft. It is best to build up the engine in separate units, using one small block of wood for the crankcase and separate pieces for each bank of cylinders and the radiator. Suitable size wire can be used to represent the water pipes.

When dealing with air-cooled engines having exposed cylinders, each cylinder will have to be shown separately. Short lengths of heavy gauge wire can be used to represent the cylinders, or better still, small bolts of the 6 B.A. and 4 B.A. sizes. The threads of these bolts give a life-like impression of the cylinder fins. Small holes are drilled in the fuselage or nacelle nose to take the cylinders which are then glued in, and a length of thinner wire, soldered or glued to the tops of the cylinders will represent the exhaust pipe. Valve guide casings can also be represented by lengths of wire running up the side of each cylinder. In some cases baffle plates were fitted along the sides of the cylinders to direct the airflow. These can be made from thin strips of tin fitted into slots cut to receive them. See Fig. 2. The early marks of Gypsy and Cirrus, four cylinder, in-line, air-cooled engines were of this open type.

There are two distinct methods of reproducing uncowed radial air-cooled types of engine. Firstly, the engine built up on the fuselage nose and secondly the engine, the cylinders and crankcase of which are built up as a separate unit, and fitted complete, to the fuselage or nacelle.

In the former case, the nose of the fuselage or nacelle is

shaped to form the crankcase of the engine around which the cylinders are fitted. The shaping of the nose for this type of engine had been described in an earlier article. Short lengths of wire or small bolts are used for the cylinders. The number of cylinders will vary with the type of engine and will range from five for a small, low powered engine, to seven and nine for the larger types. In addition, radial engines sometimes have two banks or rings of cylinders, the rear bank being fitted close behind the front and in such a way that the rear cylinders come in line with the gaps between those in front. With this type of radial we may have two rows of five, seven or even nine cylinders.

It will be appreciated that in the larger types of single row and all types of two row radial engines, the cylinders will be set very close together on the model and consequently a large number of holes, also close together will have to be drilled in the crankcase block. It is therefore advisable to make these holes as small as possible. To this end, we must file small shanks on each of the bolts representing the cylinders so that the shanks only are fitted into the crankcase. See Fig. 3.

The valve guide rods and tappet covers for each cylinder are formed from smaller pieces of wire. Some engines have only one guide rod which runs vertically in front of the cylinder and one tappet cover on top of the cylinder. A single piece of wire bent over the top of the cylinder will suffice for this. In other types, two rods and covers are used on each cylinder, two wires, forming a V in front of each cylinder, with the upper end of each length bent over to form the rocker covers, are used in these cases.

When modelling sleeve-valve engines, remember that no valve rods or tappets are used.

Wire is also used for the induction pipes of each cylinder. These are normally short L-shaped lengths rising out of the crankcase and bending over into the cylinder. If the cylinders each have a separate exhaust stack, this will usually be on the top and another L-shaped length of wire soldered to the top of the bolt can be used.

On a 1/72nd scale model all these parts will be small and a pair of fine nosed pliers and fine tweezers will be found useful in the assembling of the engine. The holes for the smaller pieces of wire, such as the valve guide rods, can be made with the point of a needle or pin.

The second method is that of building up the cylinders on a crankcase that is separate from the fuselage or nacelle. This is a rather more trying business since the diameter of the crankcase will normally be small. The crankcase is shaped out first and a hard wood should be selected for this part. The section will be circular, and it is a good plan to file down a good length of wood to uniform circular section and from this length several engines can be made, the cylinders and various rods being built up on the end of the length of wood and cut off when each engine is complete. See Fig. 5. The system of



filing shanks on the cylinders for fitting to the crankcase will be even more necessary in this type of construction and great care will have to be exercised to prevent the wood from splitting. The shape of the front of the crankcase must be carefully copied from the original. A hole should be drilled through the centre of the crankcase to take the airscrew pin.

When fitting radial engines of the single row variety, one of the cylinders is always vertical on the top of the engine. With two row radials one of the cylinders in the rear row is vertical on the top.

Those modellers who have a flair for metalwork can, of course, file the crankcase out of metal and fit the cylinder shanks in with solder. The various rods being also soldered to the cylinders.

Exhaust collector rings are often fitted instead of separate exhaust stacks for each cylinder. These rings can be represented by a circle of wire fitted at the rear of the cylinders and to which can be soldered, if necessary, the tail pipes of the exhaust system.

If the model under construction is of an aeroplane that has its radial engine enclosed in a circular cowling, it will be advisable to make the engine separately. The cowling can then be made from wood or metal and fitted over the finished engine. Two types of circular cowling will be met with quite frequently. They are the Townend ring, a short chord cowling, and the long chord N.A.C.A. cowling, now the most widely used type. Both of these may be made either of wood or of metal.

When wood is used a block is cut to the required length and squared up to a size slightly larger than the outside diameter of the finished cowling. The outside diameter and the diameter of the circular front aperture are then marked on one end of the block with a pair of compasses and a hole, the size of the aperture, carefully drilled through the block from front to rear. See Fig. 6. The block is then carved to a circular section and the leading edge rounded over. Any gills on the trailing edge should be scored in. See Fig. 6. The small streamlined "bumps" over each cylinder position can be represented by pieces of thin cardboard glued on, and any exhaust pipes are made from wire and fitted into holes drilled in the leading edge of the ring. The engine is now fitted inside the ring and the whole assembled on to the model.

The Townend ring cowling is made in a similar manner. It is much shorter than the N.A.C.A. type and the diameter of the rear edge of the cowling is often smaller than the leading edge.

Both these types of cowling can, of course be carved integral with the fuselage block instead of being made and fitted separately. When they are made as part of the fuselage, the use of templates will be essential in order to secure a good circular shape throughout the length of the cowling. Where the shape of the fuselage immediately behind the cowling departs abruptly from the circular form, as in most cases it will, the modeller will, no doubt, find that a much more satisfactory result can be obtained by making the cowling separate.

Alternatively, these cowlings can be made of metal. A length of heavy gauge wire is bent into a circle of the desired diameter to form the exhaust ring in the leading edge of the cowling. A thin sheet of tin is then cut out and bent into circular form and the wire ring is soldered to one edge. See Fig. 7.

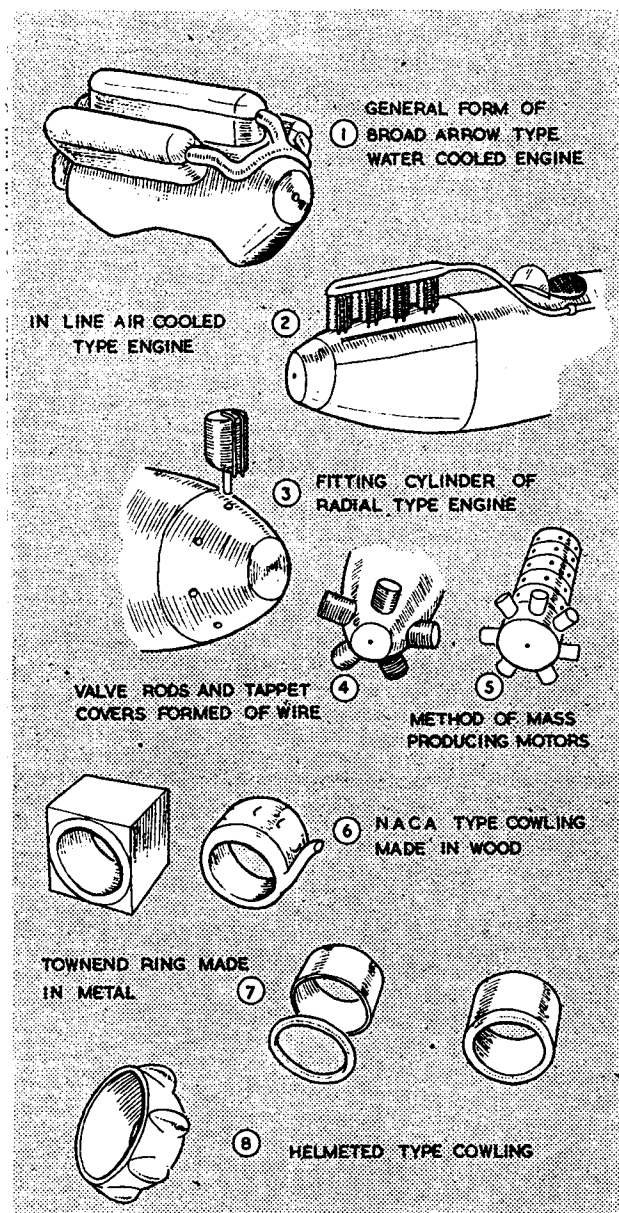
Some types of cowling have large "helmets" beaten out to accommodate the tops of the cylinders. This is seen on the cowlings of the Avro "Anson" and Airspeed "Envoy". Here the cowlings are best made of wood and a block sufficiently large is used so that the helmets may be filed out. See Fig. 8.

Before the radial type of engine was developed, the rotary type was used in large numbers. Many aeroplanes of the 1914-18 war period were fitted with rotary engines, two famous examples being the Sopwith "Camel" and the Avro "504-K" which latter survived for many years as a "joy-ride" aeroplane in the various Air Displays which used to tour the country in the summer months.

In these rotary engines, the cylinders were set round a central crankcase in the same way as a radial, but the whole engine turned round a fixed crankshaft, the airscrew being

fixed to the front of the crankcase. These engines, which will, of course, have to be made as separate units, are built up in a similar manner to the radial types. They were also normally enclosed in a cowling very much like the modern N.A.C.A. type, but since the cowling acted as a collecting ring for the exhaust, the bottom was usually cut away to allow the exhaust to escape below the fuselage. A metal type cowling is best used to represent this type on a model, the wire ring being bent so that it forms about 4/5ths of a complete circle. The engine must be constructed so that there will be sufficient clearance between the tops of the cylinders and the inside of the cowling to allow the engine to revolve freely.

Cowled engines of the N.A.C.A., Townend or Rotary variety may of course, be represented by merely carving the shape of the cowling out of the solid wood and eliminating the reproduction of the actual engine. This is a simple operation which only entails the shaping of the external form of the cowling. The front of the cowling should, however, be drilled out to a depth of about 1/8 inch to give a better effect and a small washer can be fitted in the centre as an airscrew seating.





**M**Y three readers will notice a slight difference in our highly technical series this month. We have had a break from our usual collection of little gadgets, and featured instead two only of a more complicated type which need more description and illustration.

First of the two is an extremely useful device that really merits the description of workshop equipment rather than just that of gadget.

Many readers, no doubt, have suffered with myself the tortures of the damned while engaged in the uncomfortable and often discouragingly unproductive task of attempting to bend bamboo or similar hardwoods to shape over a naked flame.

At last here is the answer. Away with all those old candle ends—stick them in the fire! Instead, get down to the job of dismantling an old cocoa tin and cutting from it the simple shape shown in the drawing. Bend this carefully to a smooth cone and rivet or bolt the overlapping flanges together. Cut the centre and rear brackets from thin sheet metal and bolt the cone to them, then screw the protective base plate and the feet of the brackets to the wooden base.

Use a spirit lamp or alternatively solid fuel of the "metaldehyde" type (known as solid meth). The die takes only a few moments to reach the required temperature. Test with a strip of bamboo by laying it gently on top of the cone, which if hot enough will cause the strip to soften where it is in contact with the metal, and bend of its own accord. Take care not to have too fierce a source of heat, or you will get the metal red hot and the wood will burn. Keep the wick low, if you use a spirit lamp, or if you use solid fuel a quarter of a normal tablet is quite sufficient for a die the size of that illustrated. Another point to watch if you are using solid fuel is to make sure that it is quite dry—if it is not and moisture is present the tablet will burn quite happily at first until the moisture turns to steam, whereupon it starts to get boisterous and throws liberal amounts of burning fuel for several feet around. I suffered in this way first time I tried it, so make sure you warm it gently before using it.

For larger or smaller curves move the wood correspondingly towards the wider end of the cone for the larger and in the opposite direction for the smaller. You are, however, by no means limited to circular shapes as almost any kind of curve may be duplicated by holding the strip at varying angles. Ellipses, parabolas, whirls and scrolls are all easily reproduced. Remember, though, if you want two members exactly the same such as wing tips, use a piece of bamboo the correct thickness but twice the width and then split it when bent (easily carried out with a sharp knife or razor blade) into the two desired parts. When bending it is always best to make sure of the curve by slight exaggeration, as on cooling the wood often expands slightly and the radius of the curve may decrease. Note. The drawing on the right shows the original die full size. The size shown is very convenient for small models but for models of any size a larger die should be constructed, the optimum size being about two and a half times that shown. It is unlikely that a tin will be found big enough to make the pattern and sheet tin, obtainable from most ironmongers, will have to be used. It also enables you to achieve a much greater range of radii. Be careful, however, as most hardwoods will not take too sharp a curve so do not work too near the pointed end.

Now we come to the second device which is designed to improve the stability of the flying wing type of machine.

The purpose of the auto-elevon was to obtain constant lateral stability on a tailless sailplane after flying trim had been obtained with the normal trim tabs.

The device itself consists of an elevon situated at the extremity of the wing, mounted on a piano wire shaft running in bearings in the wing. At the root of the wing the shaft is terminated by a pulley made of balsa (see diagram). The rest of the assembly consists of a second pulley (A) mounted at right angles to pulley (B) and fixed to a wire shaft as shown. The two pulleys are connected by a drive made of thread. At the end of the balance shaft there is a small lead weight and at its other end (inside the wing) the shaft is bent at right angles so as to engage with either of the two stops if the balance shaft should turn in either direction. The operation relies on the fact that if the machine banks to the right then the weight will fall to the right and in so doing will turn pulley (A) and pulley (B) and therefore will also depress the elevon and so bring the machine back on an even keel. Of course the thread drive must be put on the right way round, otherwise the elevon will operate in the wrong direction. The above operation applies in the same way if the machine banks to the left.

That then is very briefly the construction and the operation of the device, however there are one or two other points.

Firstly the "stops" are required, otherwise the balance shaft could turn too far round; it will be found that only a fairly small movement is required.

2. The pulley (A) is not actually at right angles to pulley (B) because pulley (A) must be mounted perpendicular to the ground, when the machine is at rest and pulley (B) will be at the same angle as the wing dihedral.

3. I found it advisable to fix the thread to both pulleys, in the case of pulley (A) with a drop of cement and with (B) with a small wire 'U' made from a pin, the latter can then be adjusted so that the relative position of pulley (B) to pulley (A) and therefore the elevon can be altered for the purposes of centralising the controls.

4. The angle in the balance shaft is really a matter of trial and error, but it must be greater than 90 degrees otherwise when the machine noses down the balance is liable to swing forward in either direction.

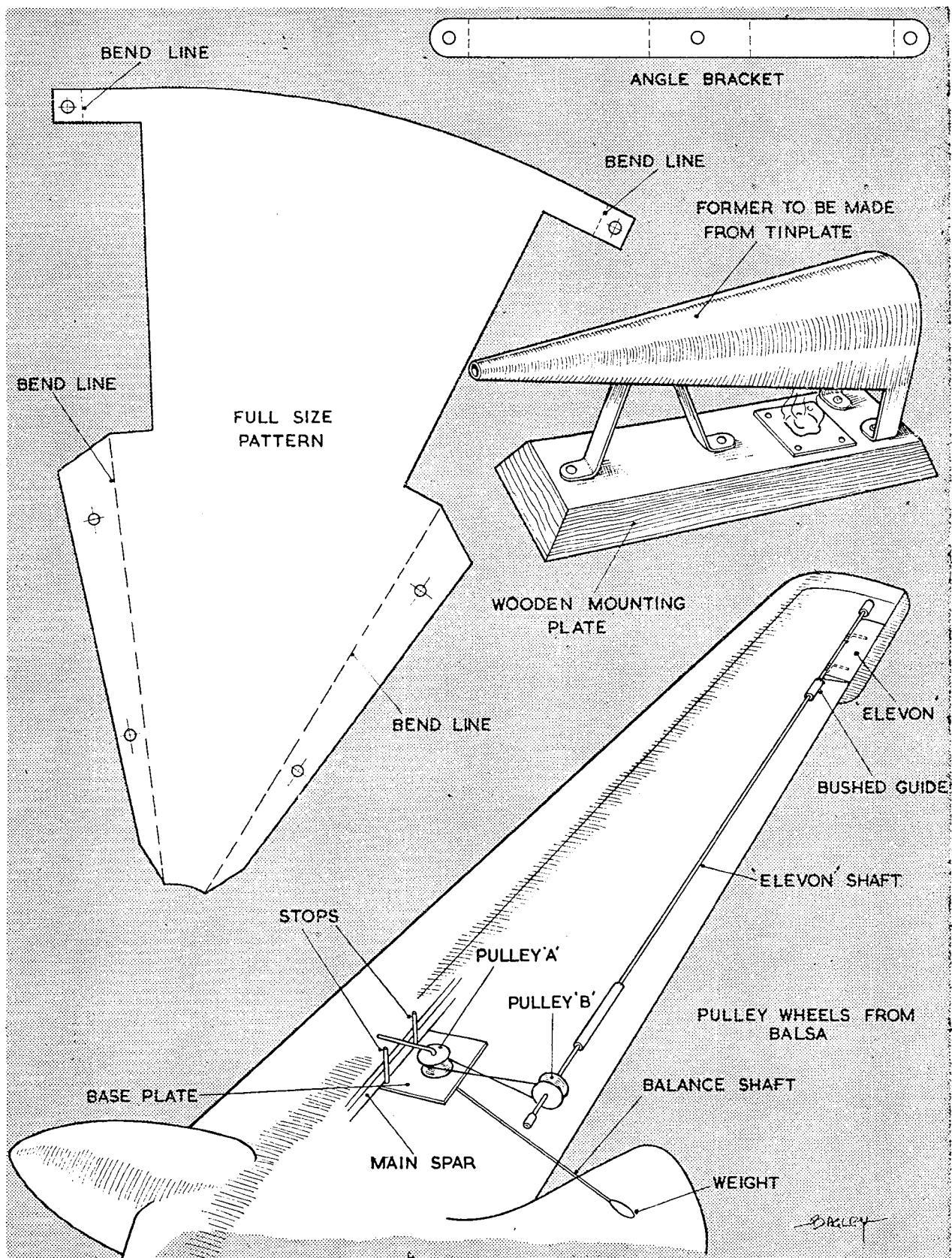
5. There are various parts of the assembly which could be altered, such as the length of the balance shaft outside the wing, therefore needing less weight, and vice versa, the ratio of pulley (A) to pulley (B) and also the area of the elevon itself.

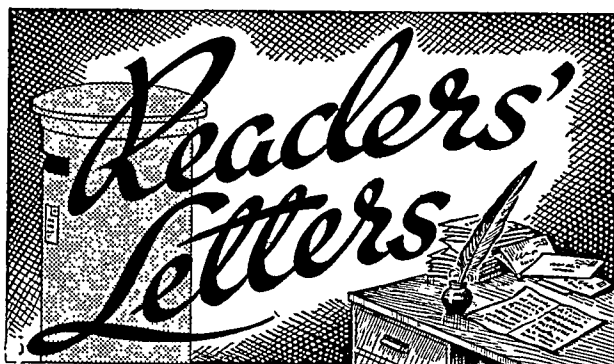
6. The action of the elevon is damped to a certain extent by the airflow over it, and could be further damped if required by placing a small fin on the weight on the balance shaft.

7. All bearings in the assembly must of course be perfectly free as the whole device depends for its sensitivity upon the ease of movement.

8. The reason for placing the main part of the assembly at the root of the wing (thus entailing a long shaft to the elevon) was so as to concentrate the bulk of the weight near the centre of the aircraft. The pulley assembly could no doubt be placed within the body of the aircraft, but in this case as the wings are of the detachable type it was decided against.

That is all for Ration Period 10—if you've any coupons left there'll be further supplies in June.





*The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.*

DEAR SIR,

On reading the article about tailless model design in the December '47 issue of the AEROMODELLER, I was prompted to take advantage of the author's invitation and give a few ideas of my own on the subject.

Firstly I must criticise Mr. Guilment in that he made a statement to the effect that "sweepback is essential" which seems to me to be leading design into the confines of stagnation.

Far from belittling his treatise, which on the whole is very helpful, I should like to point out that considerable success has been gained with straight and swept-forward-wings.

A moment's thought will reveal that sweeping the wing forward alters a good many of the design features which while holding true for swept back models must be essentially different in the other case. The first difference other than plan form is the use of *wash in* rather than the usual washout at the tips which gives us (in a similar manner perhaps) the necessary longitudinal dihedral for C.P. movement control. Again there is a difference in the type of wing section used. A far better L/D ratio and also better stability has been obtained by using a symmetrical aerofoil instead of the more usual high lift reflex TE and consequent high drag sections. Clark "Y" was tried but because of its inability to pull out of dives due to the greater lift at the wing centre, it was discarded in favour of RAF.30, which has proved quite satisfactory in flight tests.

I should be pleased to hear from those having access to wind tunnels regarding my theory, which is as follows:—

Taking into consideration the fact that the airflow over an aerofoil tends to turn, *i.e.* over the upper surface towards the centre and over the lower surface towards the tips of the wing, it will be seen that the upper air flow has further to travel before reaching the trailing edge than the lower airflow on a swept forward wing.

In order that reunion of these airflows will take place the upper must flow faster and thereby produce the partial vacuum featured in the normal lift theory. It is my belief that this is what makes the symmetrical aerofoil so efficient under these circumstances.

To pass on to fin positioning, it is found that the normal upright fin to the rear of the wing is quite satisfactory on the swept forward model, there being less possibility of blanketing than on a swept back type.

This position is also more desirable, for its escape from damage upon landing, than the underfin. Tip fins are a nuisance from the point of view of this last point, also for the fact that slight inaccuracies are magnified by the distance from the normal axis defeating their object of lateral stability.

In conclusion I should like to say how much I appreciate the advance of design in the tailless model sphere, which is no doubt partly due to the interest radiated from the pages of the AEROMODELLER.

Farncombe, Surrey.

CYRIL S. WEST.

DEAR SIR,

I found Mr. Guilment's article in the December AEROMODELLER very interesting, and as I have made some research with tailless sailplanes I feel in a position to reply.

Firstly Mr. Guilment makes several references to the Horton full-size tailless sailplane firm and he appears to

closely follow the full-size tailless doctrine. With tailless models this can be fatal, as the full-size machines have control surfaces and a pilot to control them, and I would especially emphasize this where the towlaunch is concerned.

On aspect ratios Mr. Guilment seems to favour from 10 to 15 which is high for a normal model, let alone a flying wing. I have found just what is required in the way of aspect ratio and have found an extremely low aspect ratio to be just the goods as far as stability is concerned, while not going so low as the A.P.S. "Floating Kidney". On my machines I have frequently used an A/R of 4.5:1 combined with a sweepback of 45 degrees and an angle of washout of 25°. Now, according to Mr. Guilment this breaks all the rules in existence, yet my model flies as stably as any orthodox model. I challenge any modeller to use this formula and see if his model isn't stable. I should add that the area of washout is 25% wing area and 3/8" dihedral is used for every foot of span. I think the explanation for the stability of this formula is that the large angle of sweepback gives the also large area of washout a good moment leverage plus the dihedral which gives additional lateral stability. No less than four fins were used, two small tip fins, one main central fin and a sub underfin of ply which also acted as a skid. The wing section used was Clark Y.

Mr. Guilment's principles of construction seem sound enough and I agree that the tongue and box wing fixing is certainly required but as for his sparless wings I entirely disagree. Any sailplane needs a spar, as a study of wing loads will tell you. In his conclusion Mr. Guilment states that if everybody pools their ideas the perfect layout may be reached. Well, try my theory, and I guarantee I have done something towards the perfect model.

Totternhoe, Beds.

C. A. BATES.

DEAR SIR,

Mr. Halifax in article VI of Aerodynamic Design suggests that Model Engineers talk through their hats, I think he would do well to remember the old proverb about the kettle calling the pan. In article V he quotes for the velocity of the blade element the formula:

$$V_e^2 = 0.1333n^2R^2 + V_d^2$$

May I enquire where the constant 0.1333 appears from. He uses the figure 14<sup>2</sup> apparently for R<sup>2</sup>, surely the 14 is the diameter and if he arrives at a ft./sec. result it should be in feet. In spite of using these corrections to his constant it still works out at approximately 1.60.

The radius used, *i.e.* 7 ins., gives the tip radius, I always understood the radius used in airscrew calculations was .75 × tip radius where the blade is at maximum width and efficiency.

Further in article VI Mr. Halifax quotes a lengthy expression for the blade area and proceeds to get all tangled up. He quotes Cd as .2 and it should be .02 but even with the expression corrected arrives at an answer which appears to have no relation whatsoever to the mathematics. If he takes the trouble to work it out as stated he will arrive at the ridiculous figure of 0.713 square inches blade area.

As the expression for thrust (which is used to obtain the efficiency) is dependent on S, the blade area, why is he surprised when the efficiency comes out at 39 per cent. instead of 85 per cent. The expression for blade area is inversely proportional to V<sub>e</sub><sup>2</sup> so surely the best thing to do is to decrease the diameter and increase the blade area.

Apart from theoretical errors who is going to fly a plane with the abortion of a propeller as drawn mounted on the front. One flight and the prop would be smashed. Please Mr. Halifax, temper thy theory with practice.

Mr. Halifax consoles we pen-knife slashers by saying the designed airscrew will be about four times as efficient as our valiant efforts. I wonder how modellers manage to keep their stink wagons airborne let alone produce a terrific climb.

Barnsley.

A. ELLIOTT, S.I.Mech.E.





BY OWEN G. THETFORD

*The Short Sealand ten-seater amphibian.***Hunting Hollanders.**

Recently placed in service with the Royal Netherlands Air Force is a batch of eleven Percival Proctor aircraft. The batch is comprised of one Proctor III and ten Proctor IVs, and all the aircraft have been reconditioned for service with the Dutch after being declared redundant by the Royal Air Force.

The Dutch Proctors were built under sub-contract by F. T. Hill and Sons, Ltd., at Trafford Park, Manchester, between December, 1942 and November, 1944. They are silver-doped and display the usual Dutch military insignia on wings and fuselage. The Royal Netherlands Air Force serial numbers are from W.1. to W.11 inclusive, the numbers being painted in black on the rear fuselage. The Proctor III is W.1 and was formerly numbered HM 365 in the R.A.F. The old R.A.F. serial numbers of the ten Proctor IVs are as follow:—W.2 (NP 158); W.3 (NP 162); W.4 (NP 166); W.5 (NP 192); W.6 (NP 213); W.7 (NP 241); W.8 (NP 272); W.9 (NP 283); W.10 (NP 348) and W.11 (NP 360).

**Swiss and Swedish Vampires.**

De Havilland Vampire jet-propelled fighters proved a great success in both Swiss and Swedish Air Forces. New contracts for later types of Vampire to both countries are in hand.

In the Swedish Air Force seventy Vampire I fighters are already in service with Fighter Wing F.13 under the Swedish designation J.28. These aircraft were delivered by air to Sweden within the space of eighteen months, commencing in 1946. The new contract is for the Vampire III, as now entering R.A.F. squadrons, and an even greater number of aircraft has been ordered. These latest Swedish Vampires have long-range tanks in the wings and are equipped for rocket-projectiles or bombs beneath the wings for ground attack duties. The Goblin engines will be built under licence in Sweden.

Following successful Service trials with a flight of Vampire I fighters delivered in the summer of 1946, the Swiss Air Force has placed an order for seventy-five Vampire VI fighters, fitted with a late Mark of Goblin engine and equipped like the Swedish version for ground-attack duties.

**Short Sealand.**

First new aircraft type to be completed at Short Bros. Belfast factory, the Short Sealand ten-seater amphibian prototype made its first test flight on 22nd January, 1948.

Displaying the civil registration letters G-AIVX, the Sealand is powered by two 350 h.p. Gipsy Queen 70 motors, has a wing span of 59 ft., a length of 42 ft. 2 ins. and a loaded weight of 8,700 lb. The maximum speed is 174 m.p.h., the cruising speed 127 m.p.h. and the initial rate of climb 815 ft. 1 min. The range is 700 miles and the service ceiling 21,600 ft.

As we write, the second prototype Sealand, a Mk. II fitted with Alvis Leonides motors, is nearing completion.

**U.S. Navy Code Letters.**

For just over a year now, a new system of unit identification lettering has been in force on United States Navy, Naval Air Reserve and Marine Corps aircraft.

The code letters are painted three feet high on the fin and rudder, above the starboard wing and below the port wing, appearing in white on aircraft camouflaged the standard "Midnight Blue" and in black on aircraft with natural aluminium finish or silver doped. Additionally, each aircraft is assigned an individual recognition number which is painted ahead of the star insignia on the fuselage, and again juxtaposed with the unit lettering above and below the wings.

Aircraft at sea with the carriers carry the initial letter of the carrier's name, or the first two letters if there is any danger of confusion with another vessel. Marine Corps aircraft aboard carriers are distinguished by means of a horizontal white bar beneath the tail letters.

Shore-based patrol-bomber squadrons organized as Fleet Air Wings carry two letters, one to indicate the Wing and the other the Squadron.

Scouting seaplanes carried aboard battleships and cruisers carry two letters, the first to indicate battleship or cruiser by "B" or "C" respectively and the second to indicate the squadron to which the aircraft belongs, one squadron of scouts being spread over several ships.

Marine Corps aircraft carry two letters, the first to indicate the Wing and the second the Squadron.

Naval Air Reserve aircraft differ from the rest in having the second letter of the group indicative of the class of aircraft ("F" Fighter, "A" Attack, "R" Transport, "T" Trainer, etc.) instead of the squadron. As mentioned in an earlier issue, Reserve aircraft are additionally identified by means of an orange band encircling the fuselage amidships.

The letters on carrier-borne and scouting aircraft are self-explanatory and are observed on Corsairs, Tigercats, Hellcats, Phantoms, Fireballs, Skyraiders, Maulers and Seagulls.

Fleet Air Wing markings on Privateers, Neptunes, Mercators and Mariners are as follow:—Initial letter "A" (F.A.W.1); "B" (F.A.W.2); "C" (F.A.W.3); "D" (F.A.W.4); "E" (F.A.W.5); "H" (F.A.W.7); "L" (F.A.W.10); "M" (F.A.W.11); "S" (F.A.W.14) and "W" (F.A.W.18).

Marine Corps Corsairs, Tigercats, Hellcats, Maulers, Harpoons, Mitchells, Commandos and Dakotas are identified by Wing according to the following initial letters:—"A" (First Marine Aircraft Wing); "B" (Second Marine Aircraft Wing); "P" (Fleet Marine Pacific); "W" (Marine Air West Coast); "L" (Marine Air Atlantic); "E" (Cherry Point Base).

Naval Air Reserve Corsairs, Hellcats, Helldivers, Avengers, Harpoons, Catalinas, Ducks, Dakotas and Texans are identified by Base according to the following initial letters:—"B" (Atlanta); "C" (Columbus); "D" (Dallas); "E" (Minneapolis); "F" (Oakland); "H" (Miami); "I" (Grosse Ile.); "J" (Jacksonville); "L" (Los Alamitos); "M" (Memphis); "P" (Denver); "R" (New York); "S" (Norfolk); "T" (Seattle); "U" (St. Louis); "V" (Glenview); "W" (Willow Grove); "X" (New Orleans) and "Z" (Squantum).

## AIRCRAFT DESCRIBED No. 6.

The Fairchild 24W-41A.  
**ARGUS**



THE Fairchild Type 24, one of the most popular types of personal aircraft in the United States since the middle nineteen thirties, made its first appearance in Europe in 1936. The first Type 24 to be registered in Great Britain was G-AECO, belonging to a Mr. Campbell Shaw at Castle Bromwich. Known as the Fairchild 24.C8-6, it differed from present day machines in that it had a somewhat smaller cowl with helmets over each rocker box assembly, the outline of the fin was slightly rounder, and the wheels were housed in a pair of large streamlined spats.

Three other machines were registered thereafter at regular intervals—G-AEQU, G-AFFK and G-AFKW, and but for the intervention of war it is quite likely that the Fairchild would have become a very popular mount for the family man private owner.

When war broke out, the four existing machines were impressed into the R.A.F., where, in the Winter of 1941, they were joined by the first arrivals from the United States of a batch of 800 Type 24 W.41, or C.61's in Army parlance, supplied on lease-lend agreement with that country.

The service version of the 24 became known as the Argus I, and although a number of them were used on communication duties with Ferry Command, the Argus will always be remembered in connection with its commendable service with A.T.A., to which it became the standard light hack machine for the transport of ferry pilots from the ferry pools to contractor's aerodromes, etc., in place of the assortment of British light aircraft used during the first years of the war.

Although slightly underpowered the Argus I could cope quite happily with a load comprising four persons with parachutes and kit from any aerodrome of reasonable size.

Batches of Argus I and II machines were allotted the serial numbers EV.775 to 808, FK.316 to 358, HB.592 to 722, and HM.166 to 177.

With the gradual closing down of the A.T.A. pools throughout the country in the Summer and Autumn of 1945, a great many of their Argi were flown up to Dumfries for long term storage, pending their ultimate return to the U.S.A. upon the cessation of lease-lend.

Following a purchase agreement with the U.S.A. in 1946, a

BY E. J. RIDING

few firms, that of the late G. A. R. Malcom at White Waltham in particular, undertook the work of converting several batches of these aircraft for civilian use, and in one or two cases Argi forming the equipment of No. 1 Ferry Pool at White Waltham have actually found their way "home" so to speak, now serving with the West London Aero Club at that aerodrome.

Altogether 43 Argi have been registered in Great Britain to date since October, 1946, most of them appearing in ones or twos, but a batch of nine, running consecutively from G-AJOW to G-AJPE were supplied to the Home Counties Aero Club at Willingale Airport near Chipping Ongar, Essex. Butlin's Holiday Camps have also acquired a small batch in which they have been giving joy rides to their customers at various seaside resorts.

**Construction :** The fuselage comprises a basic structure built up from square section steel tubes to which are attached light spruce and plywood formers and stringers, over which is laid the fabric covering, the cross sectional shape changing from a circular one at the engine bay to a vertical knife edge at the fin post. The wings are of orthodox wooden construction having spruce spars and ribs, ply leading edge and fabric covering. The tailplane and fin are of similar construction with plywood covering, whilst the rudder and elevators are all made from steel tube with fabric covering.

Metal split type trailing edge flaps are fitted to the portion of the wings inboard of the aileron gap. The external wing bracing struts are made from streamlined section steel tubes. A 30-gallon fuel tank is situated in each wing root between the front and rear spars.

**Power plant :** One 165 h.p. seven cylinder air-cooled radial Warner Super-Scarab.

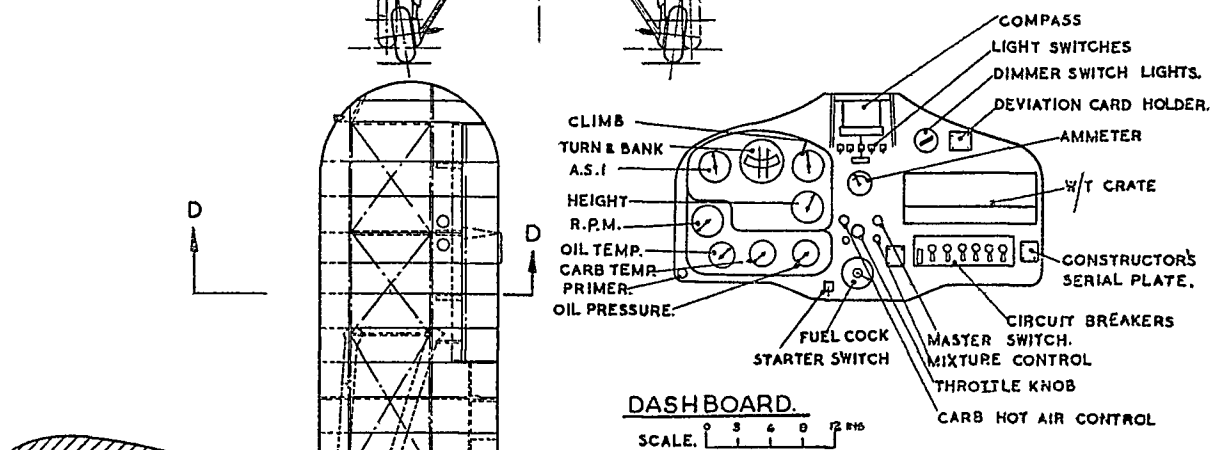
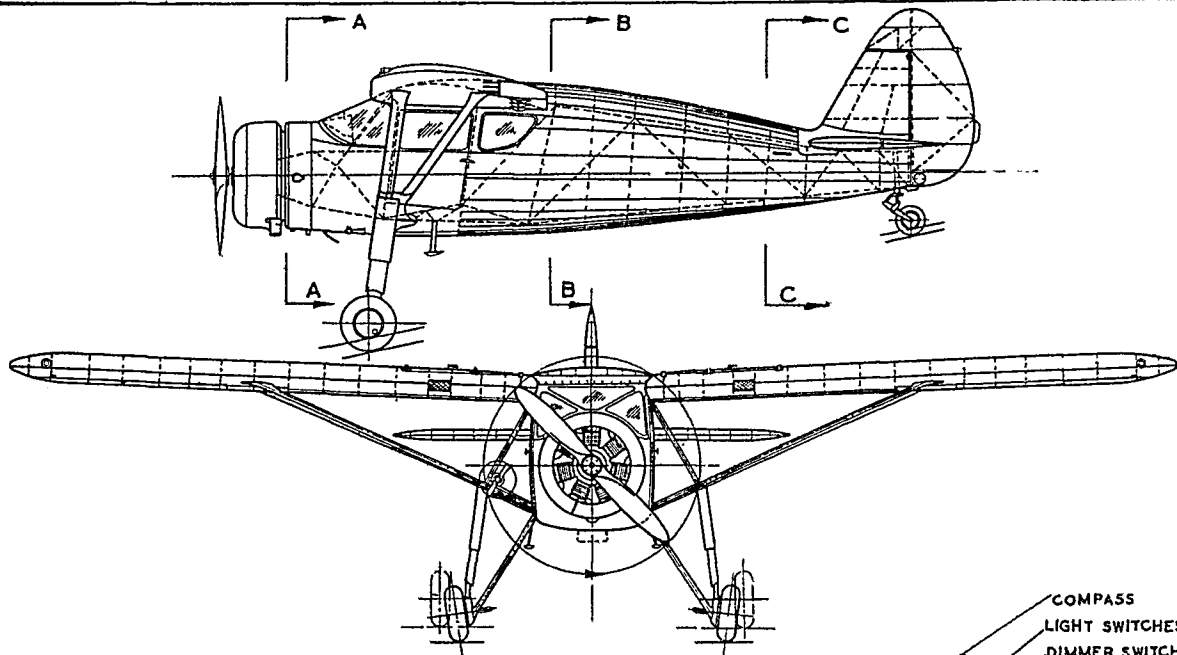
**Colour :** Machines belonging to the Home Counties Aero Club, as shown in our photograph of G-AJOW, are aluminium all over with crimson letters on wings and fuselage. G-AIXM shown in the heading photograph is crimson all over with cream letters on wings and fuselage. At the time the photograph was taken it belonged to Mrs. Noreen Dimpfl and was kept at Denham.

**Specification :** Span : 36 ft. 4 ins.; length: 23 ft. 9 ins.; height : 8 ft.; wing area : 174 sq. ft.; tare weight : 1,482 lbs.; loaded weight : 2,560 lbs.; max. speed : m.p.h.; cruising speed : 110 m.p.h.; landing speed : 50 m.p.h.; ceiling : 15,700 ft.; range : 720 miles,

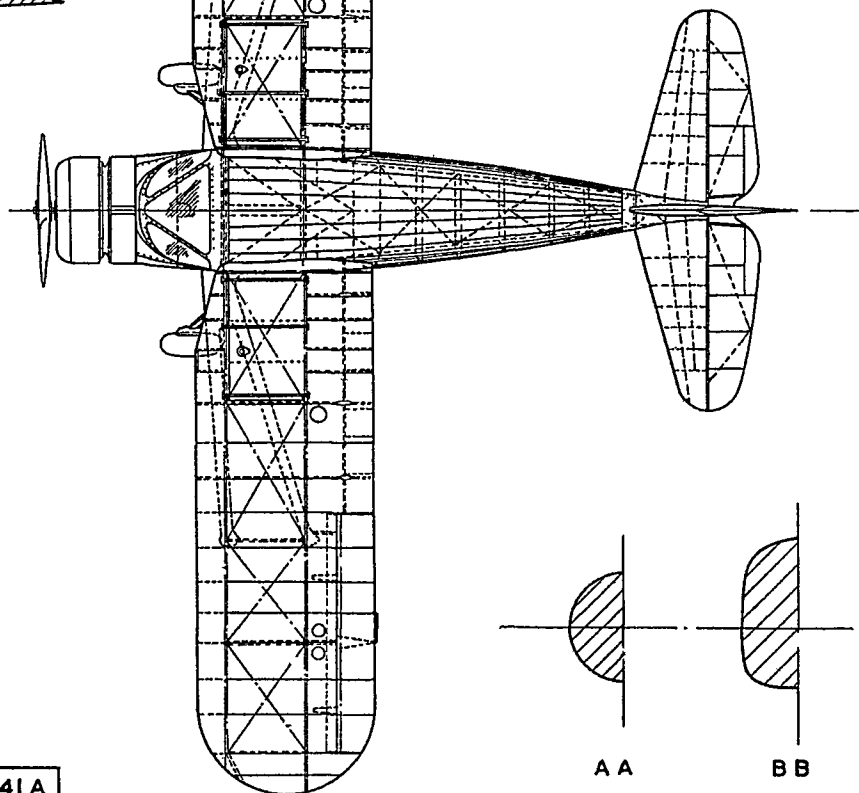
$\frac{1}{4}$  in. to 1 ft. reproductions of the G.A. drawing may be obtained, price 1/—, from our Leicester Office. Sets of four different flying or ground views of the Argus, size  $6\frac{1}{2}$  ins.  $\times$   $4\frac{1}{2}$  ins., price 6/—, from Eaton Bray Studios.

Aeromodeller Photos.





DD

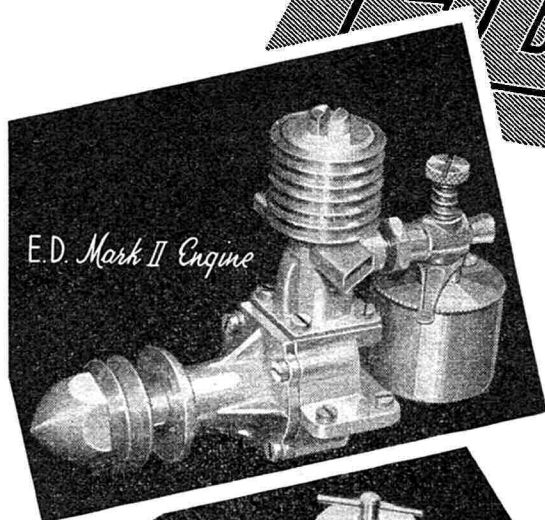


A A

B B

C C

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Hole centres for Engine bearers  $\frac{9}{16}$  in.  $\times$   $1\frac{1}{8}$  in.  
Flywheel 10/6

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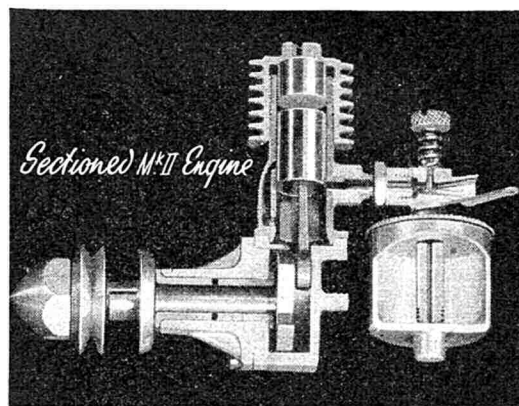
Bore  $\frac{1}{2}$  in. Stroke  $\frac{5}{8}$  in. Width  $1\frac{7}{8}$  in. Length 4 in.  
Height 3 in. R.P.M. 8500. Static Thrust 23 ozs.  
Hole centres for Engine bearers  $\frac{9}{16}$  in.  $\times$   $1\frac{1}{8}$  in.  
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Irish eyes were smiling when this group of the Belfast M.F.C. assembled at their annual rally last year.

## Club News

BY CLUBMAN

**H**ECTIC indeed have been my journeyings since I last penned these notes, and the staff now whistle a version of "Much Binding" when I show my presence at the office, which I am told goes something like "Much trav'ling round the Clubs—we wonder how he gets his bloomin' work done!" With two Council meetings, Northern Heights dinner, a social at Coventry, indoor Rally at Manchester, giving Sywell Aerodrome the once-over in readiness for the Nationals, chinwag with a whole bunch of clubs at Derby, Area meeting at Worcester, Lecture to the Leicester lads, and a further one to a Naval Air Station club at Bramcote—I've hardly had time to take my boots off! (The better three-quarters claims to have found the answer to the book title "Why husbands leave home".)

However, I find it stimulating to get around and find out first hand just what makes this hobby of ours fire on all cylinders. The enthusiasm to be found in every branch of the sport is unbounded, and I found everyone only too anxious to know what was happening in other quarters, and a steady pursuit of new ideas.

Space—plus the spate of reports usual at the beginning of the "active" season—prevents more than a general mention of many important matters, but for the keen contest fan, let me announce that the new 1948 S.M.A.E. Handbook is now available, and at that well before the commencement of the contest season! Full competition rules of both general and individual type are included, and I recommend those interested to send in their orders to the Secretary at Londonderry House, Park Lane, W.1., right away.

Reference to the list of current British Records will disclose plenty of scope for record attempts this season, and I hope that I will be kept busy in my official capacity looking after this important inventory. The new F.A.I. formulæ are as near as dammit unrestricted, and no keen modeller should find the regulations too irksome. Undoubtedly additional classes will require introducing, but the current list is brought in as meeting as near as possible the necessary sections without getting too top heavy.

The various Areas have been busy this past month, and first report is from the **SOUTH EASTERN AREA**, centred on Eastbourne, Their A.G.M. was well attended, and the Society's Chairman, Mr. A. F. Houlberg, was on hand to give any assistance and information required.

The **NORTH EASTERN AREA** also concluded an A.G.M. and staged an indoor contest, successful clubs being Stockton and Blydon, Chambers of the former club putting up best time of the day with a flight of just over 2 minutes.

The **MIDLAND AREA** Indoor Rally, staged at Leicester on the 8th February, saw some good r.t.p. flying by B. Roberts of the Coventry club, and some engine starting that would really shake any contest director—if such prowess can be repeated on the field! I had the doubtful pleasure of timing the engine starting event, and in a number of instances the lowest time I could record was that taken to do a quick "one-two"

on the knob. D. S. Hall, the winner, only took 5.1 seconds to start up six times—and the first was from cold! Full results were:

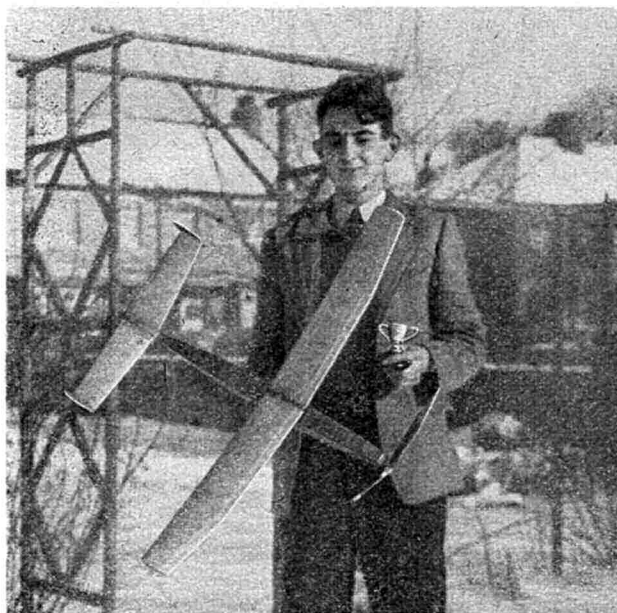
<b>CLASS "A" R.T.P.</b>	B. Roberts (Coventry)	556.4 agg.
	S. Wade (Loughboro')	121.2 "
	R. Godden (Coventry)	67.3 "
<b>CLASS "B" R.T.P.</b>	R. Adamson (Derby)	97.3 "
	J. Blore (Avro)	42 "
<b>ENGINE STARTING</b>	D. S. Hall (Leicester)	5.1 total
(6 starts)	E. M. Smith (Leicester)	7.3 "
	B. E. Smith (Leicester)	7.6 "

Hall's times were 1.6, 1.1, .9, .5, .5, and again .5. Engine was a Forster.

In bitter weather, I travelled up to Manchester to witness the Inter Area Indoor Rally staged by the **NORTH WESTERN AREA** in conjunction with the "Daily Dispatch". Teams from London, Scotland, and both the Northern and N.W. Areas competed in a class "A" r.t.p. event which produced some exceptionally fine durations, but the Hall/Knight/Mayo/Wingate team from London took home the trophy with a clear margin. Good consistent flying won the day, and only two of their twelve flights were below the three-minute mark. Mick Hetherington of the Northern Area carried off the kudos for top time of the day when flying in the individual event, his duration being 4:39. McCoy of the N.W. team had bad luck when his model slipped the hook and landed on a ledge at the top of the hall, this upsetting the trim of a consistent model. Flight times in full are given as a comparison for clubs who indulge in the featherweight activity, and the close times of some contestants will be noted.

<b>CLASS "A" INDIVIDUAL</b>				
M. A. Hetherington (Doncaster)	260	279	539	agg.
R. Musgrove (Oldham)	249	228.6	477.6	"
C. E. Exley (Sheffield)	240	22.5	465	"
R. McCoy (Oldham)	155	202.5	357.5	"
C. D. Helliwell (Doncaster)	175.5	175	350.5	"
P. Montgomery (Kirkcaldy)	187.8	160	347.8	"
<b>INTER AREA TEAM EVENT</b>				
<b>LONDON</b>	Wingate 228.8	264	272.9	
	Mayo 206.5	220.6	239.5	
	Knight 216	223	223.2	
	Hall 171.7	196.4	171	Total 2633.4
<b>NORTHERN</b>	Hetherington 235.9	248.3	193	
	Exley 215.6	217.6	206.5	
	Muxlow 150.6	150.9	173	
	Helliwell 164.5	141.7	126	Total 2223.6
<b>SCOTLAND</b>	Morrison 141.6	214.2	194.5	
	Montgomery 183.8	171.9	178.5	
	Wedderspoon 164.5	175	168	
	Robertson 141.3	25	41	Total 1799.3
<b>NORTH WESTERN</b>	Musgrove 230.6	246.7	25.5	
	McCoy 6	172	174.4	
	Moffitt 136	118	85.2	
	O'Donnell 171	158	—	Total 1523.4

The **LONDON AREA** indoor flying is carried out on a "league" system, Northern Heights, Hayes, Harrow, North Kent and Regent's Park still being in the running for this year's honours. The recent A.G.M. saw all officers re-elected with the exception of Press Sec. Buxton, which is a pity. His bulletins were amusing reading, even though I hear rumours



Alan Brown and his "Solution," winner of the Beverley M.A.C. Concours d'Elegance. How refreshing to see a Concours winner that obviously flies!

that he was vaccinated with a triple strength dose of Virus Americanese!

The MERSEYSIDE M.A.S. (of which I have just had the honour of being made an honorary member) has provisionally fixed its Annual "Clwyd" Slope Soaring meeting for July 4th. Another slope soaring ground at Newquis and Sealand Aerodrome will be used for general club flying. Mr. Gosling was winner of the Senior Championship Cup for 1947, Reg Aviard being the Junior champ.

For a change, here's a spot of news regarding outdoor flying from the WAKEFIELD M.F.C. W. Dennison put up a flight of 3:17.6 with his rubber-powered job, while E. Ramsden's sailplane clocked 2:10.8. Both these flights were made in January in poor weather.

Distinguished guests at the NORTHERN HEIGHTS M.F.C. dinner included Lord and Lady Semphill, though deep regret was expressed at the absence of Robert Kronfeld who should have been in attendance, but was killed a few days earlier. A goodly array of trophies was presented, and a special presentation went to Secretary H. R. Turner, making him a life member of the club in recognition of his unstinting services. Light entertainment included a spot of "hot jive" by the clubs own dance band, including some really slick "saxophonizing" by our old friend Henry J. Didn't know you had it in you Henry—or was it better to get it out of your system?

The SCUNTHORPE M.A.C., suspended during the war, has come to life once again under the secretaryship of Mr. L. Trotter. A club room, a fair-sized flying field has been procured, but the only thing missing is the secs. address! Send it along L. T. so that you can be entered on our records, and would-be members know where to find you.

A. J. Barr took two pots at the COVENTRY & D.M.A.C. social and dance, these being the President's Trophy and the Points Cup. B. Roberts also carried off two cups, with J. Barrel the holder of the remaining item. I and the wife had a very enjoyable time at this affair, which was enlivened by the attendance of a contingent from the H.M.S. Gamecock club. You should see some of those sailors' legs—as demonstrated in certain fun and games held during the evening!!

The MERSEYSIDE REGIONAL COUNCIL OF M.A.C.'s, now under the chairmanship of Mr. A. Molyneux of Wallasey, has recently held a series of meetings for development purposes in connection with the movement, both for indoor and outdoor flying. A new cup has been kindly presented by the East Liverpool M.A.C., to be known as the "Elmac" Cup, and will be for all-the-year-round competition by affiliated clubs.

R. C. Woodley of Woolbrook, Sidmouth, Devon, heartily appreciates the system for Wakefield Team selection suggested in the February issue of Club News, and since adopted by the S.M.A.E. He is anxious to get a club started down there, but would appreciate anyone looking him up should they happen to be in the district.

The SHEFFIELD & D.S.M.E.E. is holding its Fifth Exhibition from the 31st March to April 3rd inclusive, at the Central Technical School, Leopold and West Street, Sheffield. Entries will be welcomed from other clubs and lone hands, entry forms being obtained from Mr. W. J. Hughes, 87, Hopedale Road, Frecheville, Sheffield.

The control line bug has bitten the HACKNEY M.A.C. boys, fifty per cent. of the members having had a go. Some find it boring, others wish there were 48 hours in a day.

SOUTHAMPTON M.A.C. cleaned up both the Eastleigh and Portsmouth & D. clubs in r.t.p. contests. A total of 740.6 was piled up against the Eastleigh score of 501, while no less than 1044.3 topped the Portsmouth total of 933.6. The S.M.A.C. "Digest" still remains probably the best of club mags that reach these offices. Congratulations.

Competition for the "Evening Express" Challenge Cup, staged by the ABERDEEN M.A.C. brought out some extremely interesting and well-made indoor models, which did great credit to Scottish modelling. Considerably more microfilm types were entered than before the war. Placings were as follows:

1. A. Mackensie	(Aberdeen)	251.2 agg.
2. P. Montgomery	(Kirkcaldy)	182.5 "
3. J. Davidson	(Aberdeen)	118 "

The BLACKHEATH M.F.C. Brains Trust has reached some conclusions regarding the Amateur v Professional teaser, and it is generally agreed that the Pro's enjoy no great advantage except in power contests, where the best of engines are at their disposal before marketing. The club's annual Gala Day will take place this year on July 18th on Epsom Downs, near Tattenham Corner. Three comps. will take place, for r.o.g. Rubber, Glider (328 ft. line) and Power with 20 secs. maximum motor run. Full particulars can be obtained from Secretary G. Hinkley, 15, Coleraine Road, London, S.E.3.

June 13th is the date set aside for the WEST ESSEX AEROMODELLERS for the first British All Control Line meeting. (Ground was given as Fairlop, but in view of the fact that this ground is now a thing of the past for aeromodellers, some other site will have to be found.) Events will include senior and junior stunt classes, and all four S.M.A.E. speed sections.

The BEVERLEY & D.M.A.C. are holding a Rally on July 11th commencing at 11 a.m. Comps. will be for Power, Rubber and Glider, entry forms obtainable from R. Skinner, 20, Norwood, Beverley, E. Yorks.

The LIVERPOOL M.A.S., after a lapse of activities, is now on the way to its pre-war strength and enthusiasm. Power models are in the majority, and with a four-hour repair service for crankshafts, etc., is likely to remain so!

A very successful exhibition was staged recently by the BARKING M.A.C., when Mr. H. J. Nicholls judged the models and presented the prizes. First place in the sailplane section went to C. R. Mitchell's "Sirocco", P. W. Barrett's "Flying Minutes" took honours in the rubber driven class, and a "Gee Bee Super Sportster" took honours in the power class for R. S. Martin. Club records are:

R.O.G. Rubber	P. W. Barrett 5:29
H.L. Rubber	P. W. Barrett 6:24
Wakefield	W. R. Barrett 2:06
F.A.I. Glider	G. R. Mitchell 7:15
Light Glider	R. E. Brown 6:47
Open Power	P. W. Barrett Ratio 50-1

Pen pals are wanted this month by three sources, one home, and two away. R. C. Gill of 1, Plymouth Road, Totnes, Devon, thinks it would be a good idea if modellers from his district could contact modellers in the North, and welcomes letters. Louis Zook of Rural Route 5, Franklyn, Indiana, U.S.A., is

sure that if the two countries only realised that models are built to suit the particular conditions of each country, we should understand each other better. He would like to correspond with aeromodellers over here, as also would S. Soundar-anayagan, 33, Campbell Avenue, Maradana, Colombo 9, Ceylon. And so, having worn the first joint off each of my number one digits (yes, I'm a two finger wizard on the typewriter) I find that my time is up, and it's goodbye for another month. Time flies always, but my models only sometimes! Cheerio till next month, and don't forget those Wakefield models.

The CLUBMAN.

#### NEW CLUBS

**SOUTH LONDON CONTROL LINE. F.C.**  
N. Sherrell, 123, Lee Road, Lee Green, London, S.E.3.  
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S. L. Hall, 12, Royce Road, Spalding, Lincs.  
**KENTWORTH M.A.C.**  
F. C. Robertson, 11, Southbank Road, Kenilworth, Wars.  
**WEST LONDON CONTROL LINERS.**  
E. M. N. Cairnes, 159, Sloane Street, London, S.W.1.  
**BRIGHTON & D. CONTROLLED FLIGHT M.A.C.**  
Miss K. M. Martindale, 32, West Hill Road, Brighton, Sussex.  
**PHOENIX M.F.C.**  
G. Elliott, 31, Creswicke Avenue, Hanham, Bristol.  
**LIZARD M.A.C.**  
F. D. L. Burley, "Gue Graze" The Lizard, Cornwall.  
**A.T.O. NO. 1 (F) SQUADRON M.A.C.**  
K. Marlow, A.T.O. Headquarters, Oxford Street, Leicester.  
**TIMPERLEY & D.M.F.C.**  
R. Evans, 66, Bloomsbury Lane, Timperley, Cheshire.  
**BY-PASS (SUTTON) MODELLERS.**  
W. J. J. Buckley, 211, Collingwood Road, Sutton, Surrey.

#### SECRETARIAL CHANGES

**AVON M.A.C.**  
E. J. Bryant, 40, Furber Road, St. George, Bristol.  
**MANGUNIAN M.A.C. (Formerly Thermal Thieves).**  
G. Boyle, 51, Dargal Street, Clayton, Manchester.  
**RAVENSBOROUGH M.F.C.**  
J. A. Aldis, 48, Park Road, Bromley, Kent.  
**YORK M.A.S.**  
F. R. Fox, 42, Middlethorpe Drive, Dringhouses, York.  
**TORBAY M.C.**  
G. C. Long, 16, Third Avenue, Daison, Torquay.  
**SOUTHEAST SENIOR M.A.C.**  
R. A. Chowns, 125, Manners Way, Prittlewell, Essex.  
**WATFORD M.A.C. (Formerly Wat ord Aeromods).**  
C. G. Taylor, 51, Woodland Drive, Watford, Herts.

#### REVISED SCHEDULE OF BRITISH NATIONAL RECORDS As at February 1st, 1948

		OUTDOOR		TIME min. secs.
	CLASS		HOLDER	
RUBBER DRIVEN	Monoplane	J. Wingate	31 32.2	
	Biplane	K. Young	31 05	
	Wakefield	R. Copland	27 56	
	Canard	D. Paveley	1 37.1	
	Scale	N. Marcus	5 21.75	
	Tailless	A. H. Boys	1 24.5	
	Helicopter	R. H. Warring	21.4	
	Rotoplane	S. R. Crow	39.4	
	R.O.W. Float type	R. Parham	8 55.4	
	R.O.W. Flying Boat	M. Rainer	1 09	
SAIL- PLANE	Tow Launched	R. Minney	43 03	
	Hand	G. D. Peckett	6 57.5	
	Tailless Tow Launched	S. Kay	7 30.5	
POWER	Tailless Hand Launched	—	—	
	Class "A"	—	—	
	Class "B"	—	—	
	Class "C"	A. T. Frazer	16 25	
	Tailless	—	—	
	Scale	—	—	
	R.O.W. Float type	D. A. G. Bellinger	1 08	
	R.O.W. Flying Boat	N. Gregory	2 08.5	
CONTROL LINE (Speed)	Class I	—	—	
	Class II	—	—	
	Class III	—	—	
	Class IV	—	—	
		INDOORS		TIME min. secs.
	CLASS		HOLDER	
FREE FLIGHT	Hand Launched Stick	R. Copland	18 52	
	R.O.G. Stick	R. McKenzie	8 42.2	
	Hand Launched	D. Gilbert	6 44.4	
	R.O.G. Fuselage	D. Gilbert	4 33	
	Hand Launched Tailless	—	—	
	R.O.G. Tailless	—	—	
	R.O.G. Helicopter	R. McKenzie	1 33	
	R. O.G. Rotorplane	L. Mawby	32.2	
R.T.P.	Class "A"	R. Rock	5 54.4	
	Class "B"	R. Parham	4 04	
	Speed	—	—	

#### NEWPORT & D.M.A.C.

J. Bowdler, 46, Lewis Street, Newport, Mon.  
**UPLANDS M.F.C.**  
J. F. Sutton, 92, Hadyn Avenue, Purley, Surrey.  
**STOCKTON & D.M.F.C.**  
R. J. Raper, 9, Southfields, Yarm Road, Stockton, Co. Durham.  
**ST. ALBANS M.A.C.**  
P. Brown, 6, Abbey Mill Lane, St. Albans, Herts.  
**SOUTH NOTTINGHAM M.F.C.**  
A. D. Noble, 57, Collygate Road, Nottingham.  
**EDGWARE M.A.C.**  
J. Wallis, 25, Fairview Way, Edgware, Middlesex.  
**EWELL M.A.C.**  
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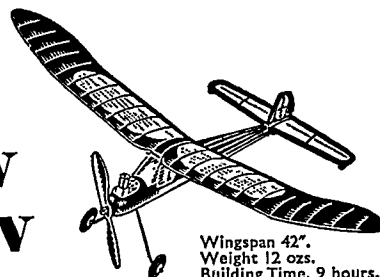


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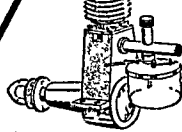
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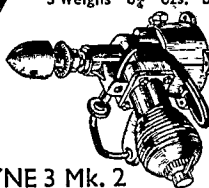


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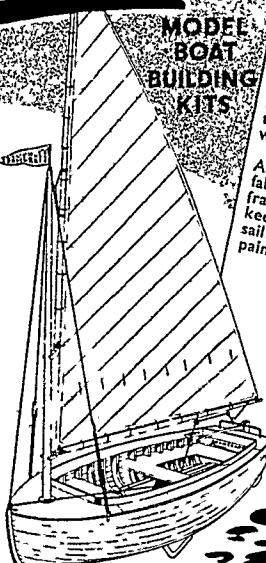
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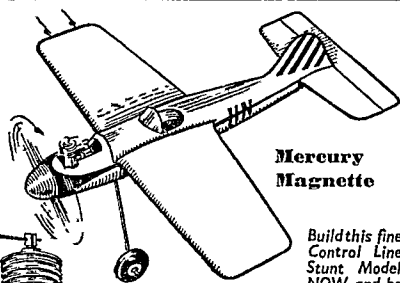
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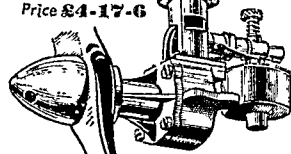
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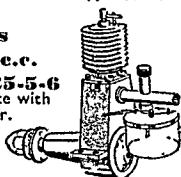
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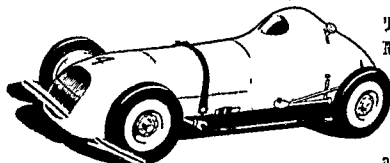
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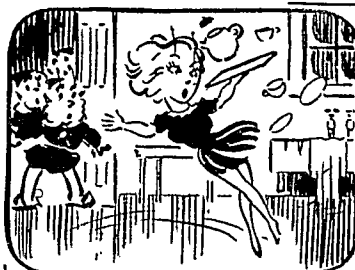
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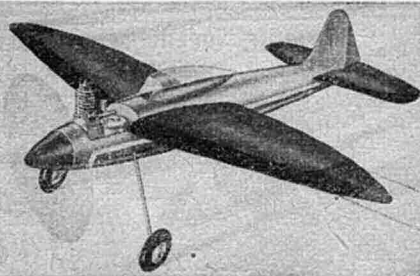
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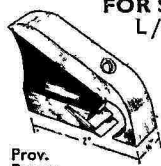
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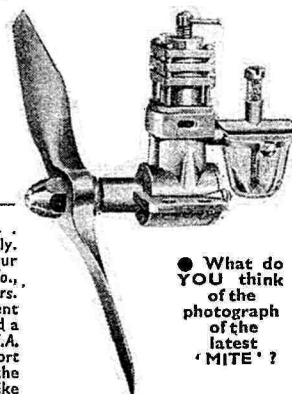
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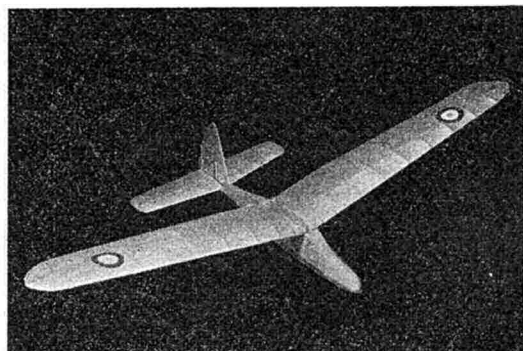
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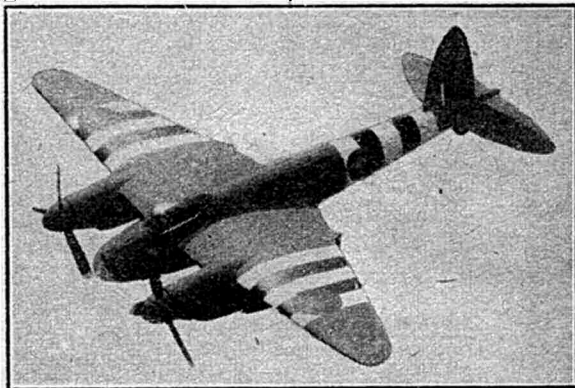
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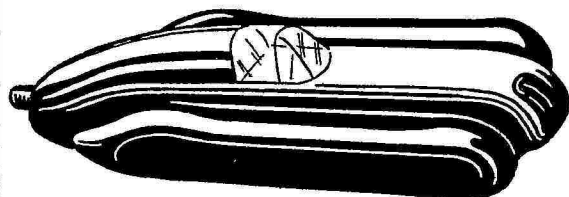
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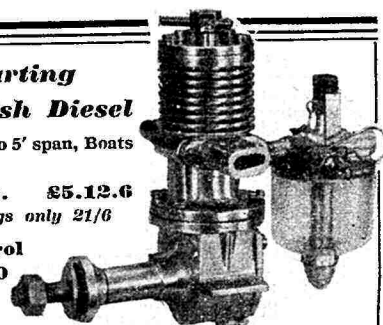
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Appearance

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