NOV 1943

AEROMODELLER 1/-

AEROMODELLING MADE EASY

SKYLEADA 1/72nd Scale Solid Models (Construction Kits) are in enormous demand, but wartime restrictions have severely curtailed supplies and if you are unable to obtain them from your local stockist it is through no fault of his. What supplies there are available we are endeavouring to distribute as fairly as possible.

SPITFIRE	THUNDERBOLT		D. H. MOSQUITO
KITTYHAWK	MUSTANG.	**1/9**	**3/-**
MARTLET	HURRIBOMBER		

Your local stockist should, however, be able to supply you with the following CONSTRUCTION PLANS.

18 World-Famous Warplane CONSTRUCTION PLANS

CONTENTS:

BRITISH
HAWKER HURRICANE
SUPERMARINE SPITFIRE
HAWKER FURY
WESTLAND LYSANDER
FAIREY BATTLE
GLOSTER GLADIATOR
B & P DEFIANT
BLACKBURN SKUA

FRENCH
MORANE FIGHTER
BLOCH 151

GERMAN
HEINKEL
MESSERSCHMITT
HENSCHEL HE 126

AMERICAN
CURTISS WRIGHT
SEVERSKY P35
CURTISS HAWKE
GRUMMAN F2F-1
CURTISS HELLDIVER

COMPLETE WITH INSTRUCTION LEAFLET

FROM THE **SKYLEADA** SOLID SCALE SERIES

1/6

EIGHTEEN PLANS FOR EIGHTEEN PENCE

9 World-Famous Warplane CONSTRUCTION PLANS

CONTENTS:

SPITFIRE
M E 109F
DEFIANT
MUSTANG
MARTLET I
AIRACOBRA
KITTYHAWK
HURRIBOMBER
THUNDERBOLT

Complete with Instructions

FROM THE **PILOT** SOLID SCALE SERIES

1/0

ACCURATE PLANS MEAN ACCURATE MODELS.

Plans in the above packets are not sold separately, but as a complete pack only. The following plans can be purchased separately at 4d. each :—

LIBERATOR, HUDSON V, BEAUFIGHTER, JUNKERS 88K, WELLINGTON, ME-110, BOSTON III, MANCHESTER, D. H. MOSQUITO.

These plans are fully detailed with 3-view drawings and perspectives.

A. HUNT (CROYDON) LTD
5&7 SOUTH END CROYDON


Superb Solids by
C·M·A
FOR accuracy of design, completeness of kit and value for money, always insist on C.M.A. SOLID MODEL KITS. Obtainable from dealers everywhere.
If unable to procure your requirements write direct for name of nearest stockist.
MESSERSCHMITT ME 109F 5/3
BRISTOL BLENHEIM 6/11
WESTLAND LYSANDER 6/-
FAIREY BATTLE 5/6
DOUGLAS BOSTON 8/3
HAWKER HURRICANE 5/3
SUPERMARINE SPITFIRE 5/3
BOULTON & PAUL DEFIANT 6/9
BEAUFIGHTER 7/11
WESTLAND WHIRLWIND 6/6
SCALE ⅛" to 1'
FOCKE WULF F W 190 A3 6/-
JAPANESE 'O' ZERO
LOCKHEED P.38 8/9
BELL AIRACOBRA 6/3
BLACKBURN SKUA 6/3
MESSERSCHMITT ME 110 6/11
D. H. MOSQUITO 7/6
WHOLESALE
ONLY
OWING TO THE SHORTAGE OF SUPPLIES WE ARE NOT ABLE AT THIS TIME TO OPEN ANY NEW ACCOUNTS.
List of model kits not illustrated
D. H. Tiger Moth 4/11
S.E. 5 .... 4/11
Pfalz D.12 .... 4/11
Morane Saulnier 406 .... 5/3
Bristol Fighter F.2b 5/3
Russian Rata L.16 .... 5/3
Polish P.Z.L.P.24 .... 5/3
D.H. Dragonfly 5/6
Caproni Falcho 6/-
Curtiss P.37 .... 6/3
Brewster Buffalo 6/9
Fokker G.I 8/11
ILLUSTRATIONS ARE PHOTOS OF ACTUAL MODELS MADE FROM C.M.A. KITS.
CHINGFORD MODEL AERODROME LIMITED
155, STATION RD. LONDON. E.4

'ELITE' MODELS

GLIDER No. 1

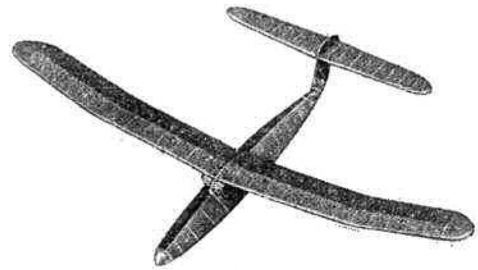
30 inch span

COMPLETE KIT **6/6** *Post Free.*

Contents of Kit :— CUT-OUT RIBS, DOPE, CEMENT, TISSUE STRIP, ETC., and FULL-SIZE PLAN.

A simple Model of original design, based on the best glider principles. Not a rehashed version of a rubber-powered machine.

GLIDER No. 2



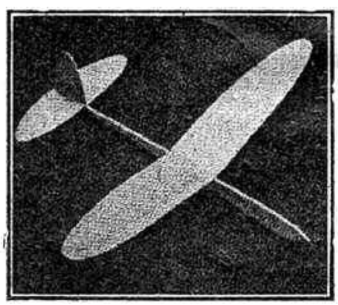
36 inch span

COMPLETE KIT **9/1** *Post Free.*

Contents of Kit :— CUT-OUT RIBS, DOPE, CEMENT, TISSUE STRIP, ETC., and FULL-SIZE PLAN.

A diamond fuselage machine with high parasol wing mounting, cleverly faired into the wing, giving SUPER STABILITY and that long floating glide which seeks and holds thermals. For its size, this model is unbeatable. Average duration is of 45-50 seconds, without thermals, off 100 foot tow line.

THE "GNAT" 16" GLIDER



Kit contains Plan, Ribs and Sheet, Cement, etc.
2/6 *Post free.*

All Accessories stocked, including Balsa Substitute, Cement, Dopes, finished Props, etc.

ELITE SOLID KITS

Series 1/72 Scale

Supermarine Spitfire V8
Supermarine Spitfire VB (Clipped Wing)
Hawker Hurricane II C
Hawker Typhoon I B
Curtis Warhawk
North American 73 Mustang I
Republic Thunderbolt
Messerschmitt ME 109 Fi.
Focke-Wulf Fw. 190 A3
Macchi C 202 (Saetta II)

Kit **2/3** Post free.

ELITE "AIRBORNE" GLIDER

Just the Model "YOU" want

Span 42 ins. Contents of Kit:—Dopes, Cement, Tissue, Strip Wire, Sheet, CUT-OUT RIBS & Full-size Plan.
11/1 *Post Free.*

We stock only H.M.G. [H. Marcel Guest Ltd.] crystal clear cockpit covers.

Cockpit Covers

SPITFIRE	6d.
H. HURRICANE	6d.
WHIRLWIND	7d.
WELLINGTON	1/10
MOSQUITO	1/6
LYSANDER etc.	1/-

Send 3d. for Catalogue. Fully Illustrated.

ALL ACCESSORIES STOCKED, INCLUDING BALSA SUBSTITUTE, CEMENT, DOPES, FINISHED PROPS, ETC., ETC.

ELITE MODEL AIRPLANE SUPPLIES
14, Bury New Road, Manchester 8.


'TRUSCALE'
1/72 Solid Model Kits
Tomahawk
Price 1/10
Boulton Paul Defiant
Price 1/10
ANNOUNCING
NEW
MODEL
Buffalo Price 1/10
Hawker Hurricane
Price 1/10
Messerschmitt 109
Price 1/10
Heinkel H.E.111K
Price 3/1
Wellington Price 3/4
TYPHOON
PRICE 2/-
Handley Page Hampden
Price 3/1
Messerschmitt 110
Price 2/5
3d. POSTAGE MUST BE
ADDED TO ALL
PRICES.
Airacobra Price 1/10
Blenheim
Price 2/5
Spitfire Price 1/10
Westland Lysander
Price 2/5
Avro Anson
Price 2/5
Whirlwind
Price 2/5
MODEL AIRCRAFT STORES (Bournemouth) LTD.
127b HANKINSON ROAD, BOURNEMOUTH
Phone: 1922 WINTON


ASTRAL
Aero
Model Co.
MATA
MODEL AIRCRAFT TRADE ASSOCIATION
MGOM
STIRLING
MAGNIFICENT FLYING MODEL
Complete Kit 21/-
ASTRAL MODELS
ARE OF
STIRLING WORTH
& WORKMANSHIP
THE ARISTOCRATS OF THE MODEL WORLD
FLYING KITS
From 1/9 To 21/-
POSTAGE 5d. to 7d.
SOLIDS From 2/3 To 5/-
POSTAGE 5d.
RANGE INCLUDES ALMOST EVERY
KNOWN FIGHTER AND BOMBER
TRADE ENQUIRIES TO:
ASTRAL MILLS, Dixon Lane Road, LEEDS 12
'Phone: 37021 (3 lines)
ASTRAL KITS ARE THE CEILING

PROPRIETORS :
MODEL AERONAUTICAL
PRESS, LIMITED

Managing Editor :
D. A. RUSSELL, M.I.Mech.E.

Editor:
C. S. RUSHBROOKE

AEROMODELLER

(INCORPORATING "THE MODEL AEROPLANE CONSTRUCTOR")

The Model Aeronautical Journal of the British Empire

Established 1936

ALLEN HOUSE
NEWARKE STREET
LEICESTER
Tel. : LEICESTER 65322

VOL. VIII No. 96 NOVEMBER 25th, 1943

SUBSCRIPTIONS:
INC. CHRISTMAS
DOUBLE NUMBER
15/- P.A. PREPAID.

EDITORIAL

DURING the seven years in which we have written this page we should have thought that we had covered most points of interest to Aeromodellers. Our subjects have ranged from International Meetings to the activities of newly-formed clubs, whose initial membership could be counted on the fingers of one hand. From dealing modestly with a few words of praise (yes, we *do* get them !) to avoiding a barrage of brickbats (yes, we have had a few of those, *too* ! !). From attempting to adjudicate on some typical Aeromodeller's " argument " such as " down-thrust versus up-thrust ". . . .

. . . . But we never would have thought that it would have fallen to our lot to deal with articles of underwear, and intimate ones at that !

The manufacture of rubber strip of the type used for propelling model aircraft was prohibited by the Government close on two years ago, following the Malayan and Singapore " incidents " ; and since then Aeromodellers have had to manage as best they could, stretching their remaining stocks to the limit ! However, a short while ago we were in one of Messrs. Woolworth's Stores in the Midlands, and, passing by the Ladies' Underwear Section (yes, it's all right—we are married), what should we see but great piles of aeromodellers' strip rubber ! ! ! Close investigation revealed lengths of genuine ¼ in. × 1/32 in. strip neatly enclosed in wrappers labelled " *Knicker Elastic—one length 24 in., two lengths 15 in.*"

The yardstick by which most things are valued today is by relation to the War Effort. We are *not* prepared to answer *that* one ! . . . . and readers may *for themselves* decide whether ¼ in. × 1/32 in. strip rubber makes its greatest contribution to the War Effort by supporting ladies' knickers, *or* by supporting model aircraft in the air . . . *we* merely draw attention to a supply—the extent of which is unknown to us !

Not so Good.

Perhaps the rubber shortage has accounted for there being so few entrants in our " Wings for Victory " Competition, announced in the March issue. Judging by the number of readers who bought plans of " Jackdaw II ", we looked forward to a good list of entrants, but in actual fact have received exactly three ! ! ! The prize winners are :—

First : Mr. T. Smith of 17, Brinlye Terrace, Worksop, Notts., who clocked 185 secs.—very good.

Second : Mr. L. Quartermain, of 3, Prospect Place, Durley, Glos., with 97 secs.

Third : Miss Jean Steer, of Flat 21, 50, Sloane St., London, S.W.1, who clocked 15 secs., and adds on her entry form " rubber perished ".

To these entrants prizes of 10, 7 and 5 National Savings Certificates have been despatched.

A New Book.

We are pleased to announce another publication from the Harborough Publishing Co., Limited.—" Model Flying Boats " by J. A. Sizer, price 2/- (2/2½d. post free from our Leicester office). The book consists of 64 pages and is size 8½ in. × 5½ in., with the usual attractive colour painting by Mr. C. R. Moore on the cover. There is a larger and more comprehensive book on Model Flying Boats and Model Seaplanes now under preparation by Mr. Sizer, and this little booklet (which deals only with Model *Flying Boats*) will serve as an introduction to the larger book, which it is hoped will be published early in the New Year.

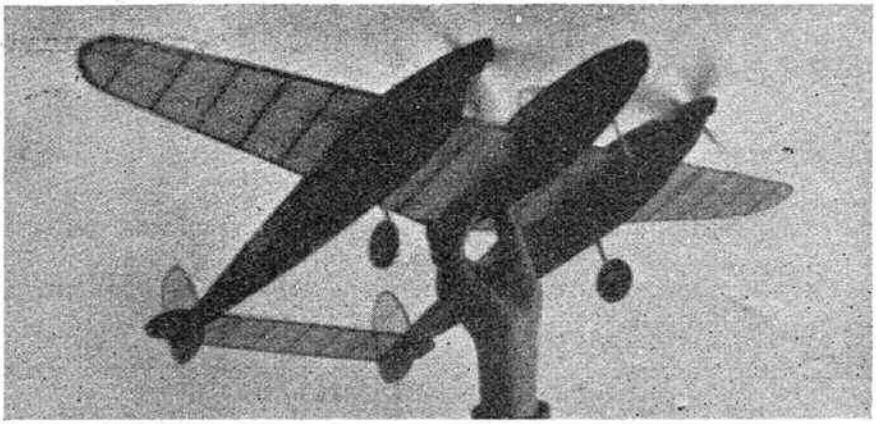
Our Next Issue.

We would like to remind readers that our next issue will be the Christmas Double Number, price 2/-, and on sale on or shortly after November 25th. As has been our practice in previous years, there will be included two coupons of a total value of 1s. 6d., which may be used when purchasing plans available through the Aero Modeller Plans Service, and full particulars of this attractive offer will be published in the Christmas issue.

The " special " articles are headed by an 8-page fully illustrated feature, descriptive of a 1/7th full size petrol engine driven flying scale model of a " Spitfire ", built by Dr. J. F. P. Forster, and a 1 in. flying-scale rubber-driven model of the B.E.2C., built by Mr. E. J. Riding . . . a McGillicuddy story . . . a 3-page " Gadget Review " . . . some fine action photographs by Mr. Galeota . . . an enlarged Monthly Memoranda by Mr. Thetford, together with several other articles and scale plans of attractive models, which will, we feel sure, make up a Christmas issue equal to those we have produced in previous years.

D. A. R.

CONTENTS OF THIS ISSUE



26″ SPAN R.T.P. LOCKHEED LIGHTNING

By

R · T · HOWSE

The machine here described makes an imposing and unusual model, with its twin fuselages, separate cabin and tricycle undercart.

It calls for quite a modest amount of material and rubber, and packs into a box about 18 in. × 7 in. × 5 in. As a matter of interest, practically all the framing (except props and L.E.'s) was cut from a sheet of 1/16 in. balsa, 36 in. × 2 in., with plenty to spare. One-third oz. of rubber is ample.

Despite the liberal use of braces, the total weight in flying trim is just over 2 ozs., and while no machine using 1/16 in. square balsa can be called robust, this model is certainly not " flimsy ".

Apart from the cabin, the construction is quite simple, but a few notes may be helpful. Care is required to see that all parts are " paired ", and when drilling holes for dowels or tubes it is best to start off by making a small hole with a hatpin or something similar, and any slight discrepancy can be rectified during the " opening-out " process.

Fuselages.

Build one side on the plan, using sufficient pins to maintain the outline and two pins to locate each vertical member. As each strut is fitted, three more are cut exactly the same length. The three remaining sides can then be assembled very quickly.

Wings.

These are built in one piece, flat on a board, and separated later. The ribs are cut as pairs of rectangles, varying in depth from ·25 in. at ribs, to ·65 in. at centre by increases of ·05 in., notched for spars, and sanded to a modified section of Clark YH after assembly.

The two centre ribs are splayed on the plan to come under sides of the cabin, and the end ribs of each section are fixed on rake, to lie flat against the fuselage taper. Capping strips stand over the ribs about $\frac{1}{8}$ in. and are shaped to fit. They provide a good hold when covering.

Tail Unit.

Centre portion built up as shown, and dowelled to the fuselages. Top fins built up as shown, and together with the solid lower fins and tail extensions are cemented on permanently.

Cabin.

This is built up in the usual way, with a short piece of 1/16 in. material used as a temporary trailing edge. The cabin is fixed to the centre section after the latter has been covered and doped. The cockpit is the last job of all and a little extra care here will make a vast difference to the appearance of the complete model.

Undercart.

Three bamboo legs, passed through slots in the cross bearers, carry 22G. extended axles bound to their lower ends, and provide a fair amount of springing for the laminated balsa wheels.

Airscrews.

These revolve in opposite directions, and are perhaps the most important items. The parts require careful shaping and fitting, but this is easily accomplished on the simple job shown on the separate sketch. When assembled, with the blades at 35 degrees, $2\frac{1}{4}$ in. from the centre, it will be found that the boss and trailing edges of the blades will lie flat on the board. The shafts, 20G., run in brass bushes and incorporate winding hooks, and carry R.T. bobbins for the motors. Any suitable clutch can be used. The spinners have been replaced after winding during tests, but would probably be omitted for outdoor flying.

Motors.

Four strands of $\frac{1}{8}$ in. × 1/30th in. rubber, 18 in. long (roped) to each prop, provide ample power and will take about 800 turns.

Covering.

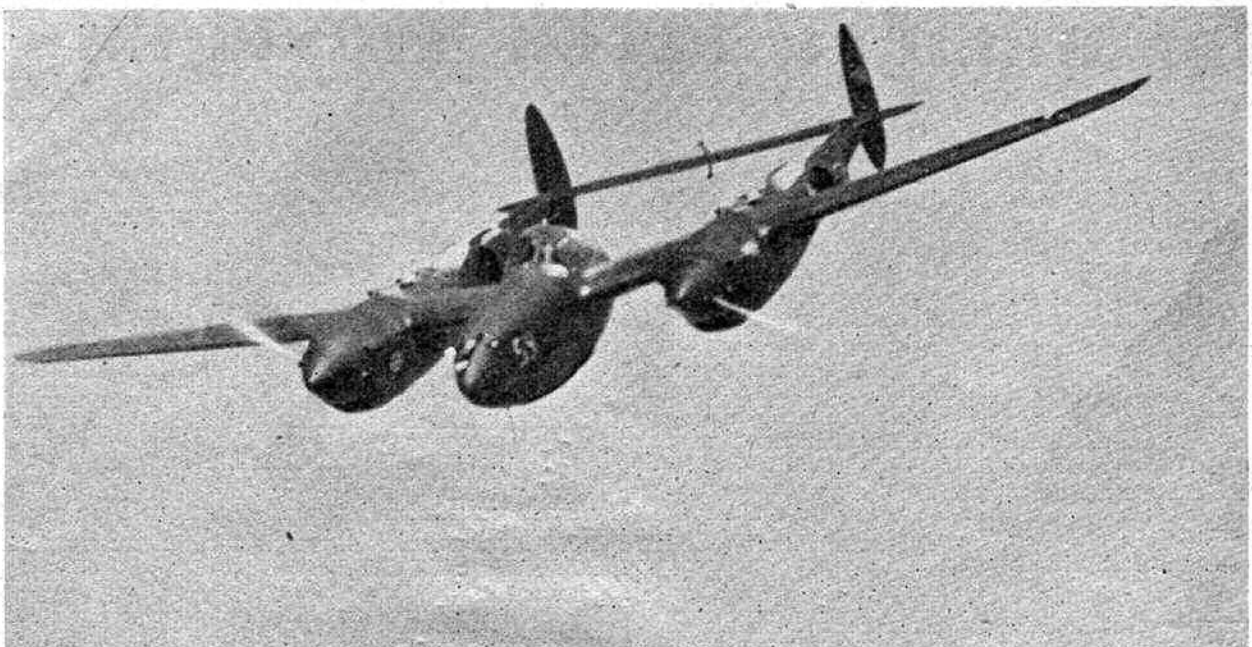
Tissue is given one coat of dope. Dummy radiators are formed of stuff paper and glued to covering.

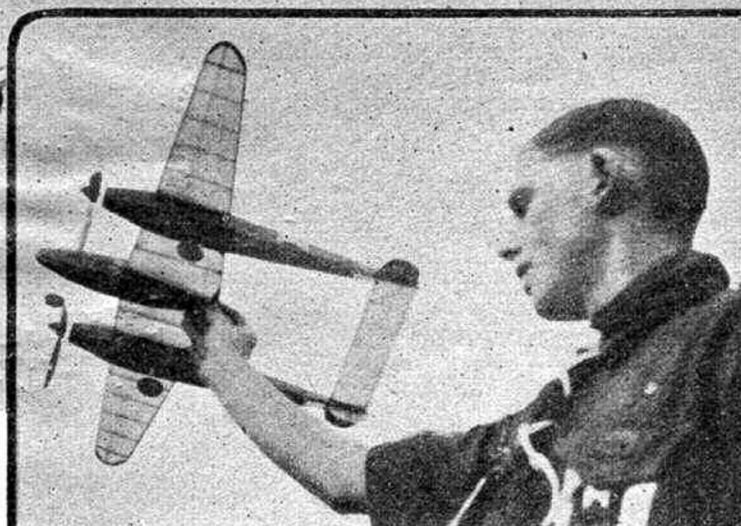
Weights.

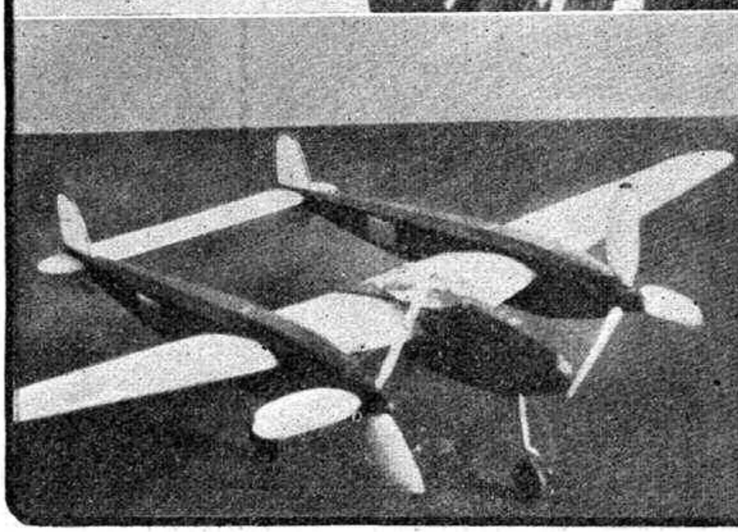
	ozs.	ozs.
Fuselage with fin, tail extension, and dummy radiators	·27	
Undercarriage leg	·08	
N.P. prop spinner	·21	
Rubber and bobbin	·17	
	·73 × 2	1·46
Centre section and cabin ..	·375	
U.C. leg	·045	·42
Outer wings	·09 × 2	·18
		·06
Total ozs.		2·12

Winding.

This is best done by persuading an assistant to hold the fuselages gently but firmly just behind the centre section, with first finger hooked round the U.C. leg. When the first motor is wound, a length of bamboo or dowel 6 in. long is inserted in winding hook and allowed to bear under the cabin. When the second motor is wound, dowel is removed and clutch is engaged. One







hand is placed over front of cabin to hold inner blades, the other hand supports model at back of centre section and cabin.

Tests.

The model has been tested R.T.P. on 24 ft. diameter circle, using a **3 ft. pole.** On 200 turns she will take off and complete a circuit. On 500 turns (the maximum so far put on), the take-off run is about 12 ft. followed by three circuits flying dead level at 2 ft. 6 in. a glide in and taxi to a stop on its three wheels, with the tail well off the ground.

No balance weight was necessary, but 1/32nd down-thrust was added to obtain level flight.

***Right.* The model being studied, while above, two full-size Lightnings display their sleek and aggressive lines.**

NON-HELICAL PITCH AIRSCREWS

BY N · K · WALKER

FOR many years aero modellers have laboured under the delusion that an airscrew would be most efficient if the same geometric pitch was adhered to for all portions of the blade, and many articles have been written describing how this may be achieved, despite the fact that a careful series of experiments by Mr. Russell demonstrated that the geometric pitch at the tip should be considerably greater than that near the centre.

The small acceptance of Mr. Russell's views may, I think, be put down to the fact that no theoretical backing was advanced to explain his results.

It is the purpose of the following investigation to deduce how the geometric pitch shall vary with position on the blade for greatest efficiency, and how airscrews may be designed and constructed to possess this theoretical pitch distribution.

It is a well-known fact that the L/D ratio or " efficiency " of an airfoil varies very greatly with angle of attack, and that for airfoils of moderate camber such as Clark Y and R.A.F.32, the loss of efficiency caused by flying at an angle only 2° greater or less than the optimum may cause a loss of efficiency of 10 per cent.–20 per cent.

Furthermore, present airscrew theory considers each blade to be an airfoil, so it is obvious from the foregoing that each blade element must meet the air at the most efficient angle for the section used if maximum airscrew efficiency is to be achieved.

Now if the blade angle at a distance " r " from the centre is θ_r :—

$$\text{(i)}\quad \tan\theta_r = \frac{\text{GEOM. PITCH}}{2\pi r} = \frac{\dfrac{\text{GEOM. PITCH}}{\text{DIAMETER}}}{\pi r/R} \qquad R = \text{radius of prop.}$$

Angle of airstream to airscrew disc $= \phi_r$ is given by

$$\tan\phi_r = \frac{V}{2\pi r n} = \frac{\dfrac{V}{nD}}{\pi r/R} = \frac{J}{\pi r/R}$$

Angle of attack of blade $= \alpha$ is given by $= \tan(\theta_r - \phi_r)$

$$\tan\alpha = \frac{\tan\theta r - \tan\phi r}{1 + \tan\theta_r \tan\phi} = \frac{P/D - J}{\pi r/R + \dfrac{P/D \times J}{\pi r/R}} = \frac{\text{slip}/D}{\pi r/R + \dfrac{J\ P/D}{\pi r/R}}$$

Or at 0·7R :—

$$\text{(ii)}\quad \tan\alpha \cdot 7R = \frac{\text{SLIP/DIAMETER}}{2{\cdot}2 + \dfrac{J.\ P/D}{2{\cdot}2}} = \frac{\text{SLIP/PITCH}}{\dfrac{2{\cdot}2}{P/D} + \dfrac{J}{2{\cdot}2}}$$

See Fig. 1.

For a normal helical pitch airscrew P/D = $\frac{\text{GEOMETRIC PITCH}}{\text{DIAMETER}}$ is constant all along the blade while " J " is fixed by the operating conditions. Hence as r/R varies from 0 to 1·0 $\tan\alpha$ will vary. For example, see Fig. 2. Here we have the angles of attack of two airscrews, a petrol model airscrew P/D=·5 and a Wakefield airscrew P/D=1·5, plotted for a " J's " of 0·37 and 1·2 respectively.

It will be seen that the angles of attack vary from 8° at ·2R to 2·3° at tip for the petrol screw, and from 6·3° at ·45R to 4·6° at the tip for the Wakefield type.

The efficiency of any blade element as defined by H. Glauert (Airfoil and Airscrew Theory) is :—

$$n = \frac{\tan}{\tan(\phi r + \gamma)} \times \frac{1 - a^1}{1 + a}$$

Now $1 - a^1/1 + a$ does not vary rapidly with " γ," therefore at any particular value of $\phi r, a^1$ and a, the maximum efficiency will occur when " γ " is a minimum. " γ " however is $\tan^{-1} C_D/C_L$, hence for maximum efficiency each blade element should operate at an angle of attack such that C_L/C_D is a maximum, and as we may consider the blade of uniform section this implies that all blade elements must have the same angle of attack.

Furthermore Glauert shows that the inclusion of the term $\frac{1 - a^1}{1 + a}$ allows for all interference between the blade elements, so that these must be considered to be of infinite ratios. *Therefore for maximum efficiency an airscrew should operate with all portions of its blades at the same angle of attack and this angle should be the angle for L/Dmax of the airfoil section used at infinite aspect ratio,* always a much larger angle than that for aspect ratio 6, e.g. NACA 6412 :—

$\theta L/D$ at $A = 6 = 0°$
$\theta L/D$ at $A = \infty = 6°$

Let us rearrange the equation to find how the pitch should vary to achieve this result.

From the preceding paragraph we obtain :—

$$\tan\alpha = \frac{(P/D)r - J}{\pi r/R + \dfrac{(P/D)rJ}{r/R}}$$

Rearranging we obtain :—

$$\text{(iii)}\quad (P/D)r = \frac{J + \tan\alpha\,\pi r/R}{1 - \dfrac{J\tan\alpha}{\pi r/R}}$$

Now for any given value of J and a particular value of P/D at ·7R (where it is usually specified and measured) there is a particular value of $\tan\alpha$ which can be calculated from equation (i).

Then P/D at other values of r/R may be calculated from equation (iii). *Example.*—(Design and Construction of Flying Model Aircraft, Page 241, Airscrew No. 3.)

J = ·37, P/D ·7R = 0·5, r/R = ·7

$$\tan\alpha = \frac{\cdot 5 - 0{\cdot}37}{2{\cdot}2 + \dfrac{\cdot 5 \times \cdot 37}{2{\cdot}2}} = \cdot 0569$$

$$\alpha = 3\tfrac{1}{4}°$$

$$P/D = \frac{\cdot 37 \times \cdot 179\ r/R}{1 - \dfrac{\cdot 00672}{r/R}}$$

r/R	$\left(\cdot37 - \cdot179\ r/R\right)$	$\left(1 - \frac{\cdot00672}{r/R}\right)$	P/D
·05	·379	·8656	0·438
·1	·3879	·9328	0·4155
·2	·4058	·9664	0·420
·3	·4237	·9776	0·433
·4	·4416	·9832	0·449
·5	·4595	·9868	0·466
·6	·4774	·9888	0·483
·7	·4952	·9904	0·500
·8	·5132	·9916	0·518
·9	·5311	·9925	0·5355
1·0	·5490	·9933	0·553

It will be observed from the graph (Fig. 3) of P/D that the curve P/D against r/R is practically a straight line from r/R = ·3 upwards and that the increase of pitch at the tip and the decrease at 0·4R is approximately 10 per cent. of the pitch at 0·7R, exactly as Mr. Russell predicted—a striking vindication of his results.

There is one important point where the new theory indicates a different result. This is that below ·3R the pitch decreases to a minimum and then suddenly increases to infinity. The effect of this can be assessed as follows.

Differentiating equation (iii) with respect to r/R, and equating the O, O, we obtain the result that the value of r/R at which the minimum P/D occurs is :—

$$r/R = \frac{J \tan\alpha}{\pi}\left[1 \pm \frac{1}{\tan\alpha} \pm \tfrac{1}{2}\tan\alpha\right]$$

Choosing the positive sign and neglecting the last term as being of negligible importance we have :—

(iv) $r/R_{\text{critical}} = J/\pi\ (1 + \tan\alpha \simeq J/3)$

For a linear variation of P/D with radius the critical radius must therefore be less than ·35R, and "J" must be less than 1·0 approximately. (The outside limit r/R = ·4, α = 0·0°, is J = 1·1.)

Hence the linear variation of pitch with radius is admirably suited for petrol models, but not for Wakefield types where J $\simeq$ 1·5, as is obvious from Fig. iii.

NOTE.—If there is no slip, as indeed may occur with a deeply cambered section, J=P/D and is zero. In this case the helical pitch airscrew will give the same angle of attack all along the blade and is in fact the pitch we obtain by putting tan=0 in the above formula. Hence for *no slip* the ordinary helical pitch is the most efficient type.

Best Linear Pitch Variation.

For petrol models we may therefore assume (from above) that a linear variation of pitch is suitable, and the required fractional change of pitch may be found by evaluating

$\frac{d\ (P/D)}{d\ (r/R)}$ at 0·7R and multiplying by 0·3 (the change is r/R for 0·7 to tip)

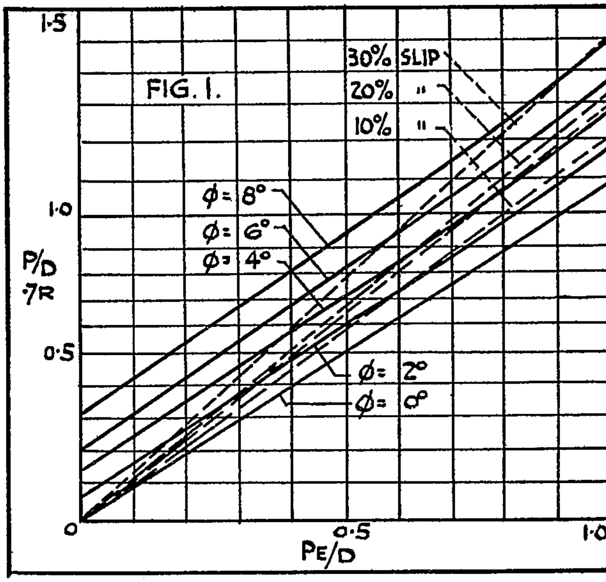
$$= 0\cdot3\ \pi\tan\alpha\ (1 - 0\cdot22\ J^2)/P/D\ 0\cdot7$$

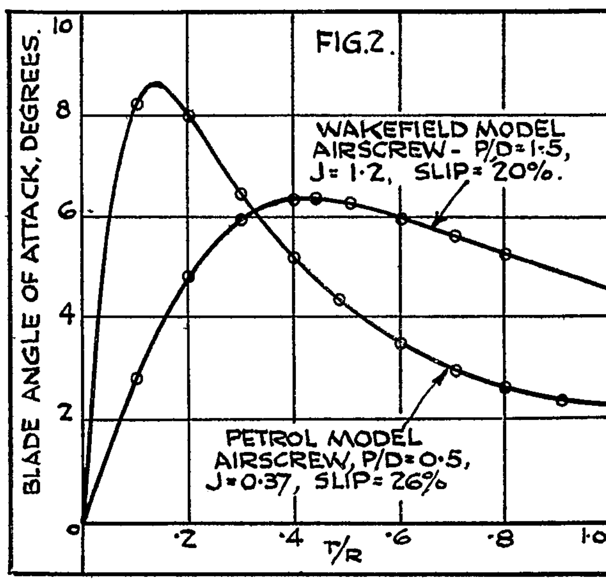
$$= (0\cdot94 - \cdot21\ J^2)\tan\alpha/P/D\ 0\cdot7$$

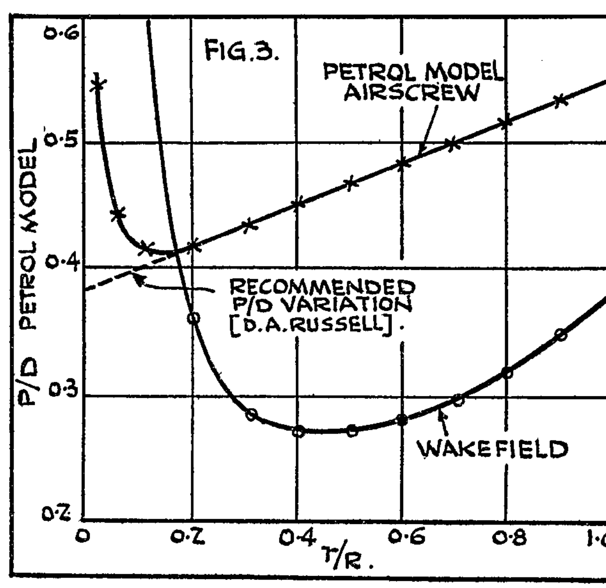
i.e. for Russell's No. 3 airscrew, $\tan\alpha = 0\cdot0569$. J = 0·37. P/D 0·7 = 0·5

$$\frac{\Delta P/D}{P/D} = (\cdot940 - \cdot029)\ \frac{\cdot0569}{0\cdot5} = 10 \text{ per cent. approx.}$$

i.e. pitch should increase 10 per cent. to tip and decrease 10 per cent. to the point at 0·4×Radius.







NATURE'S SAILPLANES

BY FRANK W. LANE

Photo by R. K. Monro

THE importance of thermals to soaring birds may be judged from the observations of Dr. Hankin in India that none of the birds on the plains began to soar until the sun had risen for some time. Dr. Hankin has suggested that under sunny conditions the air possesses properties which are a source of energy to soaring birds. F. W. Headley has recorded that on a very hot day in the Nile delta he was watching some kites soaring when a cloud suddenly obscured the sun. The kites very soon began to beat their wings and started to descend.

Two interesting, if unorthodox, theories which have been put forward to account for the soaring of birds may be mentioned. George E. Clough has maintained that wind currents by no means account for all the phenomena of soaring. He considers that when soaring a bird is continually using wing power but applied in alternative beats and not, as in flapping flight, in unison.

Clough writes: " A downward pressure of each wing is exerted, with a force equal and opposite to that of gravity. . . . One of two things must happen: either the wing must be driven down, or the body must be drawn upward and sideways toward the wing. The action of the corresponding muscle on the other side brings the body back to normal and up toward the other wing.

" Soaring is not a trick of riding on the wind, but the demonstration of an alternative method of flight requiring the use of the same motor muscles, applied on the same wings, and in very much the same way. The difference is merely in the timing of the strokes. As the pacing of a horse is, compared with trotting, as the running of a bird is, compared with hopping, so, compared with flapping flight, is soaring: an easier gait."

To the objection that such wing action has not been widely observed by other workers, Clough answers that the only visible motion would be a slight swaying of the body, as the downward pressure of the wing forces the body upwards. Such an action would be difficult to detect from the ground but Clough points out that such a swaying motion is observed in gulls when following in the wake of a ship.

The other heterodox theory is that a bird soars by making use of the alleged vibratory motion of the air. A German airplane designer, named Rumpler, claims to have measured these " secondary fluctuations " as he calls them and to have found that they are 15 pulsations per second. It has been suggested that this pulsating movement of the air causes the feathers on a bird's wings to vibrate and thus exert propulsive energy.

It may be remembered in this connection that an Austrian engineer constructed an airplane before the War which had no airscrew and was designed to travel by pulsating wings. The under-side of the wings were a mosaic of hundreds of pneumatic rubber cells which were given an undulatory motion by pumping compressed

Photo by A. E Slater.

"RHON BUZZARD" sailplane, designed by Hans Jacobs, designer of many German military transport gliders, hundreds of which litter the bombed and blasted airfields of North Africa, Sicily and Italy. This photograph was taken in 1940 at the London Gliding Club before the Air Ministry put a stop to all soaring in Britain.

air alternately into different rows. I do not know the result of the trials of this machine but the inventor hoped to make the craft hover, dart forward or descend vertically.

So much for the theories of natural sailplaning. Now let us examine the design which Nature has adopted for her sailplanes. The bodies of soaring birds are built on the lines of a chunky torpedo and in beam are midway between the narrowness of the swift-like birds and the width of wildfowl. This shape produces the most even "flow-off" for the air-stream from the bird. Some sailplaners have claimed that this shape also directs the wind upon a particular portion of the wings and thus enables the bird to derive maximum efficiency from soaring.

Soaring birds are among the heaviest volant birds in existence and it would appear that soaring ability depends to a certain extent upon the momentum which weight gives. Interesting proof of this theory has been provided by glider pilots. Several years ago an experimental sailplane was constructed in Germany with a wingspread of 34 ft. which weighed only 125 lb. or less than half the weight of most gliders. It might have been thought that it would break all records ; instead of which it proved a failure. It was *too* light. One pilot used habitually to ballast his sailplane with 160 lb. of water. This extra weight gave him the added momentum necessary for extra speed.

Alan E. Slater writes: "A light sailplane is an advantage when the up-currents are weak, but it necessarily flies slowly, so is no use for long-distance records. Heavy sailplanes need stronger up-currents for soaring, but can fly faster. A pilot who has water ballast may let it run out in the late afternoon when the thermal currents are getting weak."

All soaring birds have large, heavy wings. They are lightly loaded, there being a high ratio of wing area to weight of bird. The careful work of Prof. A. Magnan in France has shown that the wing-loading of the high-soaring vultures and eagles is only one quarter that of geese and ducks. Magnan also says that the soaring raptorial birds which have the largest wing area have also the greatest length, greatest weight and generally the greatest tail expanse.

There are several differences in the shape and structure of the wings of the low-soaring seabirds and the high-soaring landbirds. Seabirds, such as albatrosses and gulls, have wings of high aspect ratio or great length to breadth, whereas the high-soaring landbirds such as vultures and eagles have broad or low aspect ratio wings. These and the other differences in wing-shape may be related to the different types of wind used by the two classes of birds. Sir Gilbert Walker, however, suggests that: "The explanation may be that the land birds have to carry off big quantities of food in their talons or in their crops, and weight-bearing is essential; but for sea birds food is usually consumed in relatively small quantities at frequent intervals, and flying efficiency is of paramount importance."

Another difference between the sea and land soarers is noticeable in the structure of the wing tips which are emarginated or separated into "fingers" in the land soarers. But the wing tips of the sea soarers are more pointed and the primary feathers do not separate. Then again the land soarers possess a "feather pocket" which is much more developed than in the case of the sea birds. This concave pocket traps rising air and thus gives greater support to the wing. The pocket opens sometimes to an angle of 45 degrees in a strong current

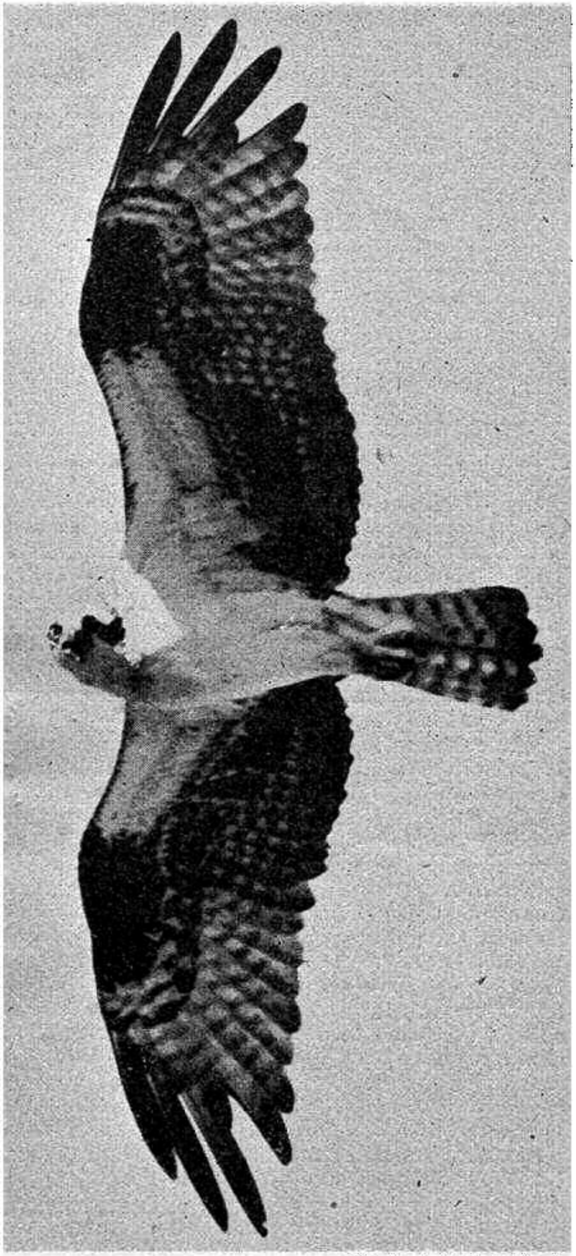


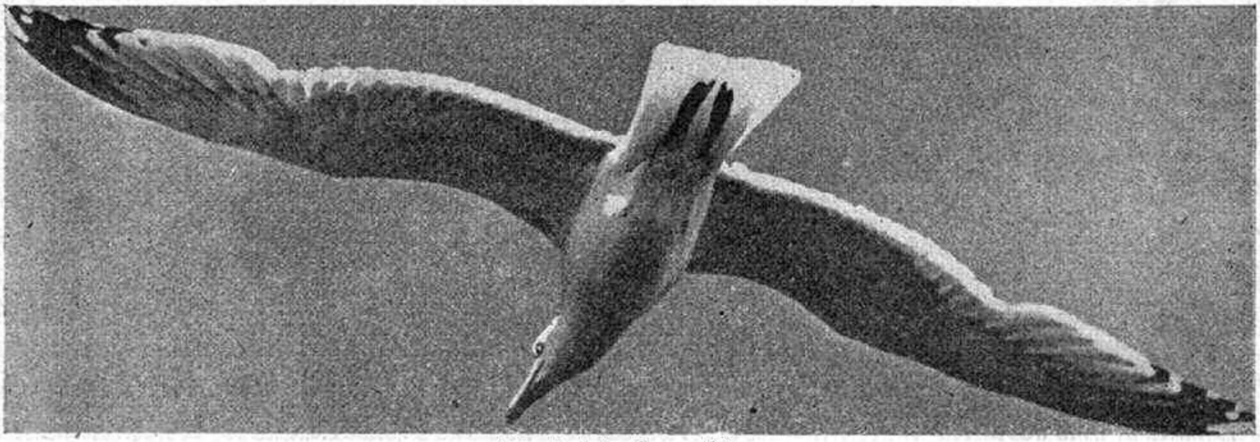
Photo by A. D. Cruickshank.

An osprey from Maine, U.S.A. This photograph well illustrates how the wing tips of land birds are separated into "fingers." Compare the wing tips of the gulls opposite with the osprey and note his low aspect ratio.

of air which acts on a tendon on the fore part of the wing which again acts directly on the movement of the feathers.

The sea and land birds hold the wings in different positions while soaring. Birds which soar over land generally extend their wings either horizontally or at a slight dihedral angle but sea birds hold their wings arched slightly downwards like a bow.

It would be interesting to know if any anatomist could say whether the theory put forward by Thomas D. Carneal is supported by the facts. Carneal writes: "I would risk the guess that an anatomical dissection



Nature's design for a sailplane.

would show that the position of the wing can be maintained by locking the joints, or by binding ligatures so that the bird could maintain his wing, extended by other means than continued muscular effort."

Since man himself has taken to riding the clouds his experiences have thrown new light on Nature's original sailplanes. Philip Wills once went gliding in the aerial haunts of some vultures in Africa. He found that the birds, ever on the lookout for "kills," parcel out their domains, and each bird patrols its own territory while keeping a sharp watch on its neighbours.

While soaring in company with the vultures one day, Wills noticed that one of the birds had discovered a thermal. The vulture at once circled and climbed. This action was a signal to the neighbouring vultures, and in less than a minute the discoverer of the thermal was the apex of a pyramid of climbing birds. Wills sailed over and was accepted by the vultures as a companion. He found that when *he* discovered a thermal, the vultures quickly followed him up!

Wills says: "If I found a thermal on my own, in less than a minute there would be a swish and a large brown bird with a wicked face would come whizzing in and join me, and in no time I would be one of half-a-dozen or more birds, wheeling so close that I could sometimes see their eyes. If the thermal went higher than about 2,500 feet, the birds would usually leave me. Evidently their comfortable range of vision is about 2,500 feet, or half-a-mile, though one airplane pilot told me he had met a vulture at 10,000 feet."

Another pilot who has soared with birds is Lewin Barringer. He put to the proof the assertion that a first-class modern sailplane, piloted by an experienced man, can out-soar any bird. Barringer competed with that accomplished soarer, the turkey buzzard. He certainly managed to outclimb it but he added: "He soon showed that his far superior manœuvrability and flying technique more than make up for his greater sinking speed."

Finally, an observation of Dr. Hankin's may be mentioned as it possibly contains a useful hint to sailplaners who are perplexed about the problem of reducing speed in the air at will. Dr. Hankin noticed that when a vulture was travelling at high speed it used a special action of its wings to slow it down. The wing was flexed at the metacarpal joint which thus caused maximum camber. This action produced an eddy under the wing. The violence, and thus breaking power, of this eddy was demonstrated when a feather that was floating in the air passed under the wing of a vulture braking in the manner described. Immediately the feather was caught by the eddy it was shot out sideways with almost explosive suddenness to a distance of 12 ft.

Dr. Hankin concludes that "It is obvious that much energy must be absorbed in forming this complicated eddy. In the absence of camber it would be less or non-existent. Hence it may reasonably be suggested that its formation is the reason why the above described wing disposition is used as an air brake in high speed flight."

Man's design for a sailplane—The "Kirby Kite

Photo by A. E. Slater.

THE DESIGN AND CONSTRUCTION OF WING SPARS

BY V · K · ROBINSON, *B.Sc. (Eng.)*

WITH the increasing shortage of rubber and balsa, many modellers are now building gliders of spruce and other hardwoods, and to obtain the benefits of an increased Reynold's Number are using fairly high wing loadings, and making the machines as big as Air Ministry restrictions permit. The need has become apparent for careful structural design as well as aerodynamic efficiency, since the extra weight and speed bring about much harder knocks than usually befall the slow flying, lighter types. With no risk of motor breakage to wreck the fuselage, the parts of the model most liable to be damaged are the wings. The spars take most of the load and, on a large model especially, great care must be taken over their design and construction. The ordinary solid rectangular section spar, as commonly used on small models, is very inefficient, and a much stronger one can be made if a little trouble is taken.

The chief loads on a wing spar may be taken as follows :—

(*a*) Torsion. The centre of pressure will not be directly under the spar for all incidences, so there will be a twisting moment tending to alter the angle of incidence. This is usually countered by covering the nose of the wing with thin sheet, and the spar therefore does not have to take much in the way of torsional stresses.

(*b*) Shear. The greatest shear force is only about half the weight of the model normally, so if the web of the spar is made of 1/32 in. plywood the stresses will be well below the maximum permissible.

(*c*) Bending. This consists of two separate kinds. The first is due to drag forces, which are quite small and may be neglected in designing the spar. The other kind of bending loads are due to the lift, and may be of considerable magnitude. The stresses so set up form the principal consideration in spar design, and so for simplicity we shall neglect the effects of shear and torsion entirely in the calculations, and allow for them by making the spar slightly larger than calculated. In any case, the stresses on the whole structure are very variable, and it is only when the model is gliding in its normal attitude that our calculations will hold at all. Consequently, for safety's sake, we must allow a very good margin between the normal calculated stresses in the spar, and the maximum permissible stresses.

We must now decide which is the best section to use for the spar. There are a good many to choose from, but the majority are impracticable for model work from the constructional point of view. Here we shall discuss only two—the hollow box and the I beam section—and compare their characteristics with those of the more usual solid rectangular section spar. The inverted Tee section, popular in America, is rejected as it will not stand reversal of stress.

A comparison of the sections is most easily effected by starting with a solid rectangular one of given depth and moment of inertia, and calculating the proportions of box and I beam sections for which the moments of inertia are the same. We can then work out the respective weights of each (as these will be proportional to the cross sectional areas) and ultimately decide which section it is best to use. The calculations are quite simple, so only the results will be given.

The basic rectangular section is taken 1 in. deep and 0.4 in. wide, as drawn out in Fig. 1, together with the box and I beam sections of equal moment of inertia. In designing these sections, 1/32 in. plywood was used as most convenient for the webs, and $\frac{1}{8}$ in. hardwood strip for the other parts. When reckoning up the weights, we must not forget to allow for the difference in density of the two materials used. Spruce weighs about 0·016 lb./cu. in. and birch ply 0·024 lb./cu. in. Using these data, the weights of rectangular, box and beam sections work out in the ratio 100 : 58 : 51. The hollow box is therefore some 7 per cent. heavier than the beam section, but this disadvantage is offset by the ease with which a box spar can be constructed, so we shall use that section in our specimen design.

We wish to design a spar for, say, a model of 7 ft. span and 2 lb. weight. The wing plan will be taken for simplicity as rectangular, and so the chord will be about $6\frac{1}{2}$ in., and the wing thickness 1 in. That gives us about 0·8 in. for the maximum depth of the spar. How is the spar loaded ? The approximate distribution of lift is given in Fig. 2. To be on the safe side, we shall ignore the falling off of loading towards the tips, and treat each half wing as a uniformly loaded cantilever. (Fig. 3.) With the notation given in that figure, we see that :—

Bending Moment at distance x ft. from centre =

$$\tfrac{1}{2}w(s-x)^2 \text{ lb. ft.}$$

Hence the greatest B.M. occurs at the centre, where

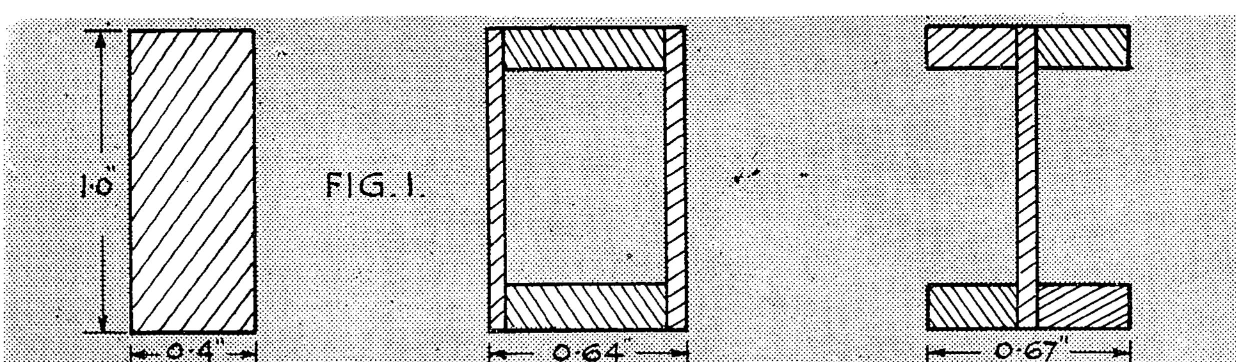
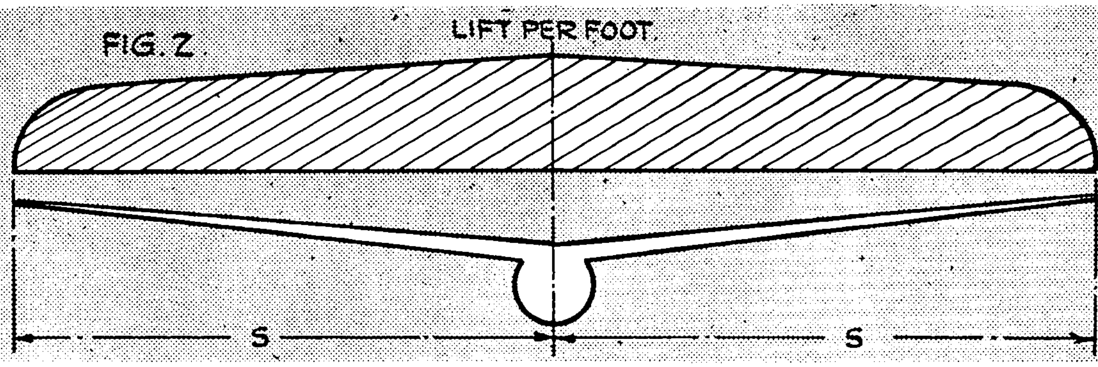


FIG. 1.

FIG. 2.



$x = 0$ when B.M. $= \frac{1}{2}ws^2$ lb. ft.

In this case, $s = 3\frac{1}{2}'$ and if all the load is taken by the spar, $w = 2/7$ lb./ft.

$$\text{Maximum B.M.} = \frac{1}{7} \times \frac{49}{4} = 1{\cdot}75 \text{ lb. ft. or } 21{\cdot}0 \text{ lb. ins.}$$

We now make use of the fundamental formula :—

$$f = \frac{My}{I}$$

where f is the stress, at a distance y from the neutral axis, on a section of moment of inertia I when acted upon by a bending moment M. We wish to keep f reasonably small, and to do this, we want I proportionately large. The maximum depth of the spar is fixed at 0·8 in. so a suitable width will be ½ in., or a little less. Say ⅜ in. plus 1/32 in. at each side for the plywood webs, and make the end pieces ⅛ in. thick. The moment of inertia of this section is 0·0134 in.^{4}, so that

$$f = \frac{21 \times 0{\cdot}4}{0{\cdot}0134} = 625 \text{ lb./sq. in.}$$

The strength of spruce is about 9,000 lb./sq. in. in tension, and about half that in compression, so the safety factor is more than 7. This is not excessive for a model of this kind, where a wing tip landing is ever likely to occur, and set up stresses far in excess of those arrived at in the above calculation, so the section is quite satisfactory.

Now the spar must be constructed. The wood chosen should be straight grained and free from knots. The stripwood for the end pieces must not be warped, as often happens when left for some time, and all the wood must be perfectly dry. If the ply has been bought rolled up, it must be flattened out before use, for which operation heat may be necessary. The first thing to do is to mark out the webs on the plywood, and then cut them out, allowing ⅛ in. margin all round. The end pieces may then be glued on to one web, using casein cement for strength, and care must be taken that they are glued on at right angles to the web. To ensure that the strips are fastened right on top of the marked out line, it is advisable to stick pins into the web, just to say on the waste wood side of the line. The end pieces may be pressed against these pins with no fear of going over the line. The spar must now be weighted down on a flat surface and left to dry. This may take 24 hours or more, according to the cement used. When perfectly dry, the scrap wood should be cut off, and the ends left smooth. Before the other web is glued on, the spar should be blocked at about 6 in. intervals along its length, including each end. This gives extra rigidity without much more weight. If the wing is not a cantilever, blocks must be fitted wherever the attachments will come. The other web may now be glued on, and before leaving the spar to dry, a small hole should be made on the neutral axis of one of the webs between each block. This allows moisture to escape from the inside, which might otherwise impair the strength of the spar. When the joints have dried, it only remains to trim off the excess wood from the second web, and lightly sand the whole spar, leaving an efficient structure having little more than half the weight of the solid section necessary.

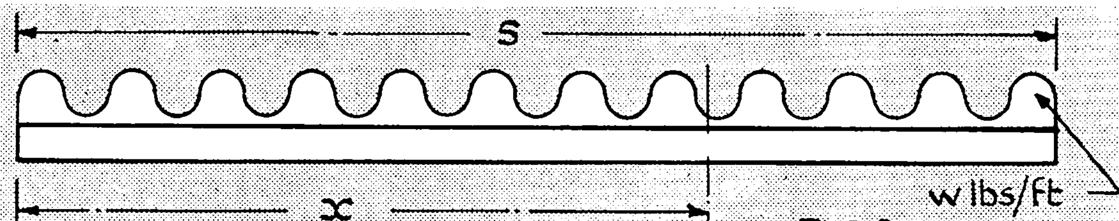


FIG. 3.

THE "CLOUD COMBER."

By J. W. JACKSON.

Fuselage and Undercarriage :

Construct two fuselage sides with $\frac{3}{32}$ sq. inch hard balsa longerons, $\frac{3}{32} \times \frac{1}{16}$ medium balsa vertical formers, and $\frac{1}{16}$ sq. inch medium balsa diagonal bracing. Join the two sides with the aid of cardboard jigs, and add the diagonals to the top and bottom of the fuselage. Add sheet balsa to nose, tail, and dowel fitting at rear. The underfin is $\frac{1}{8}$" medium sheet, and is cemented to underside of the fuselage after it has been sanded to a streamline section. The 16 s.w.g. piano wire, mono wheel undercarriage is in one piece, and is securely bound to the botton and side of the fuselage. The cross-members to which the undercarriage is bound, are $\frac{1}{8}$ sq. inch balsa, and the gussets $\frac{1}{16}$" sheet. The wheel is built up of two cross grained laminations of $\frac{1}{16}$" sheet, with a paper tube hub. Finally the nose stringers are added.

Wing :

Cut the wing ribs $\frac{1}{16}$" sheet, indoor fashion, using ply templates. Sand the trailing edge to a triangular section, and pin down leading and trailing edges for centre panels, cement in the top ribs and allow to dry. Remove centre panels from drawing and add the bottom ribs, which must be cut to make an exact fit. Cement in the spar, and cement the two panels together at the correct dihedral and brace the joint at the centre with $\frac{1}{16}$" sheet. On the elliptical tips a slightly different method is employed. Cut the Leading and Trailing edges roughly to correct outline, and cement together. Trim to correct outline when dry, and add top ribs, which are individually cut to required length. Remove from drawing, and cement in bottom ribs. Cut spar to exact taper to fit between ribs, and cement in place. Then carve and sand L. and T. edges to correct section, cement outer panels to inner panels and brace joints. The resultant wing structure is very light, strong, and aerodynamically efficient.

Tailplane:

The method of assembly of the tailplanes is the same as for the wing. Cut ribs from $\frac{1}{16}$" sheet, sand trailing edge to section, pin down Leading and Trailing edges, cement in top ribs and tips, remove from drawing and add bottom ribs, finally sand L.E. to section. The square tips are used for lightness, one cannot afford unnecessary weight in the tail.

Airscrew Assembly :

The airscrew is the most difficult part of the model, and the success of the machine depends largely on the accuracy with which the airscrew is made. The construction is unusual, but necessary in view of the shortage of block balsa, and calls for extraordinary care in the blade assembly.

Cut the blades to shape shown on drawing. Cement on the additional blocks on tongues. Carve tongues to pitch " L " as indicated, and face them with 1 m.m. ply. Then carve the blades to airfoil section, making them very thin towards the tips. The hubs must be strong, but it is not desirable to have heavy blades changing their C.G. position when prop. folds.

Cut ply sides for hub and drill sides and tongues for hinge positions. Then assemble box with a ply front and balsa spacer inside. Drill hole for airscrew shaft and cover box with cartridge paper cemented on to hold box together in the event of a heavy landing.

Build up nose block with $\frac{1}{8}$" sheet and 1 m.m. ply and insert 16 s.w.g. screwed bush. Bend motor hook on shaft, make trip, which is merely a piece of 18 s.w.g. bent round shaft a couple of times and left with about $\frac{1}{2}$" of wire projecting at right-angles to shaft. Place trip on shaft, then noseblock, ball bearing washers, spiral spring (a Hornby train buffer spring, which can still be obtained from Meccano dealers), and finally the airscrew. Then bend back shaft and insert the end into prop. as shown and cement thoroughly in position. The trip is then soldered to shaft so that it just grazes the back of the noseblock when tension spring is fully extended. Finally an ordinary brass screw, with head filed square, is screwed into the back of nose block so that when the blades are folded they are quite flat on the sides of the fuselage. You will find that the blade on the port side folds *high* on the fuselage, and the starboard one low. The requisite tension on the rubber motor is then quite easily controlled by screwing the stop in or out as desired. French polish box, blades, and noseblock. Hinges are stout pins.

Covering :

Cover the wings with tissue grain paralled to ribs, fuselage with grain running length, bottom of tailplane with grain parallel to ribs and top with grain lengthwise. Fin has grain horizontal. Water spray the whole model, allow to dry. Dope fuselage, then banana oil all over. If wings and tail are properly covered, banana oil alone is quite sufficient, and it has not got the deadly power of warping wings, in the manner which dope has.

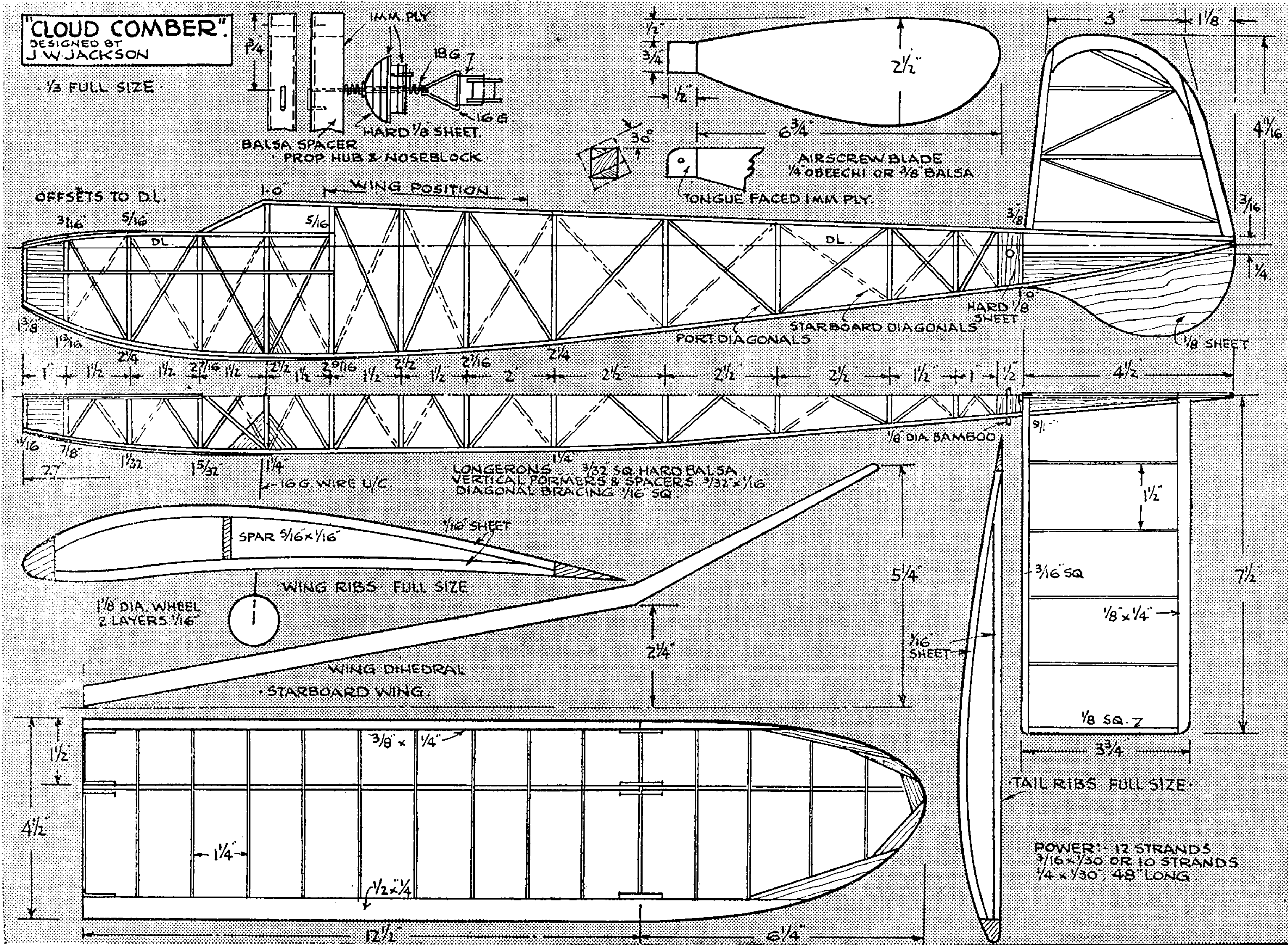
Flying :

Make up a motor of 10 strands of $\frac{1}{4} \times 1/30$ 48" long (I have used up to 54" motors in this model and got away with it). Lubricate motor well, and attach to " run true " bobbins. The tail fixing is a bamboo peg. For winding, the front bobbin has a U shaped hook through it with small clips formed on the ends so that they hook onto the triangular motor hook. The winder has a similar triangular hook and the propeller unit is unclipped, and the winder clipped onto the U hook. The motor is then wound up, the winder unclipped, and the prop. assembly clipped on. Then the model is ready for flight. This system is very successful and completely eliminates handling the airscrew during winding. The complete model weighs 5 ozs. of which $2\frac{1}{4}$ ozs. are taken up by the rubber motor.

Assemble the model, complete with rubber, and adjust the stop until the airscrew is tripped when the rubber is just off the floor of the fuselage, this is the best tension to use on the motor. Fold blades back and adjust model until it glides flat.

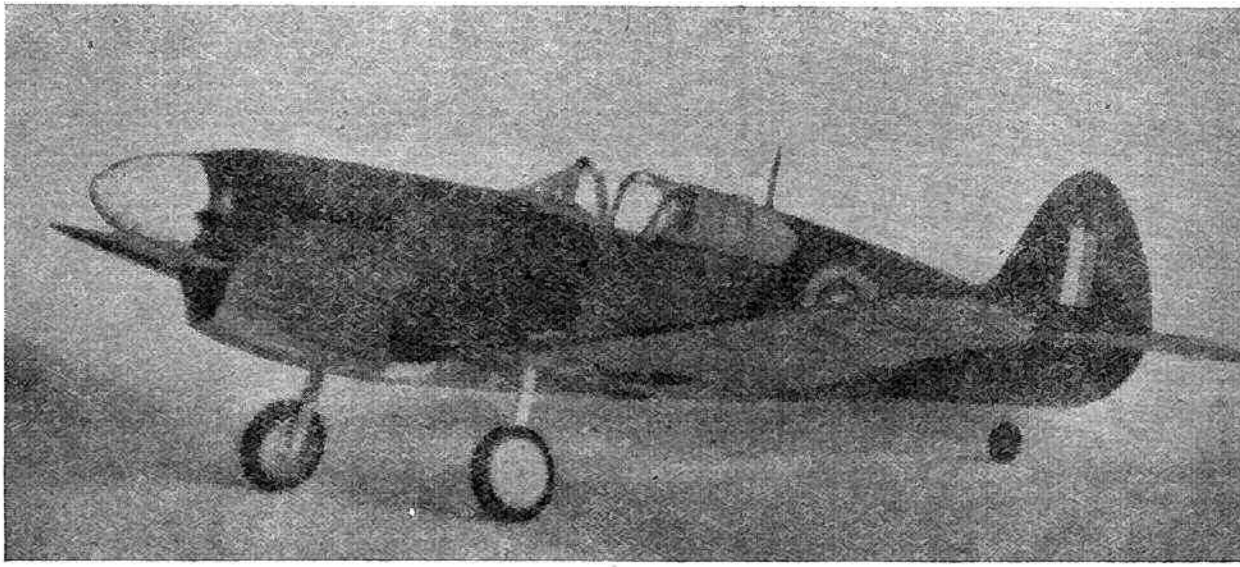
Keep this trim and make adjustments for power flight on noseblock so as to alter side, and downthrust. The model should be set to climb steeply in small right hand spirals, and circle right on glide. The fin is cemented to fuselage, and although this is very awkward when trimming the model, it saves many crack ups and anxious moments in competition flying. Always see that you have no adjustments which can be altered accidentally during winding, and handling before take off, and you will never suffer from " Comp. nerves."

One last word. Don't forget to put your name and address on the model. See plan overleaf.


"CLOUD COMBER".
DESIGNED BY
J. W. JACKSON
· 1/3 FULL SIZE ·
1MM PLY
18G
16G
HARD 1/8 SHEET
BALSA SPACER
· PROP HUB & NOSEBLOCK
AIRSCREW BLADE
1/4" OBEECHI OR 3/8 BALSA
TONGUE FACED 1MM PLY
OFFSETS TO D.L.
WING POSITION
DL.
HARD 1/8 SHEET
STARBOARD DIAGONALS
PORT DIAGONALS
1/8 SHEET
1/8 DIA BAMBOO
LONGERONS 3/32 SQ HARD BALSA
VERTICAL FORMERS & SPACERS 3/32 x 1/16
DIAGONAL BRACING 1/16 SQ.
16G WIRE U/C
SPAR 5/16 x 1/16
1/16 SHEET
WING RIBS FULL SIZE
1 1/8 DIA. WHEEL
2 LAYERS 1/16
WING DIHEDRAL
· STARBOARD WING ·
3/16 SQ
1/8 x 1/4
1/8 SQ.
1/16 SHEET
· TAIL RIBS FULL SIZE ·
3/8 x 1/4
1/2 x 1/4
POWER:- 12 STRANDS
3/16 x 1/30 OR 10 STRANDS
1/4 x 1/30, 48" LONG

CURTISS WARHAWK.

By J. F. HALLS.



The Warhawk is the name for the American version of the Kittyhawk II and only differs from the Kittyhawk I in small detail equipment and armament. It is fitted with a Packard-built Rolls Royce Merlin. It is a direct development of the Curtiss Hawk series, but differs from all the previous models in having greatly superior performance at height. No details of armament or performance have yet been released, but it is generally assumed to have a maximum speed of about 365 m.p.h. and an armament of six 0·5 machine guns. It has recently been reported in action in Tunisia where it has done quite well against the mixed bag of German and Italian dive-bombers and fighters. Although a good fighter it does not really compare with the more modern types such as the Mustang, the new marks of Spitfire, and the F.W.190.

Method of construction.—Fuselage: Cut formers (1) and (2) from $\frac{1}{8}''$ sheet, (1) plugs into (2) with a hard balsa block, a piece of brass tube is fitted in the block which is firmly cemented to (1). The other formers are all cut from medium $\frac{1}{16}''$ sheet balsa. Cut the keels from hard $\frac{1}{16}''$ sheet or substitute. The formers are cemented to the bottom keel, while the cement is still plastic, add the top keels and keep checking for alignment until the cement is well set. Add the $\frac{1}{16}$th square stringers and the soft balsa fairing for the radiator. Next trace on to $\frac{1}{32}$nd sheet the outline behind the cabin, leaving a small amount of overlap all round, this is cemented in position in the hollows at the top of former (9), the stringers being cut so as to fit on neatly. The cabin is then fitted on, either thin cane or fine gauge wire can be used for the framework.

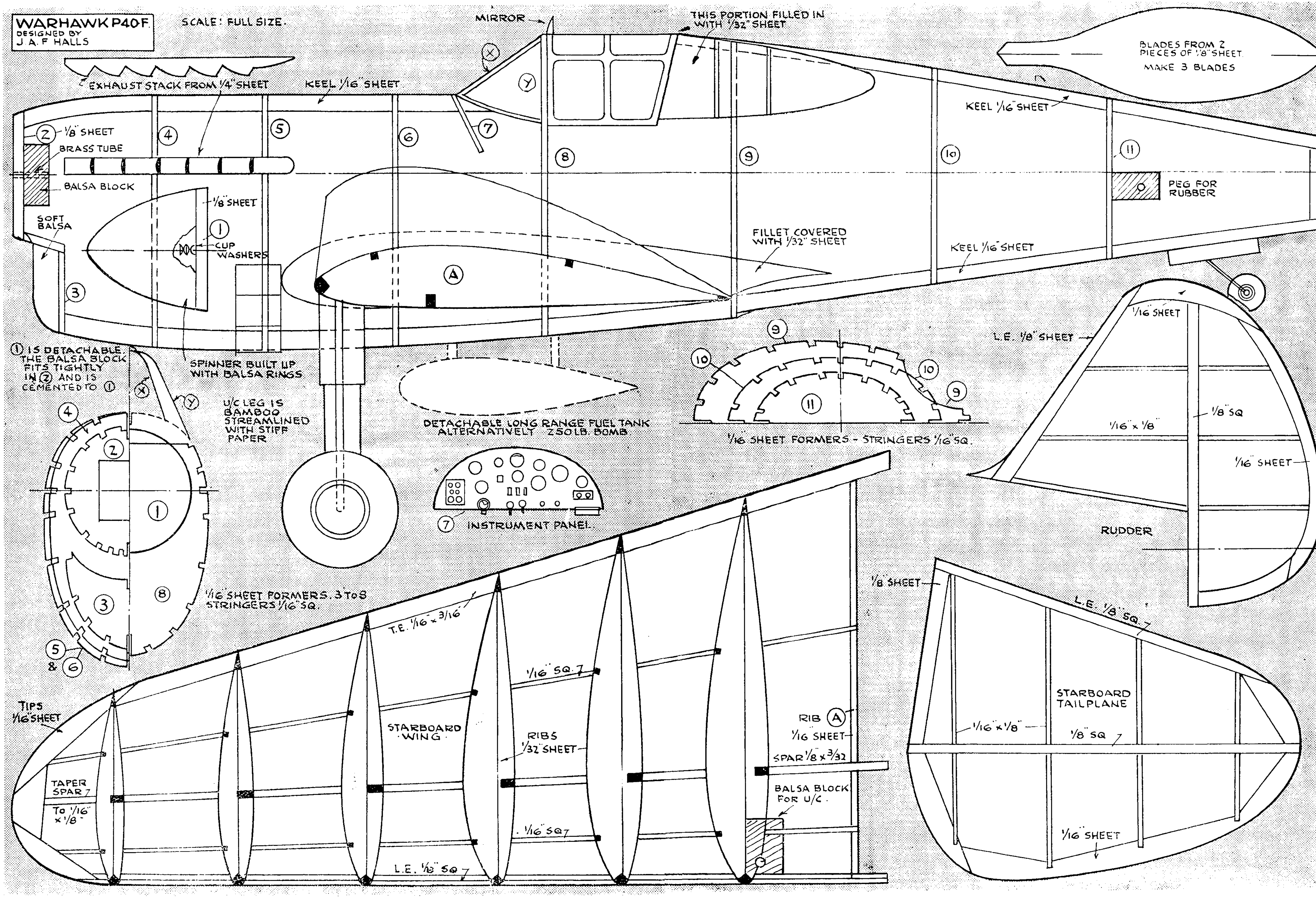
Wings.—Rib "A" is cut from $\frac{1}{16}$th sheet, all others are from $\frac{1}{32}''$ sheet. Lay out the spars on the plan and cement the ribs in position, at the trailing edge leaving about $\frac{1}{2}$ inch overlap, and finally add the wing tips.

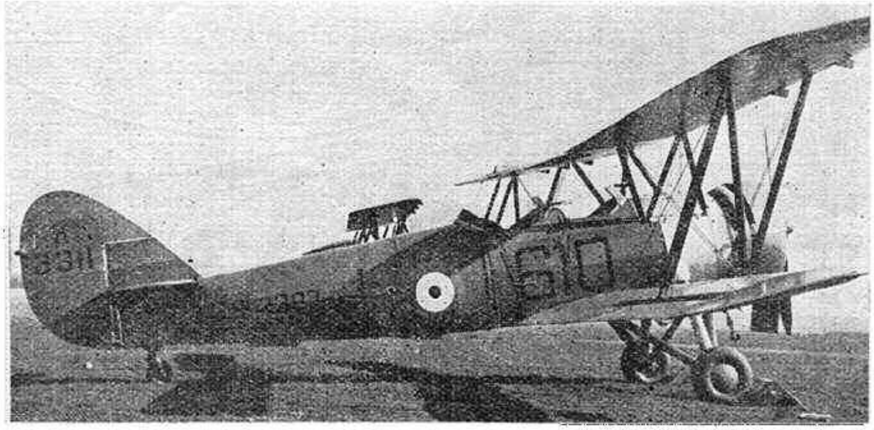
Tail-unit.—The rudder and tailplanes are built up on the plan as shown.

Assembly.—Before covering fix on both rudder and tailplane, securing with pins; keep checking alignment until the cement is well and truly set. Next block up the tailplane until the centre line (shown dotted on the plans) is horizontal, then check that the rudder is vertical (use a set-square for this). Note the tailplanes are fitted so that they have no incidence, *i.e.*, on the centre line, the $\frac{1}{8}$ square spar coinciding with the $\frac{1}{8}$ square rudder post. When the fuselage is correctly set-up, place the wing in position by sliding the trailing edge overlap along the bottom keel until it is stopped by former (9). Put $1\frac{3}{4}$ inch blocks under each wing-tip, then adjust the height of the leading edge until the incidence is as shown on the plan. Now (and *NOT* until this stage has been reached) smear plenty of cement around the trailing edge and the leading edge, also the blocks propping it up, give it several hours to set and then remove the framework from the jig. Next fill in the spaces between rib (A) and the adjacent stringers with $\frac{1}{16}''$ sheet, for the fillet outline with $\frac{1}{32}''$ sheet. Sandpaper the entire framework, paying special attention to the cemented joints, make sure that former (1) runs smoothly into former (2).

Refinements.—The wings may be made detachable at rib (B), the undercart retractable, and cockpit cover sliding, all these points were incorporated in the original.

Covering and Finishing.—Cover the underneath with duck egg blue tissue (if unobtainable use white). Cover the top with an olive tissue and dope on the earth to complete the camouflage. Add the exhausts (which are black) and radio mast, the cabin framework is doped dark grey. Add either British or American markings. It would be a pretty safe bet to cover the whole model white and add Russian markings, although it has not been officially reported in action on the Eastern front it is almost bound to eventually reach that theatre of war.


WARHAWK P40F
DESIGNED BY J.A.F HALLS
SCALE: FULL SIZE.
MIRROR
THIS PORTION FILLED IN WITH 1/32" SHEET
BLADES FROM 2 PIECES OF 1/8" SHEET
MAKE 3 BLADES
EXHAUST STACK FROM 1/4" SHEET
KEEL 1/16" SHEET
1/8" SHEET
BRASS TUBE
BALSA BLOCK
SOFT BALSA
1/8" SHEET
CUP WASHERS
PEG FOR RUBBER
FILLET COVERED WITH 1/32" SHEET
KEEL 1/16" SHEET
KEEL 1/16" SHEET
1/16" SHEET
L.E. 1/8" SHEET
① IS DETACHABLE THE BALSA BLOCK FITS TIGHTLY IN ② AND IS CEMENTED TO ①
SPINNER BUILT UP WITH BALSA RINGS
U/C LEG IS BAMBOO STREAMLINED WITH STIFF PAPER
DETACHABLE LONG RANGE FUEL TANK ALTERNATIVELY 250 LB. BOMB
1/16" SHEET FORMERS - STRINGERS 1/16" SQ.
1/8" SQ
1/16" x 1/8"
1/16" SHEET
INSTRUMENT PANEL
RUDDER
1/16" SHEET FORMERS 3 TO 8 STRINGERS 1/16" SQ.
1/8" SHEET
L.E. 1/8" SQ.
T.E. 1/16" x 3/16"
1/16" SQ.
TIPS 1/16" SHEET
STARBOARD WING
RIBS 1/32" SHEET
RIB Ⓐ
1/16" SHEET
SPAR 1/8" x 3/32"
TAPER SPAR TO 1/16" x 1/8"
BALSA BLOCK FOR U/C
1/16" SQ
L.E. 1/8" SQ
STARBOARD TAILPLANE
1/16" x 1/8"
1/8" SQ
1/16" SHEET



AVRO TUTOR

By

E. J. RIDING.

Quite recently, one's attention was attracted by the vague familiarity of a droning cackle coming from a heavily staggered, single-bay biplane with large square-cut wings and tailplane and a stalky, fixed undercarriage. Yes, it was a Tutor—or at least, its direct descendant, a Prefect.

Their heyday eight years gone, one would imagine that the Tutor and all its descendants had passed into honourable retirement. There must be some truth in the saying: " Old Avros never die—they merely fade away."

The name Avro will always be associated with training aeroplanes, although, of course, the firm is engaged in other directions at present.

The Avro 504, grandfather of all trainers and designed before the last War, was built in greater quantities than any other type. The final version, the Avro 504N, was the standard *ab inito* trainer in the R.A.F. until 1932, when it was replaced by the 621, the subject of this month's article.

Designed in 1929, the machine was a departure from usual Avro practice in that it was of fabric-covered all-metal construction. The fuselage was made from welded mild steel tube, a method used on Fokker machines since the last War. Tutor production was carried out entirely at the company's works at Newton Heath, Manchester The fuselage was made in sections, each side being divided into front and rear portions, the tubes being laid flat in building jigs and welded together. Holes for shackles and bracing lugs were jig located and the finished components welded together in an assembly jig—a method found to be practically foolproof and ensuring 100 per cent. interchangeability for all parts.

The front half of the fuselage was a rigid triangulated structure and the rear half was braced with piano wire looped through semi-circular lugs welded to the appropriate joints between cross struts and longerons. Each wire bracing was tensioned by means of a single Avro-pattern turnbuckle.

Wooded cockpit deckings and pre-fabricated stringer assemblies were clipped into position on the completed fuselage framework, the side panels being detachable for routine inspectional purposes.

Wings, tailplane, rudder and fin were also of fabric-covered metal construction. Wing spars were of hollow " I " section drawn high-tensile steel strip with ribs stamped out from aluminium sheet and flanged in a hand-operated rolling machine.

After receiving the 215 h.p. Armstrong-Siddeley Lynx IVc seven-cylinder air-cooled radial engine, the centre-section and undercarriage were fitted and the fuselage was towed 15 miles by road behind the works lorry to Woodford aerodrome, where it was rigged and test flown.

Smooth handling qualities combined with a good view and easy exit for both occupants made a machine which was regarded with affection by all who flew it. Frise-type inset ailerons were fitted to all four wings and the tailplane was provided with a fixed ground adjustment as well as a hand-wheel-operated trimmer. Undercarriage shocks were absorbed by combined oleo and rubber in compression.

Avro Tutors in service with the R.A.F. were at first painted aluminium all over with roundels on the top surfaces of the top planes and under surface of the lower planes. Red, white and blue stripes were carried on the rudder, the red stripe being adjacent to the rudder post.

In 1935, when the colour of training aeroplanes was changed to yellow, Tutors were painted accordingly with a final coat of clear varnish. The size of the roundels was modified, these being carried at the extreme tips of the wings and not encroaching upon the ailerons. Service numerals were carried in black on the rudder, sides of fuselage and under sides of the lower planes, those on the starboard wing having their tops adjacent to the leading edge and *vice versa* on the port wings. Aluminium cowlings were left in their " buffed " state. The coloured stripes on the rudder were deleted.

The first order received from the Air Ministry was for 300 machines, and many foreign governments were supplied with both the 621 and its derivative, the 626 advanced transformation trainer.

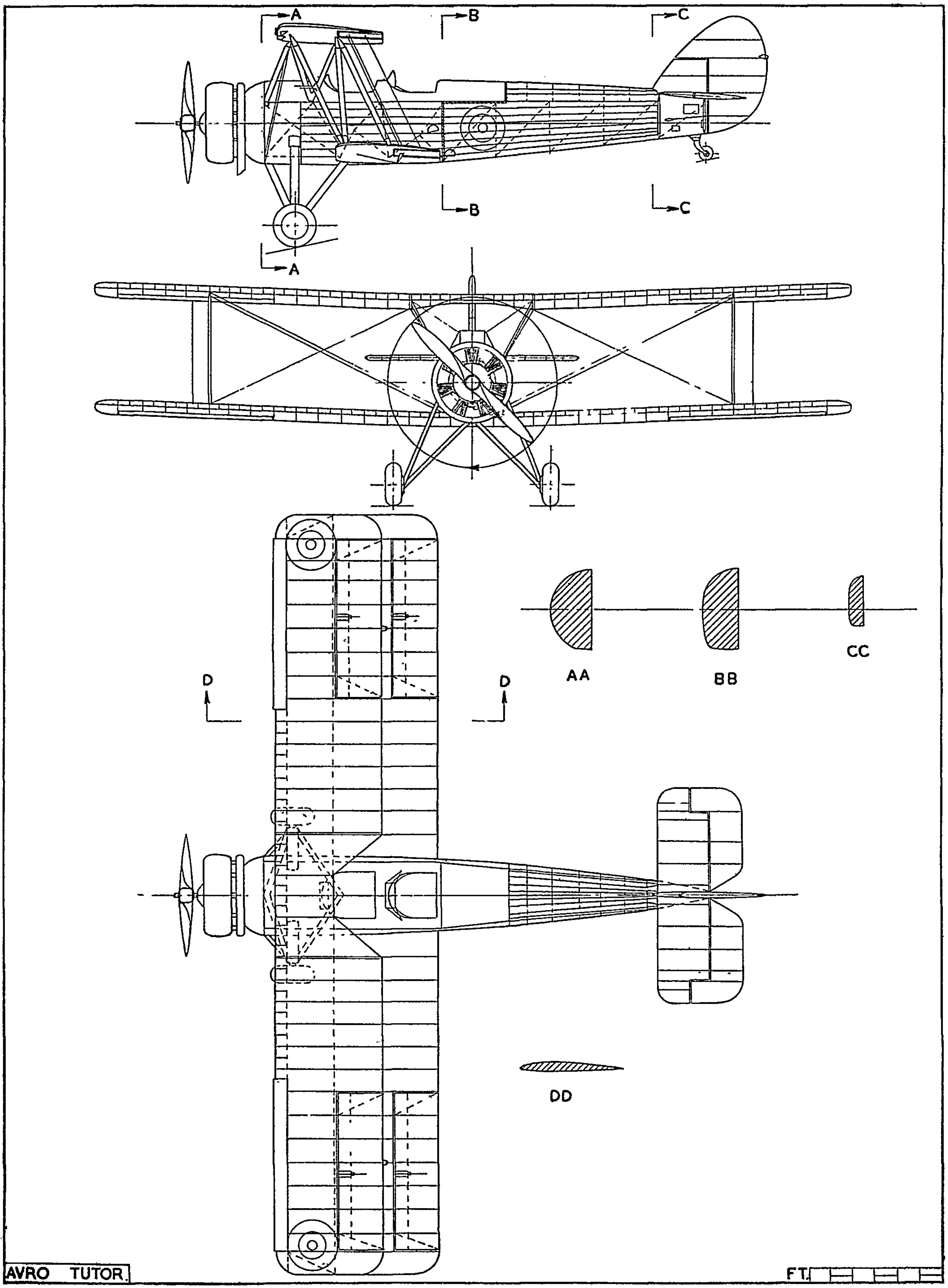
A large batch of 621s were serially numbered from K.3189 to K.3474.

Air Alan Cobham had three 621s on his various National Aviation Day campaign tours, both in this country and in South Africa. They bore the civil registration letters G-AARZ, G-ABZP and G-ABZR. One of these, ZP, was painted in a red and white scheme.

It will be noted that the Tutor illustrated bears different numbers on the fuselage and rudder. Evidently the rudder had been changed without altering the number to suit the machine. At the time the photo was taken, the machine was attached to No. 610 (B) squadron at Hooton, near Birkenhead.

Specification.

Span: Upper and lower planes, 34 ft. Length: 26 ft. 6 in. Height: 9 ft. 7 in. Wing area: 300 sq. ft. Wing loading: 8·2 lb/sq. ft. Power loading: 11·8 lb./h.p. Max. speed: 122 m.p.h.: Cruising speed: 102 m.p.h. Stalling speed: 48 m.p.h.: Service ceiling: 15,000 ft. Range: 290 miles. Weight empty: 1,800 lb. Weight loaded: 2,458 lb.


A
B
C
AA
BB
CC
D
DD
AVRO TUTOR.
FT.

. . . sorry because we are unable to supply the great demand for Keil Kraft model aircraft kits. Proud because of the reputation that these quality models have achieved. It is because of this pride we have in our products that we insist on using nothing but the best materials in their manufacture—and they are not easily come by . . .

Owing to the Limitation of Supplies Order, we cannot accept orders for Keil Kraft Kits until further notice.

KEIL KRAFT KITS

E. KEIL & CO., LTD., LONDON, E.2 — Also distributors for: Skyleada, Drome, Studiette, Truscale, Vernon, etc

Specialists in

AERONAUTICAL PUBLICATIONS

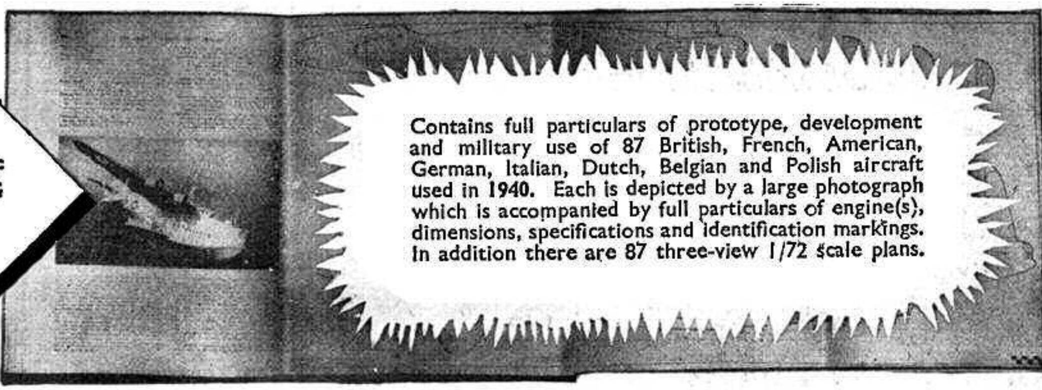
THE HARBOROUGH PUBLISHING COMPANY LTD

PRESENTS

AIRCRAFT OF THE FIGHTING POWERS

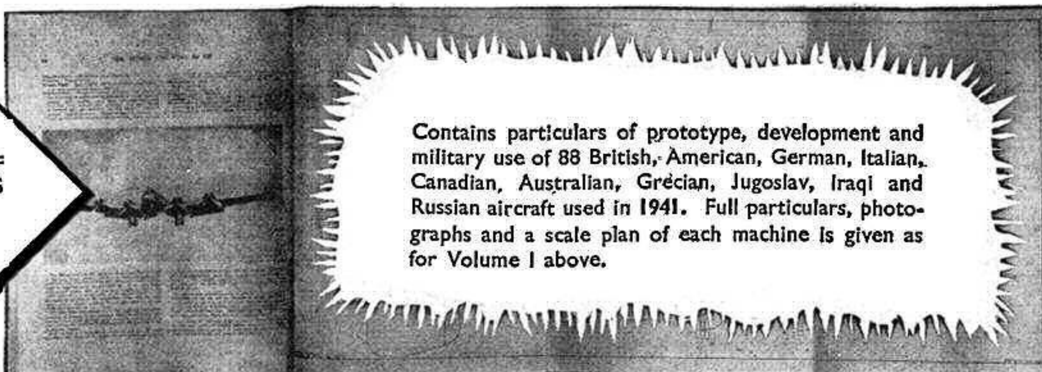
These volumes have been compiled as reference books on aircraft used in Great War II. Each book contains full particulars of prototype, development and military use of the majority of aircraft used by the warring nations. Each is depicted by a large photograph, which is accompanied by full particulars of engine(s), dimensions, specifications, and identification markings. In addition, 3-view 1/72 scale general arrangement drawings, ideal for recognition tests and for the use of solid scale model builders. Each book contains close on 300 pages, is printed on art paper, cloth bound in stiff boards, thread sewn, and gilt blocked. **Price One Guinea per Volume or 22/- Post Free**

VOL. I.
AIRCRAFT OF THE FIGHTING POWERS
1940



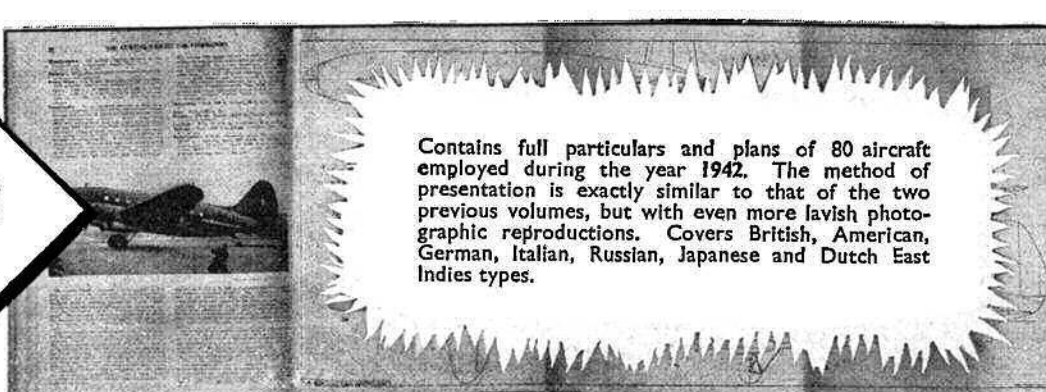
Contains full particulars of prototype, development and military use of 87 British, French, American, German, Italian, Dutch, Belgian and Polish aircraft used in 1940. Each is depicted by a large photograph which is accompanied by full particulars of engine(s), dimensions, specifications and identification markings. In addition there are 87 three-view 1/72 scale plans.

VOL. 2.
AIRCRAFT OF THE FIGHTING POWERS
1941



Contains particulars of prototype, development and military use of 88 British, American, German, Italian, Canadian, Australian, Grecian, Jugoslav, Iraqi and Russian aircraft used in 1941. Full particulars, photographs and a scale plan of each machine is given as for Volume I above.

VOL. 3.
AIRCRAFT OF THE FIGHTING POWERS
1942



Contains full particulars and plans of 80 aircraft employed during the year 1942. The method of presentation is exactly similar to that of the two previous volumes, but with even more lavish photographic reproductions. Covers British, American, German, Italian, Russian, Japanese and Dutch East Indies types.

PRICE 1½d. PUBLISHED BY HARBOROUGH PUBLISHING CO., LTD., ALLEN HOUSE, NEWARKE STREET, LEICESTER

RADIO CONTROL by Peter Hunt

The first publication of its kind in this country dealing with the many problems associated with the radio control of model aircraft. The author is well known for having carried out a number of successful experiments and the practical knowledge gained is fully detailed.
Basic principles of the radio circuit, the design and construction of components, and circuit diagrams of working apparatus are given.
Size 8½ × 5½ ins. Price 2/- or 2/2, post free

AIRFOIL SECTIONS by R. H. Warring

The standard textbook on the subject of airfoils, dealing with some 36 sections normally used by the Aeromodeller. In addition, data ordinates and an accurate drawing of each of the sections, drawn to 7 ins. chord, are given.
Size 8½ × 5½ ins. Price 2/- or 2/2, post free

THE DESIGN OF WAKEFIELD MODELS
by S. B. Stubbs

A complete treatise on the design and construction of the highly specialised "Wakefield" International class of model employed for contest work. The author devotes a chapter to each of the component parts of the machine, dealing with both the theoretical and the practical aspect.
The subject is covered by taking one typical example and following this through the various stages right to the finished product.
Size 8½ × 5½ ins. Price 2/- or 2/2, post free

SIMPLE AERODYNAMICS by A. H. Smith

The ideal elementary theoretical textbook for both the model engineer and the intending full-size aircraft engineer. Starting from very first principles the author leads the reader through a groundwork course in the principles of flight, stability, control, performance, etc., etc.
Size 8½ × 5½ ins. Price 3/- or 3/4½, post free

NOMOGRAPHS by R H. Warring

This is truly the most amazing book ever made available to the aeromodeller, comprising a set of simple charts which solve the most intricate design calculations in a matter of seconds with unfailing accuracy.
The book consists of a set of twelve especially prepared charts or nomographs covering all the major design formulae. Instead of working out long and tedious calculations, the results may be read off direct.
Size 10 × 4½ ins. Price 2/- or 2/2, post free

AIRSCREWS by R. H. Warring

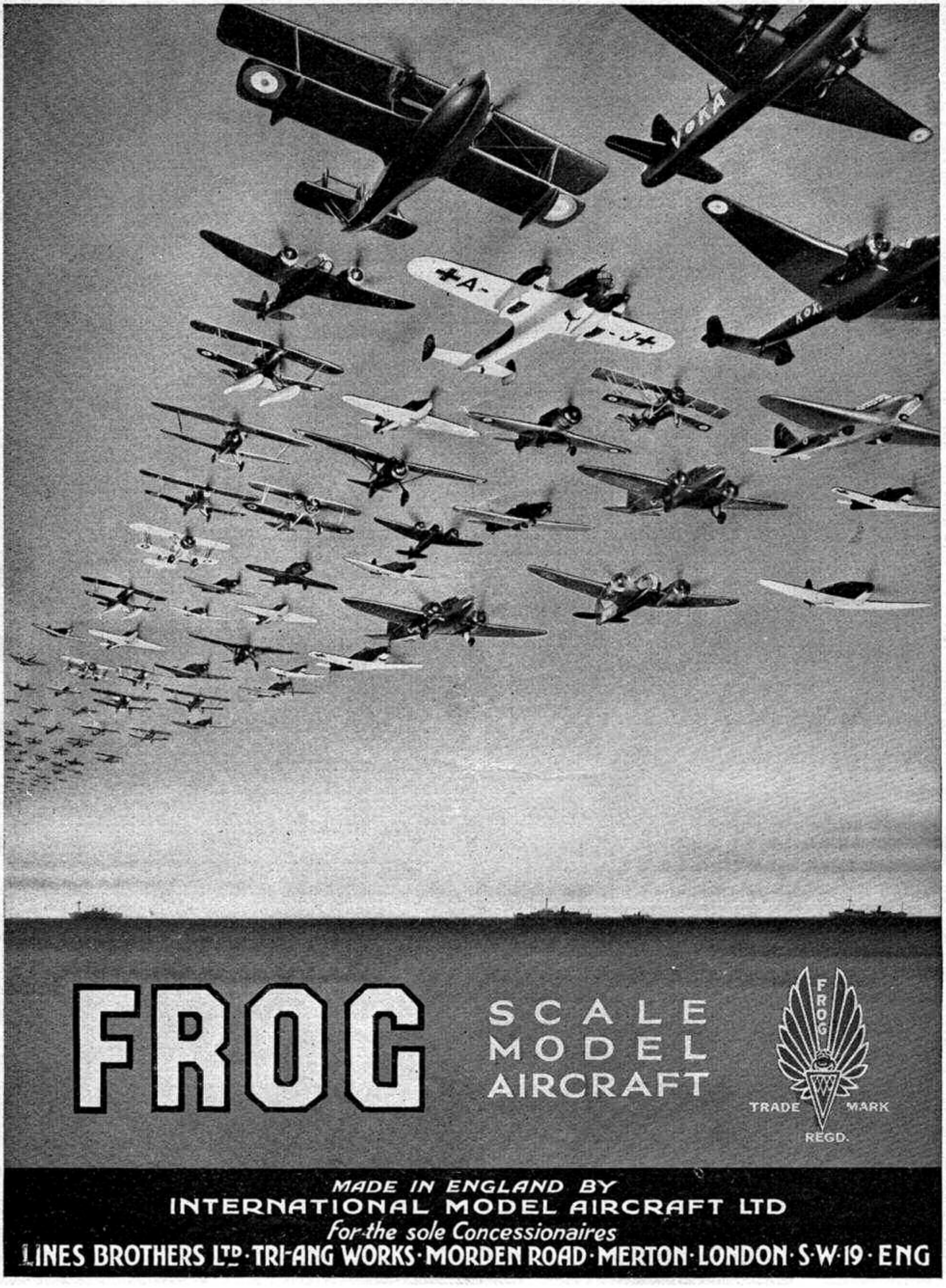
An authoritative work on a most important subject for the flying model enthusiast. Although the subject is mathematical, the theory has been reduced to a working minimum, and much practical advice as to the design and construction of free-wheeling, feathering, and folding airscrews, etc., is given.
Size 8½×5½ ins. Price 2/- or 2/2, post free

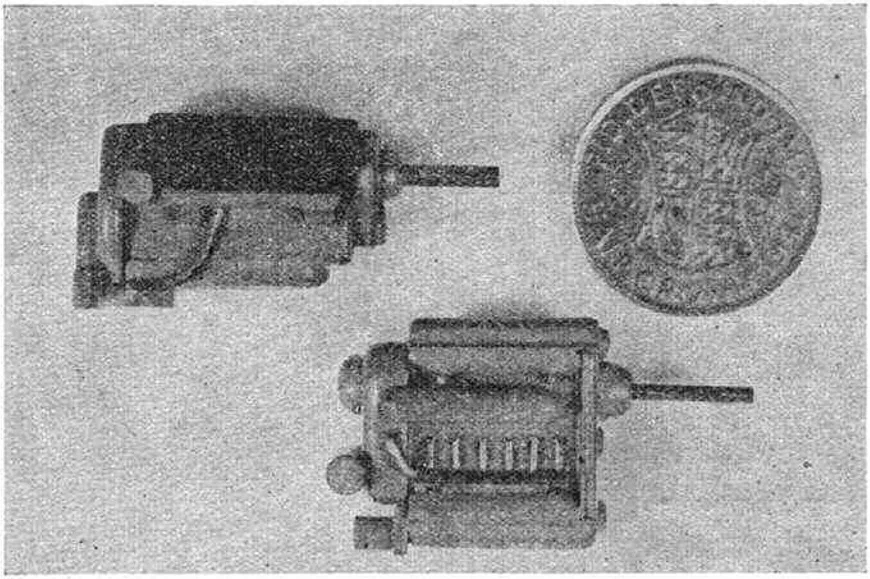
MODEL AIRCRAFT PETROL ENGINES
by J. F. P. Forster

Specially written for the petrol enthusiast and dealing at length with the problems associated with the operation and maintenance of small two-stroke engines. This book is essentially of a practical nature, fully illustrated, and is full of invaluable notes and advice.
Size 8½ × 5½ ins. Price 3/- or 3/3, post free

CAMOUFLAGE '14-'18 AIRCRAFT
by O. G. Thetford, Stud.R.Ae.E.

Written by one of the co-authors of "Aircraft of the Fighting Powers," this book for the first time groups together the camouflage, colour/insignia markings and flying history of all the principal aircraft flown in the first great War.
Included are 18 page plates of squadron markings, some 40 photographs and 8 colour plates showing aircraft, engines, undercarriages, machine-guns and aircrews in their true colourings.
Size 8½ × 5½ ins. Price 3/6 or 3/10½, post free


FROG
SCALE
MODEL
AIRCRAFT
FROG
TRADE MARK
REGD.
MADE IN ENGLAND BY
INTERNATIONAL MODEL AIRCRAFT LTD
For the sole Concessionaires
LINES BROTHERS LTD · TRI-ANG WORKS · MORDEN ROAD · MERTON · LONDON · S·W·19 · ENG



SOLID SCALE MODEL MOTORS

ARTICLE 1

BY

" S . B . S ."

For the benefit of those solid scale modellers who like to add as much detail as possible to their models, and to those who like myself, model anything of interest, the description to follow, and the accompanying plans, might be of interest.

As well be seen, the first is of a Rolls Royce Merlin to 1/48th scale. Precise accuracy is not claimed as the drawings were put together from the study of a few photographs, plus the perusal of a few manuals on modern aircraft engines. From these latter was obtained the information that the outline dimensions of the engine are: length, 75·07″; width, 29·82″; height, 41·01″.

The drawings should be almost self explanatory, but a few suggestions will not be out of place.

Make piece " A " first. Then the two cylinder blocks " C." Glue these latter on. Then add the crankcase sump " B." Next make the propeller reduction gear casing " D." This consists of three parts. (1) The main casing. (2) The propeller boss, which is bored out to $\frac{1}{32}$″ to take the airscrew shaft, the hole to continue through the main casing. (3) The small disc which centres on the crankshaft bearing line. When this assembly has set, glue it on to the front end of the crankcase. Next add " E." This part requires patience in the making. The line where the pipe branches away from the blower casing is cut with a fretsaw, and then curves to represent the section are obtained by slipping a thin strip of fine sandpaper in the saw cut and working back and forth.

Following " E " is " F," which is quite straightforward. After this the round rod " G " is cut carefully to length and laid between the cylinder block, being glued at the rear end to the blower casing " E " pipe extension, and to the back of " D " at the front end. Either side of this, and nestling against the cylinder blocks are fitted the round rods " H." These may be made out of stout wire, or as in my case, match-sticks sanded down.

Adding the details, fit the thin square sections " I " to the bottom side of the cylinder blocks. Here again I used match-sticks. The dynamo " J " and the engine bearer lugs " K " are next, and finally, the magnetos " L." Appropos these latter, I suggest that they be painted and fitted *after* the main painting of the model is complete. The mags should be aluminium coloured and as they lie very close to the black enamelled cylinders it is almost impossible to avoid marking one of the other once they are in position. I know, I did it!

Two short lengths of wire, about 18 s.w.g., make the pipes to the coolant pumps under the rear end of the crankcase.

Colouring appears to be aluminium on all except the cylinder blocks, dynamo, and odd pipes. I would suggest to those who wish to add further detail, to arm themselves with one or two good photographs, and with some bits of fine wire, etc., they can embellish to their heart's content.

With regard to tools: I worked with a cheap fret-saw, and used metal-cutting blades, they are finer and make a neater cut. Round sections, such as the piece " G," were obtained from wooden knitting needles. (No. I did not swipe them from my wife, I went out and bought them for a few coppers!)

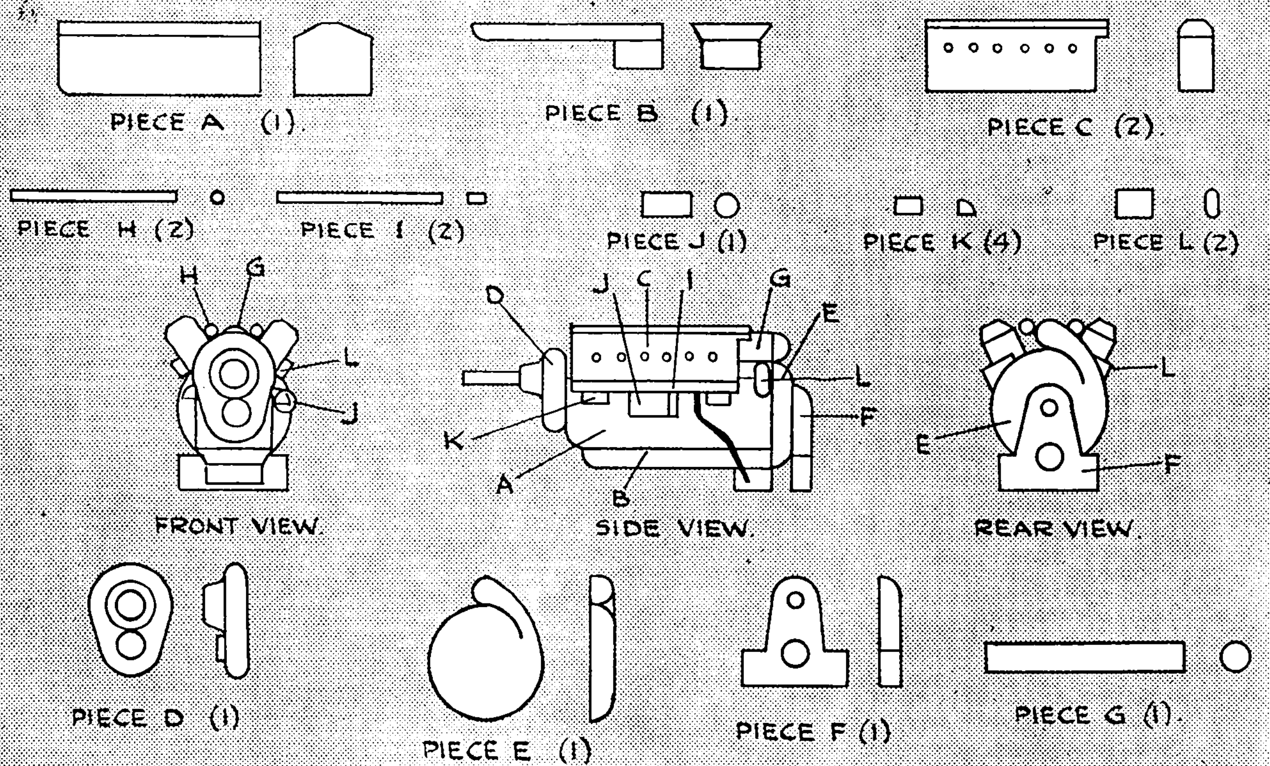
Needless to say, built into a model plane, the cowling will have to be very thin material, such as sheet metal, if the outline is to follow true scale; and it will be found that the exhaust manifolds make a neater job if mounted on the cowling rather than on the engine itself. For this reason I merely marked the exhaust outlets on the cylinders by drilling fine holes at the appropriate places.

JUNKERS JUMO 207.

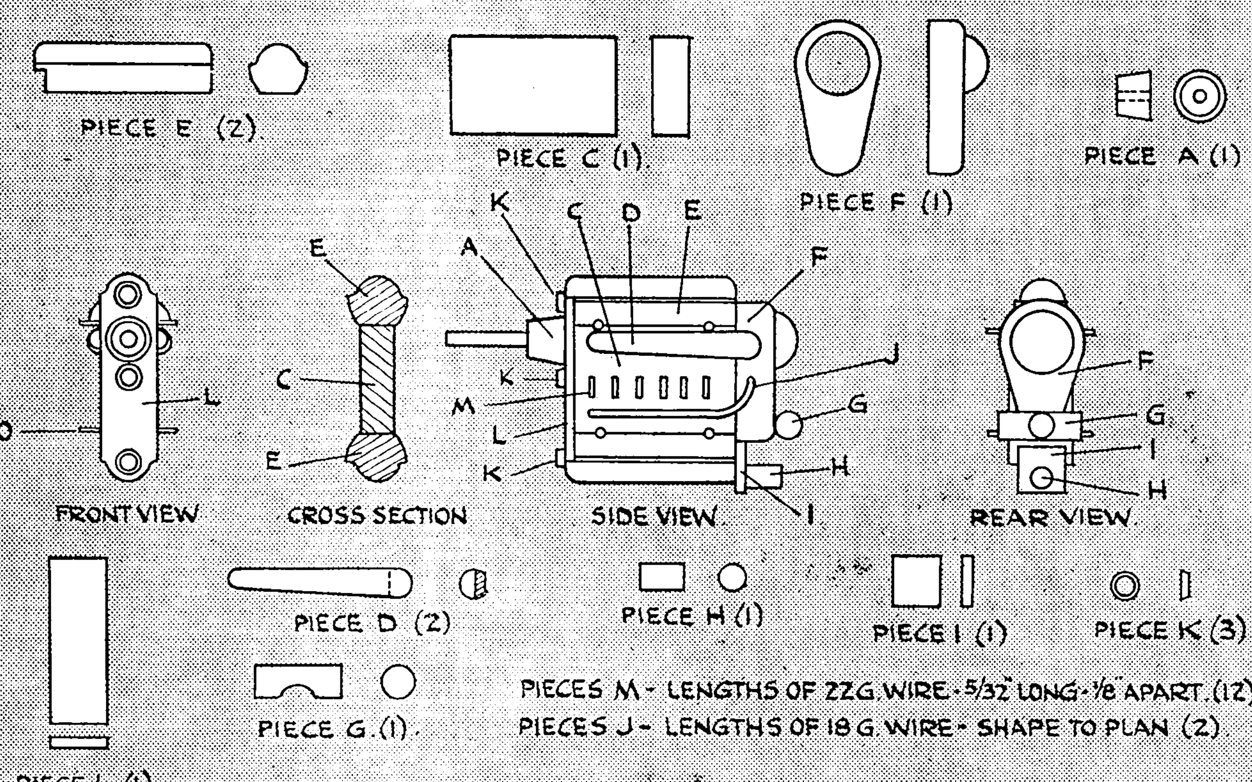
Procedure in the case of this motor is similar to that for the Merlin. In the case of the two crankcases " E," I made these from dowel rod, and in order to get the shape, they were held in the vice along the half-way line. A fine hack-saw blade or thin file was then used to cut the fine rebate which represents the flange, finishing off with sandpaper, of course. The order of making is: " C," " E," " L," " K," " A," which is drilled $\frac{1}{32}$″ through the centre, " F," " D," " I," " H," " G," " M," " J."

Very fine holes are drilled at four points for the engine bearer wires " O." All parts are glued on with clear cement, the injectors " M " after the painting, and a pair of tweezers will be useful in putting these latter on.

The piece " G " is provided with a fluted recess at the point shown by a shaded circle on the Rear View. This is quite shallow and was done with a thin round file. A thick needle wrapped with sandpaper would do as well. All parts were coloured with grey shades, and looked very effective.



1/48 ROLLS ROYCE MERLIN.



1/48 JUNKERS JUMO 207.

"JUMPIN' JIVE"

By PETER S. BROWNE.

Jumpin' Jive was designed in the first place as an experimental model, to be fitted with retracting undercarts, two-bladed folding props, slots, and various other home-made brain storms. But an impending competition, with its attendant nightmares of non-retracting undercarts, over-zealous folding props, and other bugbears, reduced the Jive to a respectable duration job. Perhaps it was just as well, for it is doubtful whether subsequent performance could have been substantially improved by any gadgetry, and I would rather have a model I could rely upon every time than a super gadget-rack with a few second's better performance.

In spite of (or because of) a rather high wing loading, the Jive has a good performance for a model of its class. No flight fell below the 1:10 mark, even in the filthiest weather, and the majority were between 1:40 and 2:00, with a best of 2:45. The Jive never had a chance to show its thermal paces, being lost in driving rain during a competition on Epsom Down. (By the way, if any Epsom Downer finds a red and white Jive, will they let me know ?)

The construction is fairly straightforward.

FUSELAGE :

This is a conventional box structure, with all struts and spaces of $\frac{3}{32}$ square hard balsa if you can get it. If not, carefully-chosen substitute should not materially alter the performance. The streamline "snout" is added after the basic structure is completed. The nose section is filled with $\frac{1}{16}$th sheet, and the last bay at the tail with $\frac{3}{32}$nd sheet backed with 1 mm ply.

The wing slides through the hatch, constructed of $\frac{1}{16}$th sheet, and is secured by bands passing over the wing and attached to pegs inserted in the strengthening sheet. This may seem fragile ; but in practice it has stood up to a great deal of hard wear, including power-dives, on both slab and streamliners.

UNDERCARRIAGE :

This is formed in one piece from 18 s.w.g. wire, and slides into a 1 mm. ply box firmly cemented at point "X" in the fuselage. This is, in my opinion, the ideal undercart, and I have used it without fail on all types of models. It has the advantages of shock-absorbancy, light weight and easy removal, without the unsightliness of the conventional wire-and-bamboo bird cage, or the rather chancy strength of bamboo legs. If the wire works loose, it can easily be packed tight again. The wheels are the now popular hub-less type, built up from $\frac{3}{32}$nd sheet and 1 mm. ply, covered with tissue, and doped and polished.

WINGS :

These are of spar-less construction, with a $\frac{3}{8}$ x $\frac{3}{8}$ L.E. and a $\frac{1}{2}$ x $\frac{3}{32}$ T.E. into which are slotted the $\frac{1}{32}$nd sheet ribs. Tips are of $\frac{3}{32}$nd sheet (or laminated $\frac{1}{16}$th sheet, shaved knife-thin), and the centre-section is covered with $\frac{1}{32}$nd sheet. Make very strong joints at the polyhedral brakes, and take great pains over curving the L.E.—otherwise the main advantage of this type of wing is negatived.

TAIL ASSEMBLY :

The fin outline is from $\frac{3}{32}$nd sheet, with $\frac{3}{32}$nd struts. The completed fin is cemented firmly and with a slight right bias to the $\frac{1}{16}$th sheeting at the rear of the fuselage. The underfin is from $\frac{3}{32}$nd sheet, strengthened with $\frac{1}{16}$th bamboo.

The tailplane is also sparless, with a $\frac{3}{16}$th by $\frac{3}{16}$th L.E., $\frac{1}{4}$ x $\frac{3}{32}$nd T.E., and $\frac{3}{32}$nd tips. Ribs are $\frac{1}{32}$nd sheet and the centre section is $\frac{1}{32}$nd sheet covered.

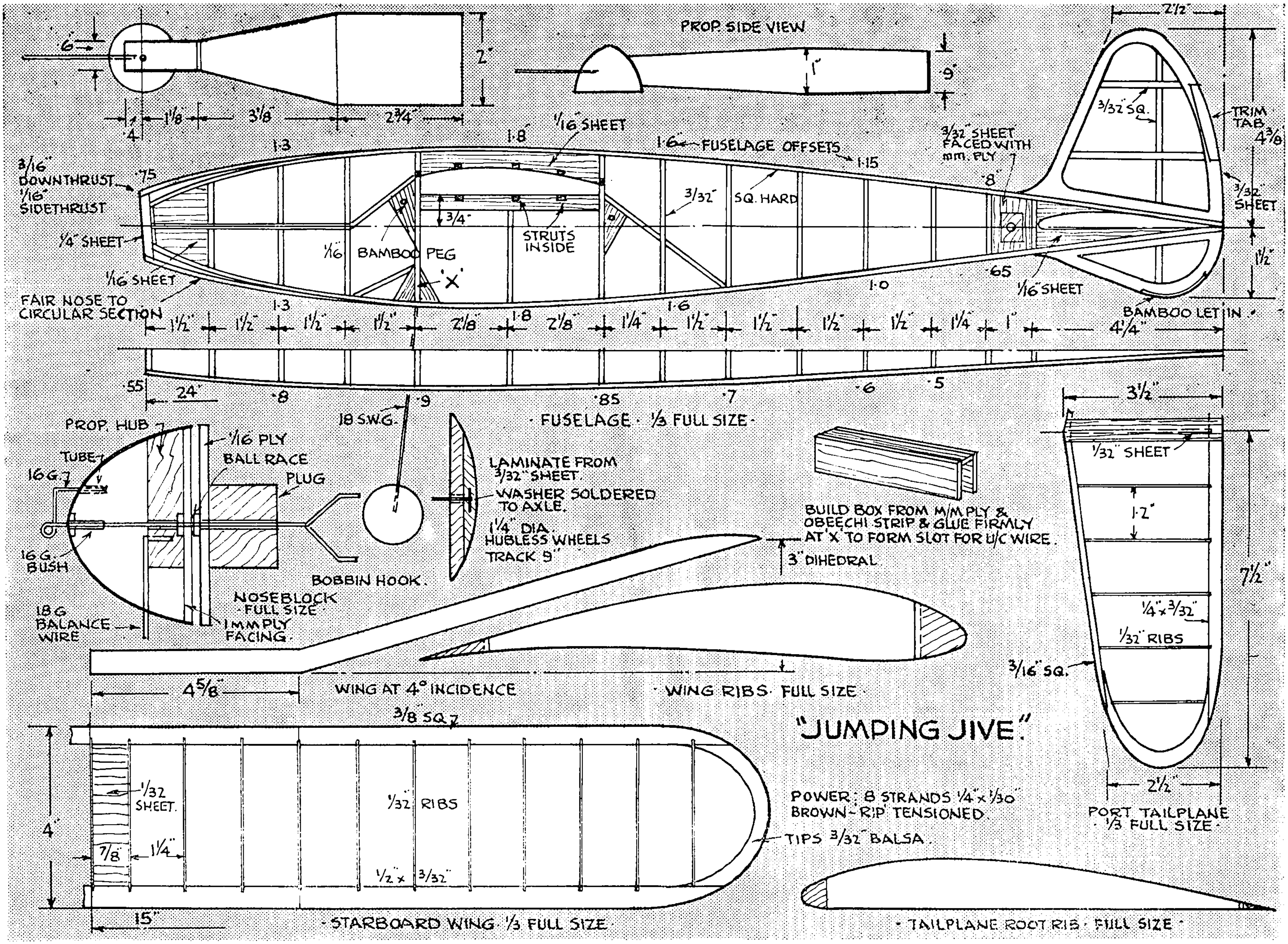
PROP. ASSEMBLY :

Carve and sand the spinner to shape, and cut slot to receive prop. blade hub. Drill and bush for 18 s.w.g. shaft. Also drill perpendicular hole for counter-balance arm. Prop. blade is carved as soon as possible, consistent with strength, with pronounced under-camber, and polished with banana oil and elbow grease. Fit hinge to prop., binding well and making sure that the action is smooth. I find that aluminium wire fasteners make first-class hinges. Insert prop. hub in spinner and cement well, ensuring that prop. bush and spinner bush are perfectly aligned, and that the counter-balance arm, bound and cemented to the prop. hub, registers with the perpendicular hole in the spinner. Fair blade root to spinner with balsa dust and cement, and finish off. Thread prop. ball race and nose-piece onto 18 s.w.g. shaft, bend bobbin hook and winding hook, and balance prop. by pouring molten lead into a paper tube wrapped around the end of the counter-balance arm. The power is eight strands of $\frac{1}{4}$ x 1.30th flat, pre-tensioned, 36" long. The Jive was covered red and white, water-sprayed, with two coats of thin banana oil.

The original Jive needed no trimming weights, trim being obtained solely by combination of thrust and incidence. The weight of a model differs with the individual builder, however, especially in these days of substitutes, so if your version of the Jive proves hard to adjust it is an easy matter to fit a small sliding trim weight.

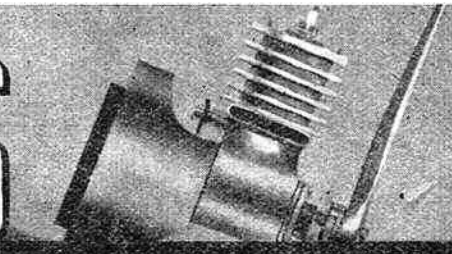
I have found that the best trim for thermal hunting with most high powered models consists of $\frac{3}{16}$th down-thrust (sounds excessive but . . .) $\frac{1}{16}$th right side thrust, $\frac{1}{32}$nd right rudder, and $\frac{3}{32}$nd positive incidence on the starboard wing panel. This gives a very tight spiralling climb to the right, changing to a sweeping left-hand turn as the power dies. The glide is exceptionally flat and stable. This trim cannot be beaten for swift altitude-getting, although I doubt its efficiency on a lower-power job. If you prefer not to tamper with the wing incidence, the same effect can be obtained by offsetting the wing : that is, for positive incidence on the starboard panel, offset the wing so that the starboard panel is further forward than its opposite number, and *vice-versa.*

The original Jive weighed exactly $4\frac{1}{8}$th oz. ready to fly.



PROP. SIDE VIEW
3/16" DOWNTHRUST
1/16" SIDETHRUST
1/4" SHEET
1/16" SHEET
FAIR NOSE TO CIRCULAR SECTION
1/16 BAMBOO PEG
'X'
3/4"
STRUTS INSIDE
3/32" SQ. HARD
FUSELAGE OFFSETS
3/32" SHEET FACED WITH mm. PLY
1/16" SHEET
BAMBOO LET IN
3/32" SQ.
TRIM TAB
3/32" SHEET
FUSELAGE · 1/3 FULL SIZE ·
PROP. HUB
TUBE
16 G.
16 G. BUSH
18 G. BALANCE WIRE
1/16 PLY
BALL RACE
PLUG
NOSEBLOCK · FULL SIZE ·
1 MM PLY FACING ·
BOBBIN HOOK.
18 S.W.G.
LAMINATE FROM 3/32" SHEET.
WASHER SOLDERED TO AXLE.
1 1/4" DIA. HUBLESS WHEELS TRACK 9"
BUILD BOX FROM M/M PLY & OBEECHI STRIP & GLUE FIRMLY AT 'X' TO FORM SLOT FOR U/C WIRE.
3" DIHEDRAL
WING AT 4° INCIDENCE
· WING RIBS · FULL SIZE ·
1/32" SHEET
1·2"
1/4" x 3/32"
1/32" RIBS
3/16" SQ.
PORT TAILPLANE · 1/3 FULL SIZE ·
"JUMPING JIVE."
3/8 SQ.
1/32 SHEET.
1/32" RIBS
1/2" x 3/32"
TIPS 3/32" BALSA.
POWER: 8 STRANDS 1/4" x 1/30" BROWN-RIP TENSIONED.
· STARBOARD WING · 1/3 FULL SIZE ·
· TAILPLANE ROOT RIB · FULL SIZE ·

PETROL TOPICS



DR. J. F. P. FORSTER.

ENGINE DESIGN.

A REPLY TO MR. L. H. SPAREY'S ENGINE BY DR. J. F. P. FORSTER.*

After waiting in vain for the expected flood of articles in reply to Mr. L. H. Sparey's articles entitled "My Engine," in the April and May issues of the *Aeromodeller*, I have been looking back over his article and drawings. Unable to restrain myself any longer, I have duly taken out pencil and paper as he entreats us to do, and here is my reply which I trust he will consider incorporates enough of "that quality which is not strained."

There are many points about his engine, and particularly about his reasoning as regards long life, little wear and tear, and not too great an insistance on weight reduction with which I heartily concur. And I also note, he seeks for much the same qualities and performance from his models as I strive for myself .... namely, a steady, controlled and not too spectacular climb ... as he says: "We do not require them to zoom up into the air like the proverbial rocket." We may, therefore, take it that he leans towards the scale type of model both in appearance and performance. Thus far we are agreed.

If we are after scale models, we must have compact engines which can be housed in realistic but accessible cowlings. There is hardly a single full-sized single engine machine of modern design with a low thrust-line and an upright "in-line" engine. I have repeatedly stressed, both in articles and elsewhere, the universal desirability of running model aero-engines inverted. From an aerodynamic standpoint, a high thrustline is still more necessary on models than on full-size machines, because of the exaggerated dihedral usually necessary on models and consequent high centre of drag. *Why, then, do we cling to the convention of drawing and photographing model aero-engines upright if they are to be used inverted?* Cannot we get rid of this slavish and senseless custom.

Mr. Sparey has made provision for easy inversion of his engine. Why not let us, in future (if some people *must* run their engines "upside down") make provision for *upright* running the *secondary* consideration, and design, draw, photograph and mount our engines the correct way up; *think* of them the right way up, and for heavens sake *use* them the right way up! I want to see all engines in future illustrated in the advertisement pages of the post-war *Aeromodeller*, and purporting to be *Aero* engines, mounted in the inverted position. If people want to use Aero engines as race-car or power-boat engines, let them have the headache of converting them, but *Aero*modellers want *Aero* engines, and it's time we had them!!!

Having got that little bee out of my bonnet (I hope for the last time!) I propose to discuss the component parts in the order in which Mr. Sparey took them, and suggest that the reader have beside him, as I have myself, Mr. Sparey's articles and drawings:—

1. *Dual Ignition.*—Not essential, but highly desirable.

2 and 3. *Detachable head and finning.*—Mr. Sparey contends that a detachable head facilitates inspection and cleaning, and is desirable.

Now I want to debunk this contention: How many petroleers can honestly say their engine has run for so many hours that it's performance has been definitely proved to suffer from carbonisation? Is it anymore difficult to clean the inside of a "pot" after its removal than a cylinder head? The piston top is exposed for cleaning by removal of the said "pot" just as easily as by removal of the head only. A gasket of some sort is needed at the joint, and is only one more possible cause of leak and loss of compression, while the bolts and faced or recessed surfaces only involve extra weight and labour, and are just as liable to strip out of their threads as are bolts into the crankcase, except that his cylinder is cast iron. The Cylinder and head in one piece make for ease, and therefore cheapness of production and have no real disadvantages. If, as Mr. Sparey contends, most engines run too cool (a prolific cause of oiled plugs) why go to the trouble of fitting an Electron head which is a more efficient dissipator of heat than steel or cast iron?

If, on the other hand, cooling should *not* be adequate, what is simpler than the imitation head as fitted to Baby Cyclones E. & F., which is nothing more than a glorified aluminium alloy plug washer adorned with ample cooling fins? This has the additional advantage of being a detachable and optional fitting which facilitates the regulation of operating temperature to suit uncowled or heavily cowled engines.

The well tried Ohlsson family of engines, among others, use one piece steel cylinders and heads with integral machine cooling fins. This arrangement is easy for the amateur to produce, and it only remains to decide the best method of holding down the cylinder to the crankcase. Spot welding, as used on Ohlssons, is not practicable for the amateur, so that either nuts or bolts, bolts only, into tapped lugs, or threading the Cylinder into the Crankcase as used on the famous Brown Junior must be resorted to. I agree with Sparey over the liability of threaded lugs in aluminium alloy to strip, so of the three methods I would prefer nuts and bolts.

The transfer passage in Mr. Sparey's drawing, like that on Ohlssons and Phantoms, is cast integral with the crankcase sleeve extension, into which the lower half of the Cylinder is a tight push fit (being unfinned and little more than a "liner" for this lower half). A thick flange round its upper extremity and not *below* the exhaust and transfer ports, as in Mr. Sparey's drawing, seems to me the most satisfactory anchorage for the cylinder retaining nuts and bolts. Furthermore,

* *It should be noted that this article was written* before *Mr. Rosenfeld's article was published. Dr. Forster will deal with several points from Mr. Rosenfeld's article at a later date.*

if hexagon bolts were employed there would be no need to carry these right up through the cooling fins, for, if the lowest fin were left fairly thick (say, $\frac{3}{32}$") the nuts could be placed between this and the next fin (3 Fig. I.) and the short hexagon bolts passed up through the crank-case flange and tightened with a spanner. Four would seem to be the minimum safe number.

The exhaust system needs to be adaptable to any sort of cowling, and a faced surface surrounding the port, with threaded holes for bolts as on Baby Cyclones, seems to me far preferable to a short flattened exhaust pipe so frequently seen on pre-war engines, to which an extension is so difficult to fit in a gas-tight manner.

It is impossible to tell from Sparey's drawing just what he proposes to do about the upper inlet of the transfer passage which will have to pass through his proposed strap or collar carrying the exhaust pipe. It looks to the ordinary reader very much as if he has overlooked this point. Is it integral with his crankcase casting ? If so, how does he propose to machine the upper face of the flange ? Maybe it is integral with the exhaust pipe collar ? In either case, I don't like it ! ! ! Another likely cause of leak and troublesome to make, too.

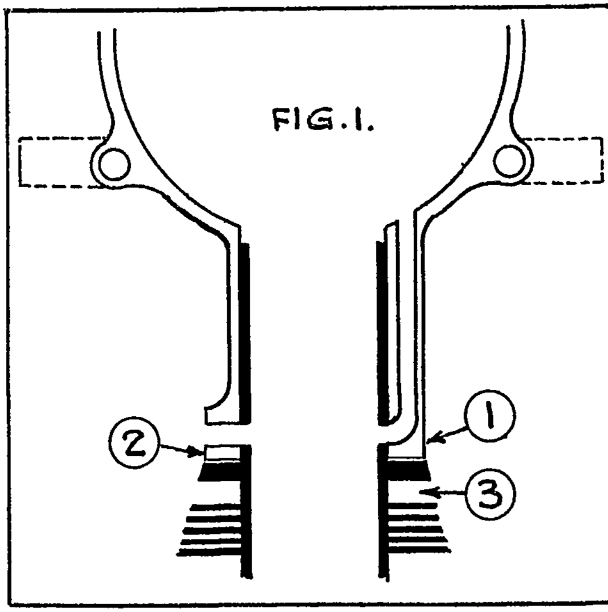
Fig. 1 shows a transverse sectional drawing of *my* proposed casting of the crankcase sleeve and transfer passage, enclosing a steel or cast-iron cylinder liner. The flange is, of course, absorbed at each side into the top of the transfer passage (1), and the exhaust port facing (2) and the four bolts and nuts at each fore and aft corners cannot be shown.

4 and 5. *Piston.*—Why even consider aluminium pistons when lapped cast-iron or steel have proved so satisfactory ? Rings are a snare and delusion ; involve much extra machining and expense, are are no better in the end (in fact often worse). Avoiding the gudgeon pin holes in the sides of the piston is certainly a most attractive idea. What goes for Gems Suzor should go for us, and I'm content to abide by this clever solution despite that nut on top of the piston.

6 and 7. *Crankshaft and main bearing.*—Mr. Sparey's proposed use of cast-iron as a main bearing is interesting and unusual in Aero engines. I'm willing to try anything once !

Contact Breaker.—I really cannot " stomach " that contact breaker ! ! It may work reliably, but it just won't do for me ! My objection, apart from appearances (even Mr. Sparey admits it might be cleaned up a bit !), are on the grounds : (*a*) of the impossibility of housing it in any sort of cowling ; (*b*) that while removing it

FIG. 1.



from the vicinity of the inevitably oily cam, he has still got it directly in the line of fire of oil, which gets thrown out *centrifugally* from the end of the bearing ; and (*c*) of its extreme vulnerability.

As a consequence of this centrifugal spattering of oil from the end of almost all main bearings, I have resolutely set my face against cams on the crankshaft or on a sleeve, and am convinced that the best place for the cam is the rear face of the airscrew driving washer. This enables the actual points to be placed well behind this potential " disc of flying oil," while the actual cam and end of the rocket-arm gets the benefit of the lubrication which reduces wear. Furthermore, the spring pressure keeps the crankshaft pressed forward, and when starting the engine, is a substitute for end thrust, so necessary for efficient crankcase sealing. Fig. 2 shows my proposed contact breaker in detail.

The rocker arm is a strip of hardened high carbon steel bent at right angle with a slight notch in the angle. The cam end is curved slightly inwards towards the angle and ground to a smooth curve from side to side where it rubs on the cam. The other end carries the rivetted or if possible spot-welded tungsten contact point, while the extreme end of the strip is bent back

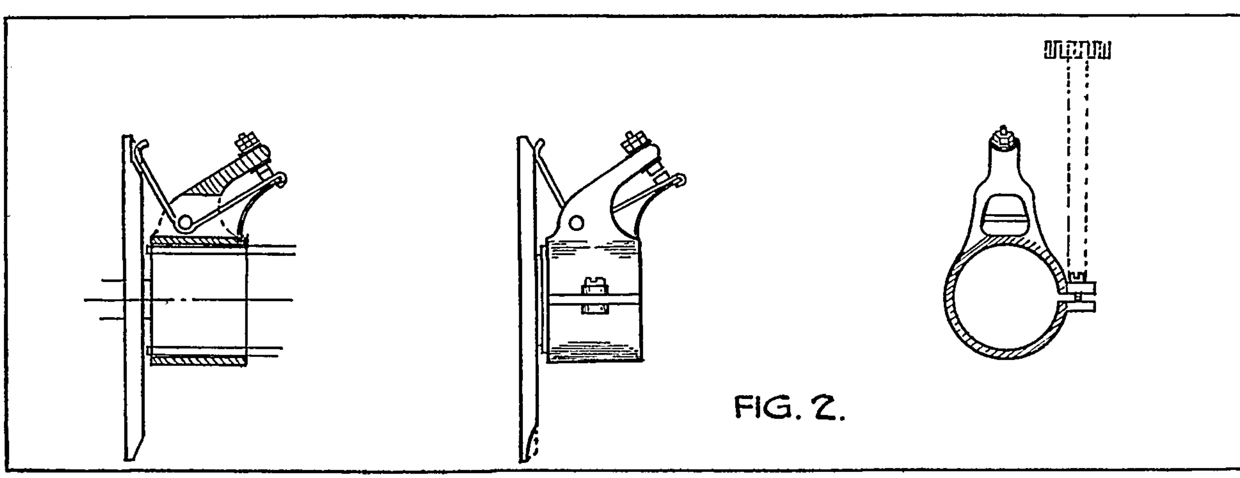
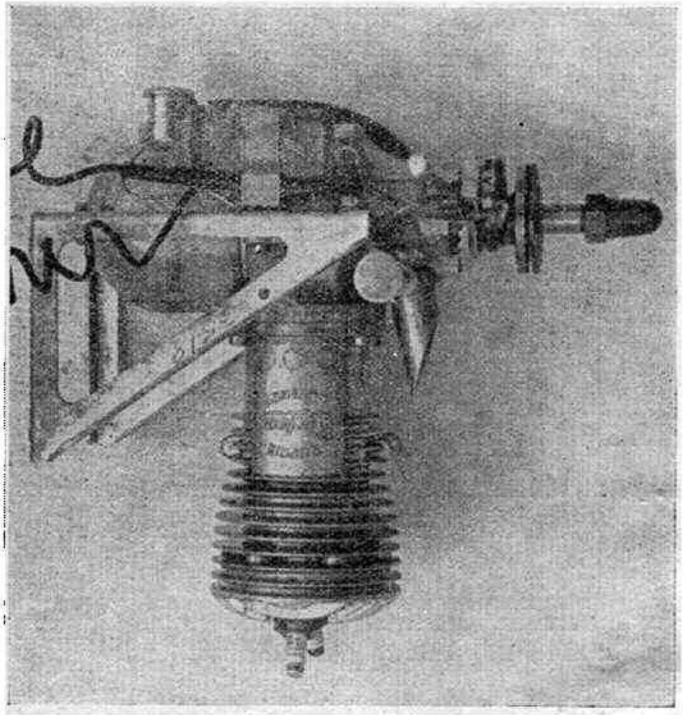
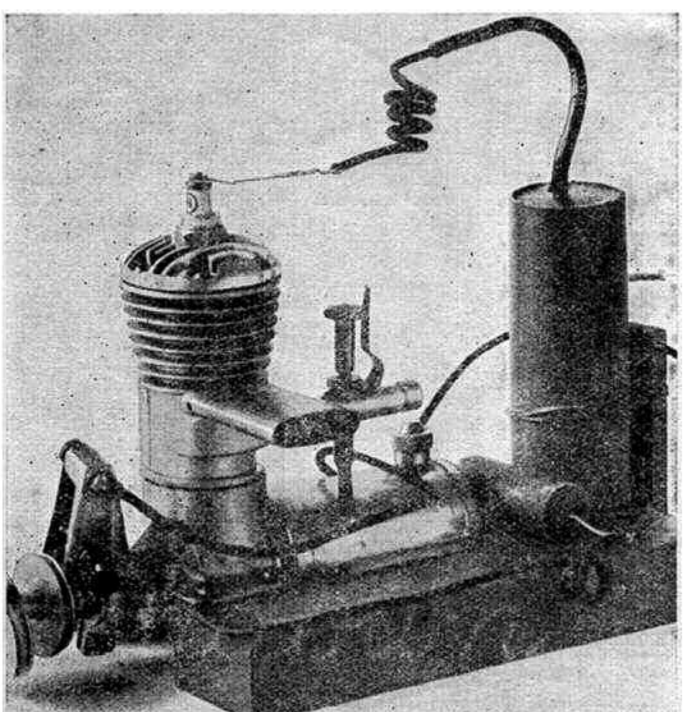


FIG. 2.



A 6 cc. Baby Cyclone of the latest type with twin plugs and petrol tank mounted behind crankcase. A neat and compact layout which may be built direct into a model, provided it is attached to a "knock-offable" bulkhead.

This photo shows a 7.5 cc. Gwyn Aero with accessories all mounted on a "Test-Rig" as supplied by the manufacturer. Incredible as it may sound units such as this have been built straight into the model!



upon itself to form a shoulder retaining the short strip of clock-spring with which it is spring-loaded. The whole arm must, of course, be bent to the correct shape before case-hardening with Kasenit or Pot. Ferro Cyanide. This arm is extremely light and unlikely to bounce, because the spring-loading is applied just behind the contact point. The whole arm pivots at the notch on a steel pin which passes acrosss the "tunnel" through the fixed contact arm, and can, if desired, be extended to form the control lever, though I prefer a milled headed extension to the stiffness adjusting screw so that timing adjustment and tightening or locking the assembly can be done by the same control lever. The whole assembly which is split and tightened around the crankshaft bearing housing by the adjusting screw, can quite easily be cut from a solid chunk of aluminium, though a casting might be preferred. By simply sliding the cockspring sideways and taking off the airscrew-driving washer, the moving arm can be withdrawn under the pivot pin for cleaning or refacing, leaving the fixed contact completely accessible also.

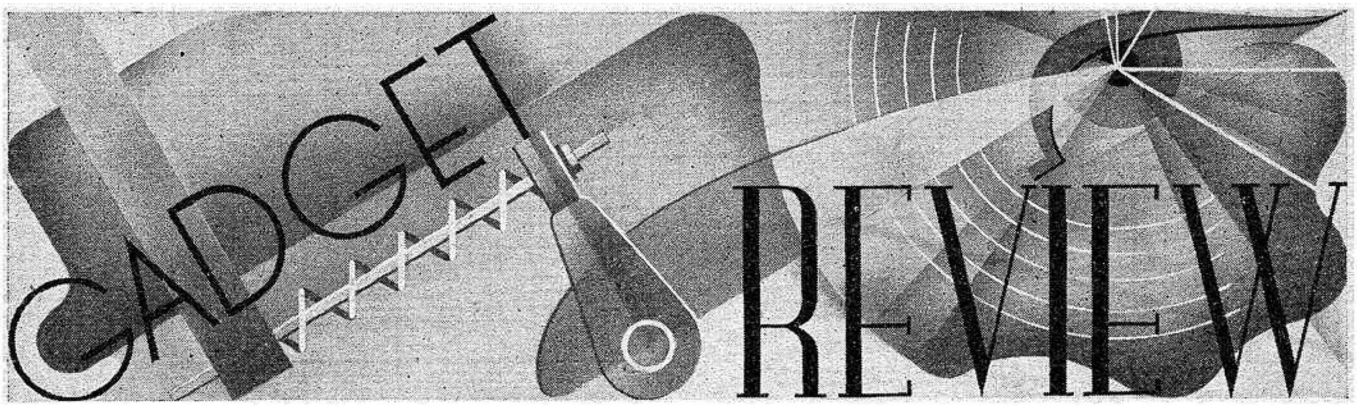
Rotary Inlet Valve.—As opposed to the piston operated or "direct" induction system, I am all in favour of this type of valve. Apart from the vulnerability of the induction pipe and depending fuel tank (which, incidentally, Mr. Sparey has still retained on his rotary valve), and the difficulty and long overhang of the mounting, using the "direct" system, it is less efficient as a means of fully charging the crankcase before compression, and a third cylinder port is required, tending to weakness and distortion and loss of compression, apart from complicating the sleeve casting.

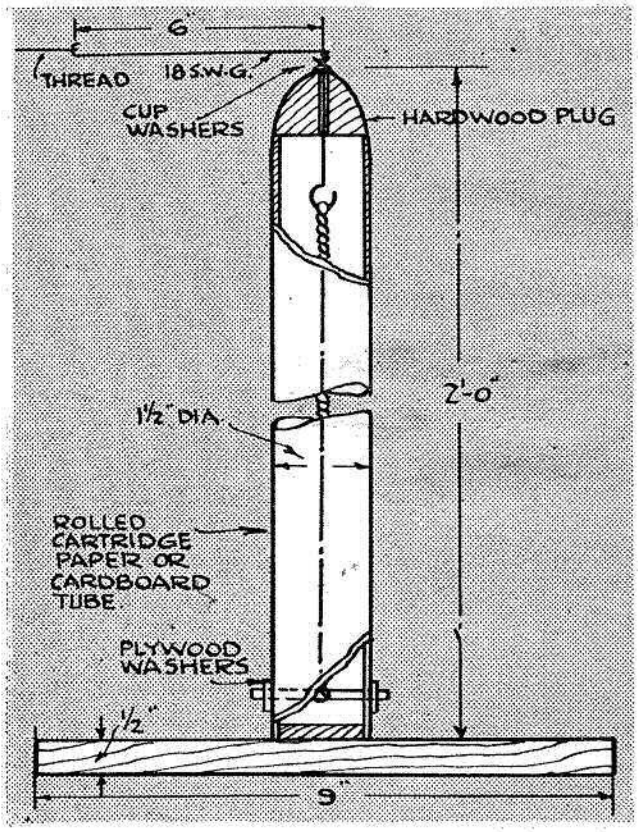
I see no advantage in the disc valve over the hollow crankshaft valve, unless it is desired to have a rotating shaft at the rear of the engine which might possibly be used for driving something such as a dynamo or a magneto. Using a disc valve, the contact breaker might, with advantage, be placed behind the engine working from a cam on this shaft, retaining accessibility and removing its control arm from the usually dangerous position near the prop. Superb lubrication of the crankshaft is guaranteed by the hollow shaft inlet, and saves all the labour of drilling and cutting oil-ways which (without pressure feed may become blocked).

In the absence of the shaft of a disc valve, the tank can be placed behind the crankcase, but if so, the induction pipe must be extended over the top of the tank so as to avoid alteration of the height of suction in climbs and drives. An alternative position for the tank is beneath the crankshaft bearing. There is plenty of room for it here, especially if a good long shaft is used, and the shallower the tank the better, as there is less alteration in suction height as the tank is emptied during flight.

NEXT MONTH.

"Xmas" Issue will include a fully illustrated description of an approximately 1/7th scale Spitfire built by Dr. J. F. P. Forster. This splendid model is powered by a 6 cc. Baby Cyclone, and should be a great interest to all "Petroleers."





AN AUTO POLE FOR GLIDERS.

THIS device enables gliders to be flown "Round the Pole."

The motor tube is made from rolled cartridge papei or a cardboard tube if obtainable. A hardwood nose plug fits into the top of the tube.

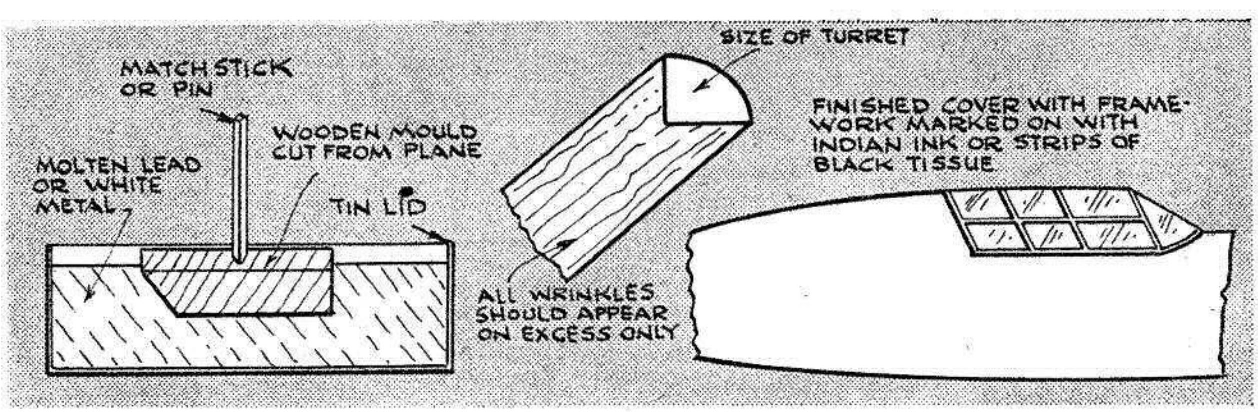
After the rubber has been wound the glider is attached to the line and hand launched. The line should be kept taut during this operation.

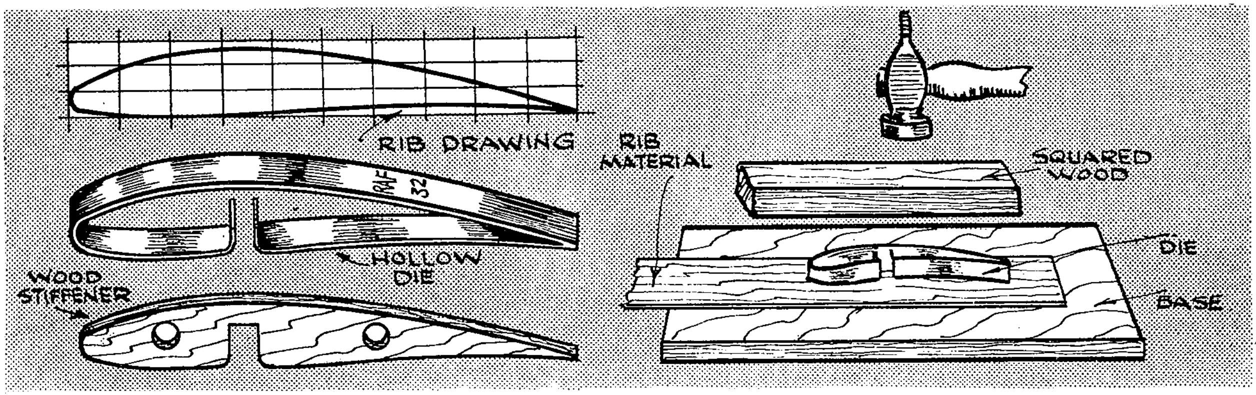
COCKPIT COVERS

FIRST a mould should be carved to the exact size as the plan. White metal or lead should be melted in a tin lid and allowed to cool. Remove the scum and press the mould, to which a pin has been fixed, into the metal and hold there until cool. Remove the mould and sand off 1/32-in. all over. Warm a piece of celluloid until it is soft, place it over the metal and press into place with the wooden mould. When hard remove and trim.

RIB DIE

A hollow die of the rib is made as follows :—A strip of tin 1-in. × the length of the outline of rib + twice the depth of the main spar notch is cut and hammered flat. One of the long sides is sharpened by a grinder or file, finishing on an oil stone. An outline of the rib is drawn full size and a strip bent round the outline as shown in Fig. 1, the die is then tempered. On the case of ribs of over 5-in. chord, a stiffener of a piece of ⅛-in. plywood should be fitted inside the die, after cutting to the profile shape. Method of operation is as follows :—The rib material is placed on a board. A piece of square wood is placed on top of same as shown in sketch. The square wood

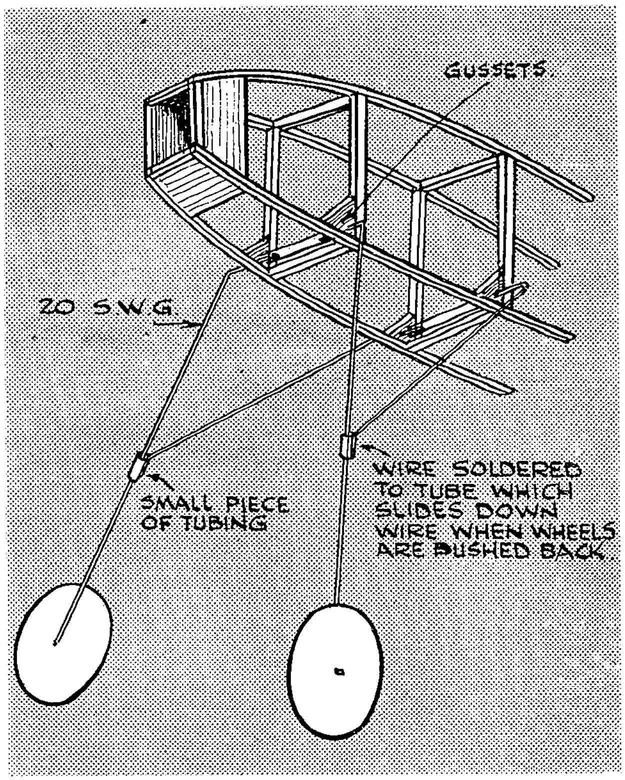


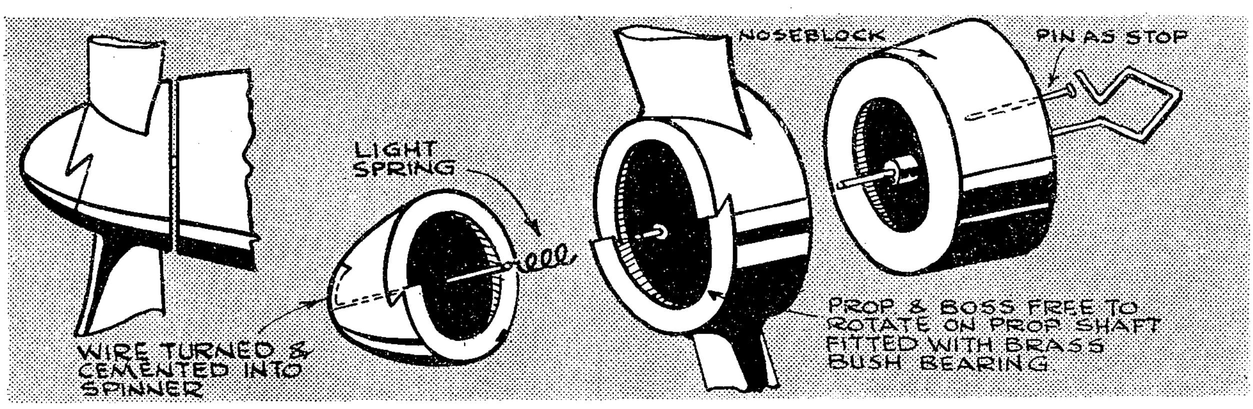


is then dealt a hefty "wallop" with a mallet. On removing the die the required rib should then drop away. It is essential that the die should be a little over size to allow for cleaning up, etc. Points to watch are :—1. This method is only useful for constant chord wings. 2. It works better with balsa than hardwood, but may be used quite successfully in the latter case. 3. The die will be stuck to the squared wood after one or two blows, thus simplifying the process. 4. The time saved is probably a minus quantity, the dies, however, are always useful for future occasions and in the case of clubs they can be made available to all members.

FREE-WHEEL

THIS is a totally enclosed free-wheel suitable for incorporating in any model using a spinner. It consists of a nose block, airscrew boss, and spinner. The airscrew boss is bushed and is free to rotate on the shaft. The front portion is built in the form of a ratchet, which engages with a similar ratchet in the back of the spinner. A coiled spring, free on the shaft, is placed between the spinner and the boss. The front end of the shaft is turned and cemented into the front of the spinner. When the motor is wound the spinner engages with the boss. When unwound the spring forces the spinner forward and the hook at the rear end of the shaft comes into contact with the pin stop on the nose block. The airscrew then free wheels.





MONTHLY MEMORANDA BY O · G · THETFORD

A 1/72 scale Supermarine Spitfire Mark 5B, built by A. Greenwood and photographed by H. R. Matthews. This model, which has a retracting undercarriage, is standing on green baize and the background was drawn in chalk on grey card.

Canadian-built Mosquitoes.

The first Canadian-built Mosquito Mk. IV bombers arrived in Great Britain in August, 1943, after having flown the Atlantic. They are fitted with Packard-built Merlin motors. Each of the five carried on the fuselage below the cockpit the name of a Canadian town foremost in the " Victory Loan " competitions. They are called " Action ", " Saskatoon ", " New Glasgow " and " Moose Jaw ".

Italian Insignia Alterations.

It is reported from Sicily that fighters encountered there soon after the downfall of Mussolini and the Fascist Party carried a new form of national insignia symbolical of the Badoglio administration. Exact details are not yet forthcoming but it is likely that the *fasces* play no further part in the marking.

Prototype Serial Numbers.

The table below gives the serial numbers of the prototype or first production aeroplanes of the Royal Air Force on which such information is available. The code letters which follow the name of the aeroplane are interpreted as follows :—SF—Silver Finish, SC—Service Camouflage, FP—First Production Model, PG—Pale Grey, and GG—Greyish-Green. These refer to the markings in which the various prototypes are finished and in the case of service camouflage being applied this is taken to mean that current at the time of the appearance of the prototype.

Type.	*Finish.*	*Number.*
Albacore (Fairey) (1st)	SF.	L 7074
Albacore (Fairey) (2nd)	SF.	L 7075
Anson (Avro)	SF.	K 4771
Anson (Avro) (FP)	SF.	K 5152
Battle (Fairey)	SF.	K 4043
Beaufighter I (Bristol)	SC.	R 2052
Beaufighter II (Bristol)	SC.	R 2058
Beaufort (Bristol)	SF.	L 4441
Blenheim I (Bristol)	SF.	K 7033
Blenheim IV (Bristol)	SC.	K 7072
Blenheim IV (Bristol) (FP)	SC.	L 4842
Bombay (Bristol)	SF.	K 3583
Bombay (Short Harland) (FP)	SF.	L 5808
Boston I (Douglas) (FP)	SC.	AE 459

Type.	*Finish.*	*Number.*
Boston III (Douglas) (FP)	SC.	W 8252
Buffalo I (Brewster) (FP)	SC.	AS 410
Buffalo II (Brewster) (FP)	SC.	W 8132
Defiant (Boulton Paul)	SF.	K 8310
Don (De Havilland)	SF.	L 2387
Fulmar (Fairey)	SC.	N 1957
P 4/34 (Fairey) (1st)	SF.	K 5099
P 4/34 (Fairey) (2nd)	SF.	K 7555
Gauntlet (Gloster)	SF.	J 9125
Gladiator (Gloster)	SF.	K 5200
Halifax (Handley Page)	SC.	L 7245
Hampden (Handley Page)	GG.	K 4240
Hampden (Handley Page) (FP)	SC.	L 4032
Harrow (Handley Page) (FP)	SC.	K 6933
Henley (Hawker)	SF.	K 5115
Hurricane (Hawker)	SF.	K 5083
Hurricane (Hawker) (FP)	SC.	L 1548
Hereford (Short Harland) (FP)	SC.	L 6002
Lancaster (Avro) (1st)	SC.	BT 308
Lancaster (Avro) (2nd)	SC.	L 7527
Lysander (Westland) (1st)	SF.	K 6172
Lysander (Westland) (2nd)	SF.	K 6128
Lerwick (Saunders Roe)	SF.	L 7250
Master (Miles) (2nd)	SF.	N 3300
Master (Miles) (FP)	SC.	N 7408
Mosquito I (De Havilland)	SC.	W 4050
Oxford I (Airspeed)	Y.	L 4534
Roc (Blackburn)	SF.	L 3057
Skua (Blackburn) (1st)	SF.	K 5178
Skua (Blackburn) (2nd)	SF.	K 5179
Spitfire (Vickers Armstrongs)	PG.	K 5054
do. (FP)	SC.	K 9787
Sunderland (Short)	SF.	K 4774
Swordfish (Fairey)	SF.	K 4190
Wellesley (Vickers Armstrongs)	SF.	K 7556
Wellington do.	SF.	K 4049
Wellington I do. (FP)	SC.	L 4212
Wellington II do.	SC.	L 4250
Whitley (Armstrong Whitworth)	SF.	K 4586
Whitley IV do.	SC.	K 7208

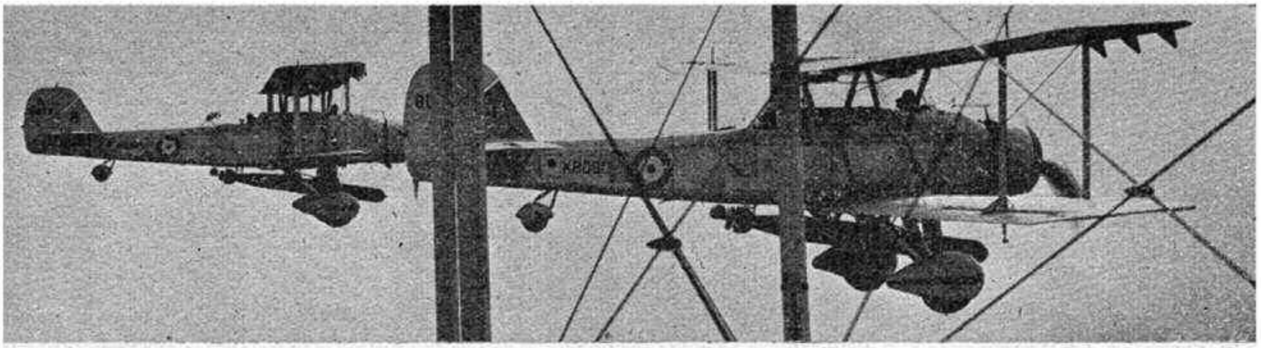


Photo: Keystone.

AEROPLANES DESCRIBED X

VICKERS VILDEBEEST IV

BY H · J · COOPER

NEXT MONTH: THE FOUR CANNON MUSTANG

Although the Vildebeest first appeared in 1930, thirteen years ago, two squadrons were equipped with this type when Japan entered the War, and they were used operationally in the attempted defence of Singapore. Several are still flying in this country with Training Command. The Vincent, the general purpose version, was used in the East African campaign of 1941.

The prototype Vildebeest was fitted with a Bristol Jupiter X.F motor and a second development aircraft had a Siddeley Panther. The Vildebeest was designed as a two-three-seat torpedo-plane and bomber, and was of all-metal construction, duralumin being the medium mostly employed. A wheel or twin-float undercarriage could be fitted.

In 1931 one of the prototypes, registered G-ABGE, was fitted with a 595 h.p. Hispano Suiza 12 Lbr. water-cooled motor and attained 134 m.p.h. This version was accepted after competitive trials both as a landplane and on floats, by the Spanish Ministry of Marine, and an order for twenty-six was placed. The first aircraft, numbered 0–3, was flown as a landplane from Brooklands to Seville during 24th–27th March, 1931. On arrival it was fitted with twin floats, which had been sent out separately. The remainder of the order was built under licence by the *Construcciones Aeronauticas S.A.* (*C.A.S.A.*) at Cadiz. These aircraft were coloured all silver except for the motor cowling and deck as far back as the rear cockpit, which were dark grey. The serial numbers (T-14, T-15, T-16, etc.) were painted in black on the sides of the fuselage.

G-ABGE was later fitted experimentally with a Jupiter motor with a Townend ring.

In 1932 the Vildebeest appeared in a slightly refined form in the New Types Park at Hendon. It was equipped with a Pegasus I motor and had wheel-spats. A faired tailwheel had replaced the earlier skid. This machine bore the serial number N 230 on the sides of the fuselage and rudder. Red, white and blue roundels were carried on the fuselage and wing-tips, and the rudder bore vertical stripes with the red foremost.

This, the Mk. I, was the first production version for the Royal Air Force, and was delivered to Nos. 36 (Torpedo Bomber) and 100 (Bomber) Squadrons at Singapore.

In 1934 the Mk. II appeared. It was generally similar to the earlier models, but had the lower fin deleted and the rudder shortened; the tailplane and elevators were modified and a Pegasus II M.3 motor of 580/630 h.p. was fitted. This version was delivered to No. 22 (Bomber) Squadron, then at Donibristle. Two machines from this squadron were numbered K 4589 and K 4591. They were coloured similarly to the Mk. Is, but by this time the rudder stripes had been abandoned.

Twelve Vildebeest IIs were delivered to the New Zealand Government in 1935, and since the outbreak of war have been engaged on coastal reconnaissance work together with some replaced Vincents from the R.A.F.

The Mk. III, which appeared soon after the II, had an amended rear cockpit and gun-mounting, and the sliding hatch immediately aft of the pilot's cockpit was made into a permanent cockpit. This version was also delivered to the Singapore squadrons at Seletar.

The Mk. IV made its appearance late in 1936. It was the culminating development of the design and was equipped with a cowled Perseus sleeve-valve motor of 825 h.p. The prototype, which was built as a Mk. II and converted, was numbered K 4164. Apart from the motor and the fitting of a three-bladed Rotol airscrew the Mk. IV differed only in internal features from the preceding version. The third cockpit was not a permanent fitting, but the hatch was retained. The Mk. IV was delivered only to No. 42 (Bomber) Squadron and was the first aircraft with a sleeve-valve motor to go into service anywhere in the world.

Early in the War most of the Vildebeest squadrons received new equipment in the form of Bristol Beauforts.

The Vincent was produced in 1934. It was essentially a Vildebeest III but had special equipment for operating in the Middle East, and could carry a long-range fuel tank in the position normally occupied by the torpedo of the Vildebeest. The prototype, K 4105, was shown at the R.A.F. Display at Hendon in 1935. One of the first Vincents flew non-stop from Baghdad to Cairo (800 miles) on 24th February, 1934, to appear in the R.A.F. Middle East Display. The Vincent had a top speed of 142 m.p.h. and with the extra tankage the maximum range was 1,255 miles. The Vincent was issued to Nos. 8, 45, 55 and 84 (Bomber) Squadrons, all stationed in the Middle East.

The wings and tail unit of the Vildebeest and Vincent are built up on two spars of duralumin sections with duralumin tubular ribs. The covering is of fabric. The fuselage is of duralumin tube construction and is covered forward with metal panels and aft with fabric. The fuel tanks are contained in the upper wings.

Armament of the Mk. IV consists of a ·303 Vickers gun mounted on the port side of the motor cowling and firing ahead through the airscrew disc, and a ·303 Vickers gun on a rocking pillar in the rear cockpit. A 1,800 lb. Whitehead torpedo was carried in the crutch below the fuselage, or bombs up to 1,950 lb. in the racks below the lower wings.

From a recognition point of view the Vildebeest presented little difficulty. It differed considerably from

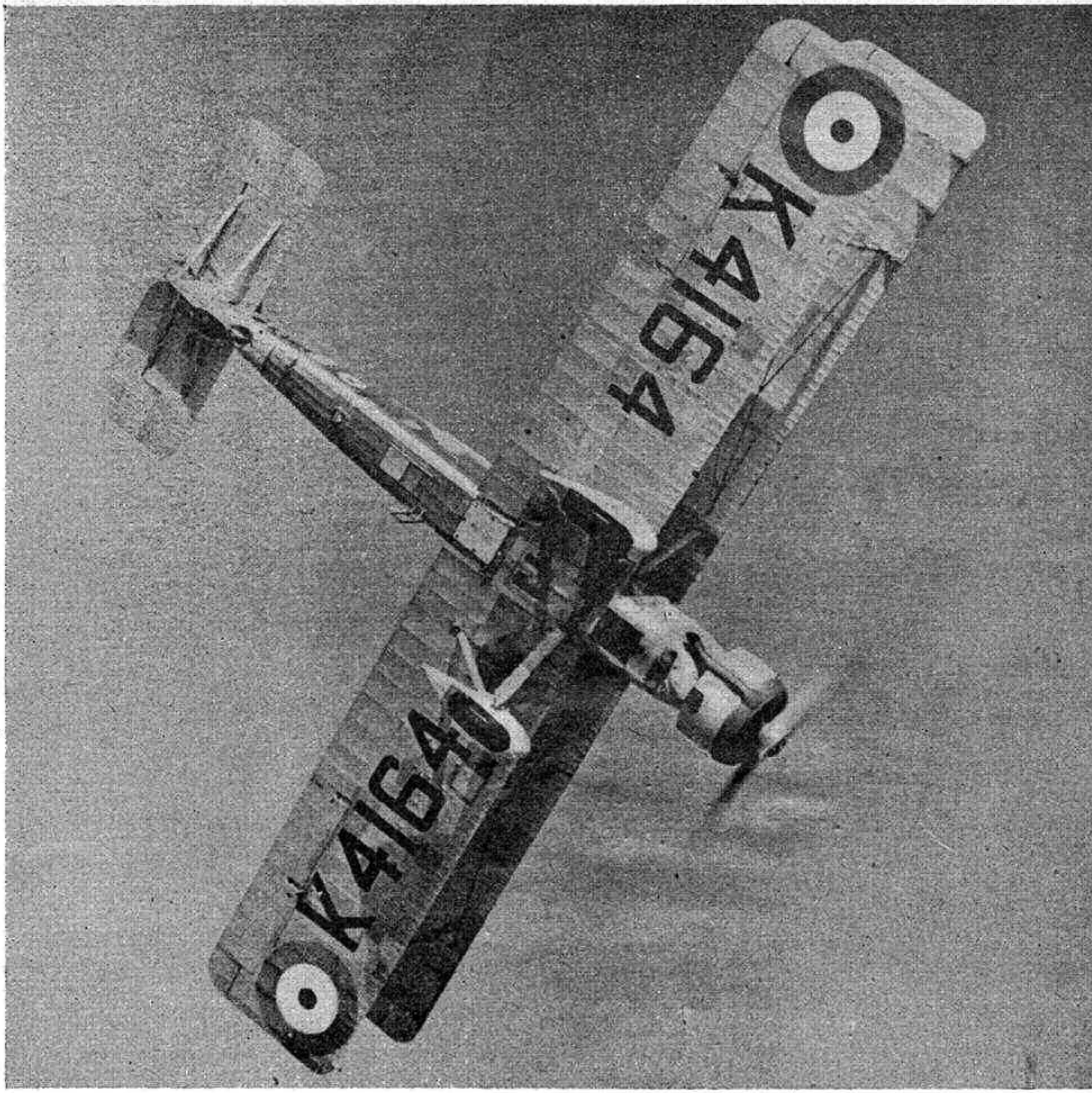


Photo by courtesy of Vickers-Armstrongs, Ltd.

the Fairey Gordon and Westland Wapiti and other contemporary types of the same size. Actually in the air it often looked a good deal smaller than it really was, and when approaching at first could be mistaken for a Gipsy Moth or something about that size, especially when fitted with the Hisso motor. This effect was created by the large gap and the single-bay wings of equal span, and when the Perseus motor was fitted even the sound was misleading, for the sleeve-valve motor purred just like a Gipsy.

Like their predecessors, the Mk. IVs were very popular with their pilots. Although a heavy aircraft, with an all-up weight of 8,500 lb., the Vildebeest could be thrown around as easily as a fighter biplane, and could get off the ground after a very short run. No. 42 Squadron's aircraft bore serial numbers from K 6409 to K 6414 and from K 8080 to K 8086. K 6409 was the C.O.'s aircraft, and carried the red and blue squadron leader's flag painted on the fin. Flight Commanders' aircraft carried a coloured diamond (red for "A" Flight; yellow for "B") on each upper plane inboard of the roundels, and all machines had a flash on each side of the wheel spats in the flight colour. K 8080 and K 8083 were two machines from "B" Flight. Training Vildebeests are now camouflaged on the sides and upper surfaces with dark green and dark earth, while the undersides are yellow or light grey.

The following data apply to the Mk. IV:

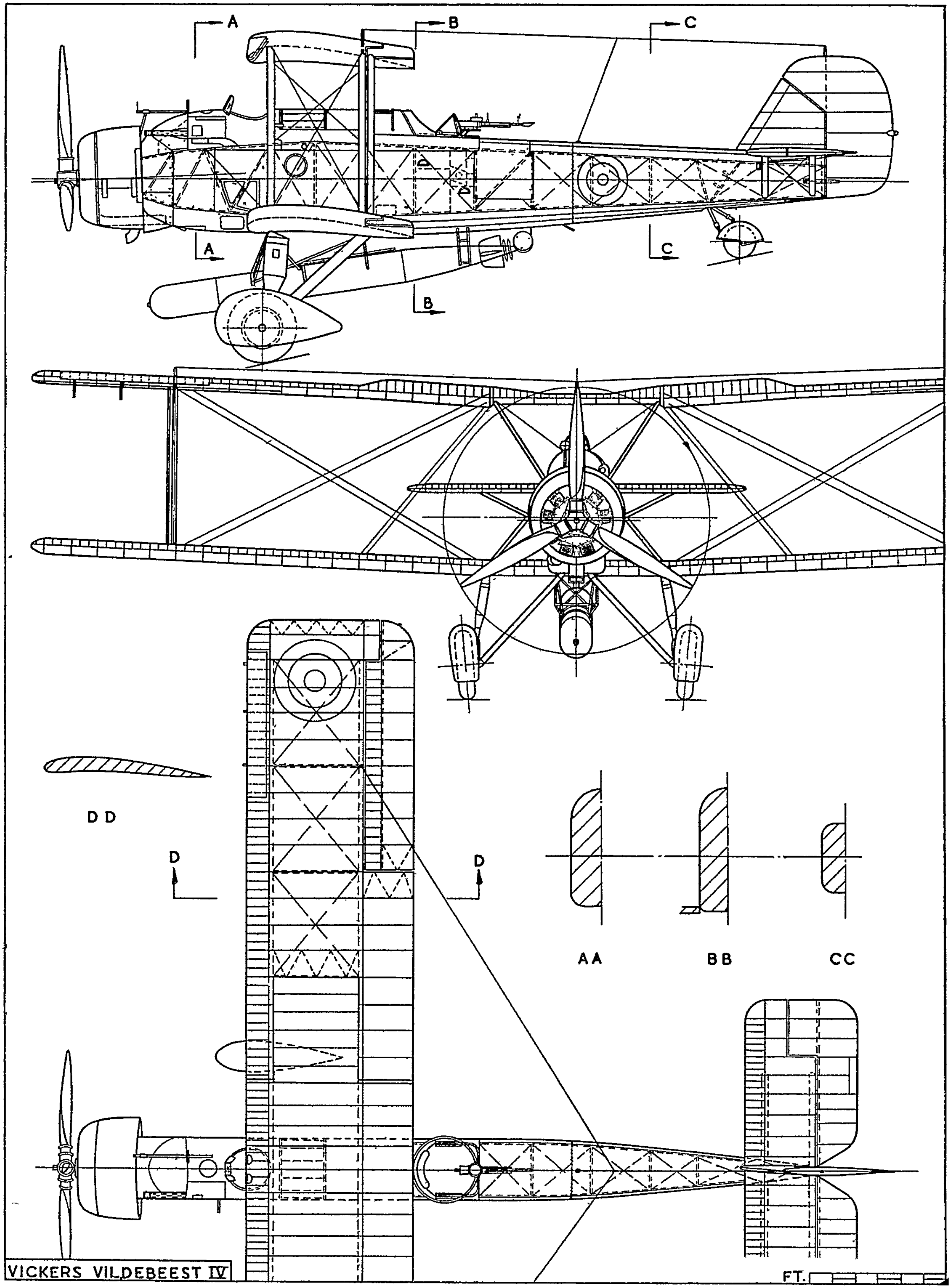
Dimensions: Span, 49 ft.; chord, 7 ft. 7 in.; length, 37 ft. 8 in.; gap at c/s, 7 ft.; tailplane span, 15 ft. 3 in.; tailplane chord, 5 ft.; track, 9 ft. 6 in.; airscrew diameter, 12 ft.; height (tail up), 15 ft.

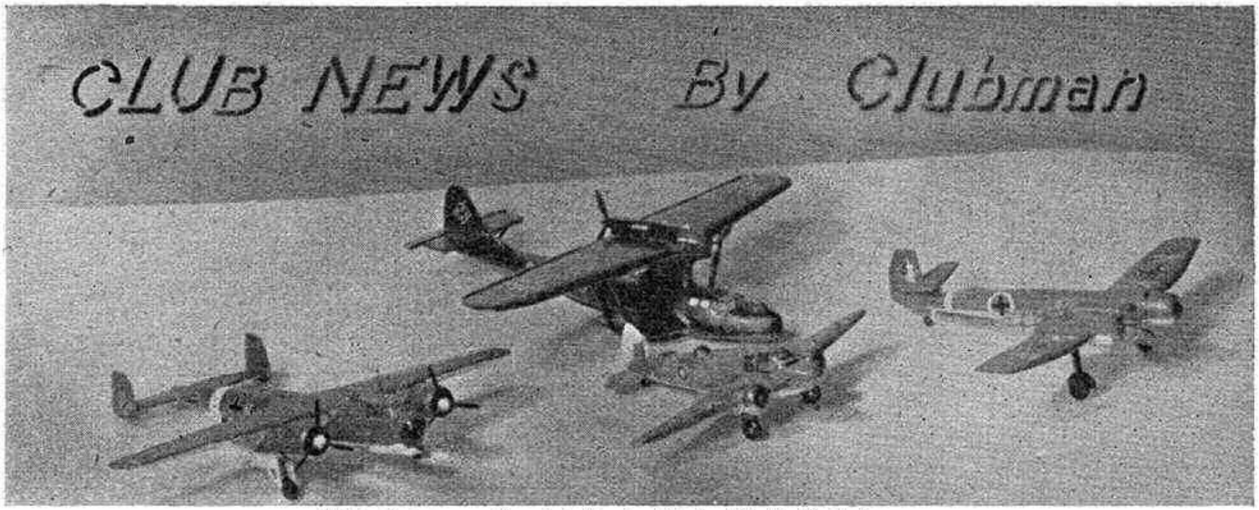
Areas: Mainplanes (total, including ailerons), 728 sq. ft.

Weights: Tare, 4,724 lb.; fuel and military load, 2,994 lb.; loaded, 8,500 lb.

Loadings: Wing, 11·68 lb./sq. ft.; power, 10·3 lb./h.p.

Performance: Max. speed, 156 m.p.h. at 5,200 ft.; operating speed, 145 m.p.h. at 15,000 ft.; landing speed, 58 m.p.h.; initial climb, 840 ft./min.; absolute ceiling, 19,000 ft.; range, 608 miles at 130 m.p.h. at 5,000 ft.


A
B
C
A
C
B
D D
D
D
A A
B B
C C
VICKERS VILDEBEEST IV
FT.



A pleasing array of well-finished solids by W. A. McC. Stenson.

THIS month's section is being kept down to a minimum in order to accommodate the new list of Clubs, both affiliated and unaffiliated, now operating in the British Isles. The list is pretty considerable as you will see, although I am quite prepared to hear that the list is nowhere near complete. This is the fault entirely of those clubs who have failed to answer both direct appeals and the requests given through both these columns and the Editorial Section in past issues. It is always surprising to me how some club officials fail to follow out what are after all purely routine duties. Nevertheless the fact remains that whatever information is solicited from time to time, some clubs are always omitted through their own shortcomings. However, it is hoped that the new list as printed will give assistance to both the clubs themselves and the many individual aero modellers who we know from experience are looking round for clubs to join in their own particular districts.

It is rather surprising to note the large number of clubs that have not yet undertaken affiliation to the Society of Model Aeronautical Engineers. May I once again stress the very necessary need for unity in the movement as a whole, and this can only come about through a unified affiliation of all clubs to the parent body. I fully realise that the S.M.A.E. as such has not in the past been able to do all that they or the clubs themselves wish. This is, of course, mainly tied up with strength, both in numbers and finance, and one cannot take out more than is put in. Unfortunately far too many clubs adopt the attitude of sitting on the doorstep waiting for things to develop as they wish, instead of mucking in and swelling the funds, thus enabling everybody to benefit in due time.

The day is fast approaching when National and International events will require their due share of attention, and this cannot be done by a body representing only a small proportion of the aero modellers in these Isles, creditable though their record has been in the past. I appeal therefore to all clubs who have not yet undertaken affiliation to get down to brass tacks immediately, as it stands to common sense that the greater the number as a whole, the more can be done for individuals.

The PHAROS M.A.C. have continued their winning strain, as you will notice from the placings of the last three competitions of the season given elsewhere. I mentioned in last month's columns that these people were actively preparing for the Biplane Competition, and their efforts have certainly borne fruit—six places in the first twelve is certainly jolly good going, and the winning times very creditable.

Mrs. Buckeridge has done exceedingly well in recent competitions and has capped the lot by winning the Women's Challenge Cup once again. Her best flight when winning this trophy was made on her third trial, the time being 4 : 40.

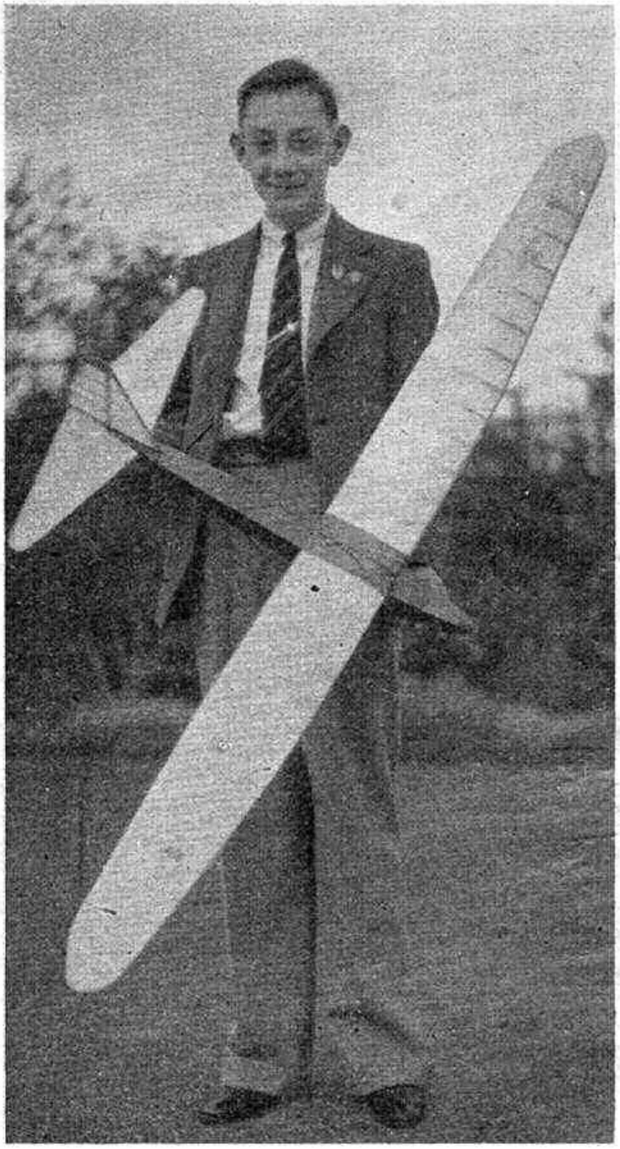
The best flight in the Biplane event was 1 : 45 by F. J. Houchin, the winner. Also it is interesting to note that the six flights made by the first and second placed men range from 1 : 38.3 to 1 : 45. This is consistency without a doubt and sure proof these chaps know their models inside out.

J. Wassell of the Hayes Club made the best flight of the day when winning the Thurston Cup with a flight of 3 : 19, the Buckeridge family following close on his heels. (Again may I ask what happened to Merseyside, who started the season so well ? It is rather surprising to note that they do not appear to have had an entry in the last five competitions.)

Unfortunately the deadlock regarding the Plugge Cup points allocation still remains, and I understand that Mr. Towner is bringing up a number of suggestions to the Delegate Meeting to be held shortly to clarify the position. It is unfortunate that such a state should have occurred, but there is no doubt that the system of points allocation needs very careful revision, and it is no easy matter to devise a system that suits everybody. One suggestion I would make myself is that a greater number of popular (Gamage) type competitions are held, thus levelling up the average entry per competition. However, I look forward with interest to the suggestions Mr. Towner has to put forward, and trust we can get down to a really workable scheme in readiness for next season.

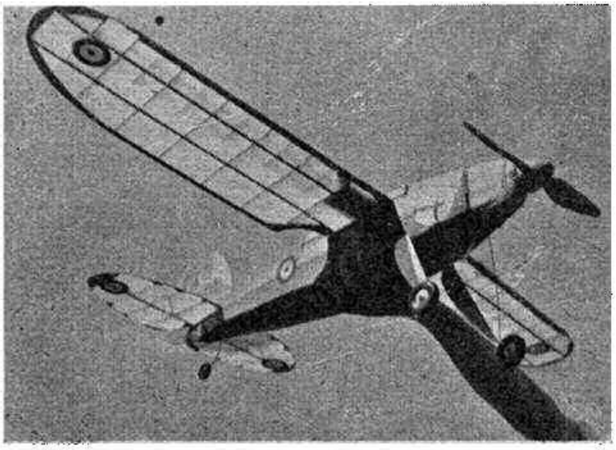
The only reports dealt with this month are those of a more important nature such as rally results, etc., and all reports of a general nature are held over to the following issue.

The HARROGATE AIRCRAFT CLUB had a good turn-up for their Rally, over 100 enthusiasts bringing out about 150 models for the various events. Weather conditions were particularly good, with no thermals about to give anyone a lucky break ! A. Peel of York put up the best time of the day with his " Aegeus " model, time being 2 : 06, while a very worthwhile yet unusual event was the Reliability Contest, won by W. Elliott of Ripon with his " Sunstar ", which made 12 flights, against H. Speights' (Harrogate) " Clipper ", which made 8 flights. Other results were :



Young "Imp," from Luton and district M.A.C. Photo sent by E. C. W. Clark.

The popular "Viper II," built from Aeromodeller Plans Service plans by E. W. Allen.



Open Duration :

C. Furse	Leeds	121
E. Carroll	Harrogate	100

Gliders :

A. Peel	York	126
C. Furse	Leeds	116

Under 30" Span :

H. Holt	Leeds	95
H. Tubbs	Leeds	88

Nearest 45 secs. :

J. D. Walliss	York	1.3 secs. error
G. Lebbon	Harrogate	2.2 secs. error

The BEDFORDSHIRE M.A. SILVER CHALLENGE CUP contest was very unfortunate for weather conditions, in common with nearly all events this year. Many models were cracked up, and teams spoilt in consequence, so all credit to the winners, a recently re-formed club, on their showing. The contest was fairly closely contested as the results show, and we look forward to some real tussles for this trophy in more peaceful times.

Results :

Carlisle Park M.A.C.	aggregate	1103.25
Upper Stratton M.A.C.	,,	1098
Hayes & D.M.A.C.	,,	1072.2

Scottish clubs had the chance of showing what they could do outside their own areas at the Gala Day staged by the EDINBURGH M.F.C. The influx of visitors was very encouraging—more than can be said for the home club members who were conspicuous by their near absence !—and everything would have been O.K. but for the usual high wind. Times in consequence were rather poor as the results show :

Open Duration :

R. Bishop	Rosyth	124.6 aggregate
H. Wardell	Edinburgh	87.4 ,,
R. Bishop	Rosyth	79.8 ,,

Open Glider :

R. Burt	Glasgow	12.9 secs.

Wakefield :

P. Russell	Stirling	99.3 aggregate
R. Bishop	Rosyth	69.3 ,,

The STREATHAM AERO MODELLERS open day held at Epsom Downs on the 26th Sept. proved a good thing for the Cheam boys winning all three events as follows :

Duration :

Worby	Cheam	375.3
Brown	Croydon	369.6
White	Blackheath	348.6

Gliders :

Wyer	Cheam	400.5
Brown	Croydon	400
Wassall	Hayes	275
Team :	Cheam	1313 points
	Croydon	1217 ,,

"A plane in the hand is worth two in the thermal." A Fairchild 24, built by A. E. Dackombe.

List of Model Aeroplane Clubs
Great Britain and Northern Ireland
(Compiled September, 1943).

ENGLAND

BEDFORDSHIRE

***IGRANIC SOCIAL & SPORTS CLUB**
R. B. Hill, 32, Lindsell Crescent, Biggleswade.

***LUTON & DISTRICT M.A.S.**
R. A. Hinks, Ia, Waldeck Road, Luton.

LUTON TECHNICAL COLLEGE AERO-MODELLERS CLUB
J. Warner, Luton Technical College, Park Square, Luton.

***LYNTON WORKS SPORTS & SOCIAL CLUB**
F. A. Lack, West College, Barford Road, Willington.

BERKSHIRE

***READING & DISTRICT M.A.C.**
D. B. Gasson, "Links View," Kidmore End Road, Emmer Green, Reading.

BUCKINGHAMSHIRE

HALTON SOCIETY M.A.C.
R.A.F. Station, Halton.

***SLOUGH M.F.C.**
A. M. Long, 158, Windsor Road, Slough

***UXBRIDGE M.A.C.**
G. Mansfield, "Sunnydene," Richings Way, Richings Park, Ivor.

CHESHIRE

***ASHTON & DISTRICT M.A.C.**
W. Titterington, 13, Lakes Road, Dukinfield.

***CHESTER M.F.C.**
F. Wilde, 9, Eaton Road, Hanbridge, Chester.

***MERSEYSIDE M.A.S.**
I. S. Cameron, 47, Neville Road, Bromborough.

***SALE AERONAUTICAL SOCIETY**
G. Barnes, 61, Clough Avenue, Woodheys, Sale.

CORNWALL

***ARTS & CRAFTS CLUB**
F./Lieut. Coggins, R.A.F., Cleave, near Bude.

TRURO MODEL ENGINEERING SOCIETY
E. K. Winhall, 45, Tresawls Road, Truro.

CUMBERLAND

COCKERMOUTH M.A.C.
S. Bell, Castlegate, Cockermouth.

DERBY

***DERBY M.A.C.**
H. Clamp, 18, Mortimer Street, Derby.

DEVON

OTTERY ST. MARY & DISTRICT M.A.C.
R. A. Kent, Highland Park, West Hill.

***PLYMOUTH AEROMODELLERS**
S. J. Nosworthy, 35, Mirador Place, Mount Gold, Plymouth.

***NEWTON ABBOT & DISTRICT M.A.C.**
L. H. Webber, 43, Lime Tree Walk, Newton Abbot.

***TORQUAY & DISTRICT M.A.C.**
E. J. Taylor, 4, Mount Pleasant, Ellacombe, Torquay.

DORSET

BEAMINSTER & DISTRICT M.A.C.
F. W. Dave, 37, Pattle, Beaminster.

***POOLE M.A.C.**
E. F. Jones, 14, Beaconsfield Road, Parkstone.

DURHAM

BRANDON M.F.C.
J. Smurthwaite, 17, Albert Street, Brandon Colliery.

DARLINGTON M.A.C.
S. Wanless, 24, Leonard Street, Darlington.

SEAHAM M.F.C.
D. E. Witham, 85, Princess Road, Seaham.

***SUNDERLAND M.A.C.**
A. H. Smith, 14, Romford Street, Sunderland.

WASHINGTON & DISTRICT M.A.C.
W. Smith, 3, Morris Street, New Washington.

WILLINGTON YOUTH M.A.C.
T. Martin, 24, Stephenson Crescent, Willington.

ESSEX

BISHOPS STORTFORD M.A.C.
D. M. Page, 15, Pinelands, Bishops Stortford.

***BRENTWOOD SCHOOL M.A.C.**
D. E. Chandler, 35, Little Gaynes Lane, Upminster.

***CHELMSFORD M.A.C.**
H. Marshall, 11, Sixth Avenue, Chelmsford.

***HALSTEAD (ESSEX) & DISTRICT M.A.C.**
F. J. Mitson, 15, Colne Road, Halstead.

***WESTLAND (ESSEX) M.A.C.**
R. A. Young, 11, Abbs Cross Lane, Priors Farm Estate, Hornchurch.

GLOUCESTERSHIRE

***BRISTOL & WEST M.A.C.**
W. J. Gould, 37, Devonshire Road, Westbury Park, Bristol.

GLOUCESTER & DISTRICT M.A.C.
J. S. Bishop, 8, Hatherley Road, Gloucester.

TEWKESBURY M.A.C.
P. Durham, Youth Club, Barton Road, Tewkesbury.

HAMPSHIRE

ANDOVER M.A.C.
A. Harvey, 148, Old Winton Road, Andover.

HYTHE M.F.C.
H. A. Adam, "Stokesay," Hythe.

PORTSMOUTH & DISTRICT M.A.S.
Mr. Taleeck, c/o Tip Top Aircraft Stores, 279, Lake Road, Portsmouth.

QUEEN MARY'S SCHOOL M.A.C.
J. B. Walker, 3, Tally-Ho Lodge, Cromwell Road, Basingstoke.

HERTFORDSHIRE

***ALDENHAM M.A.C.**
H. F. Cocksedge, School House, Alden School, Elstree.

CHESHUNT AEROMODELLERS CLUB
A. H. Salmon, 14, Plough Hill, Cuffley.

KENT

***BROMLEY SOLID MODEL AIRCRAFT & FLYING CLUB**
E. A. Walker, 43, Holbrook Way, Bromley.

CHESTFIELD M.F.C.
"Deepdene," Teynham Road, Whitstable.

DOWNHAM & DISTRICT M.A.C.
E. G. Pryor, 68, Shroffold Road, Downham, Bromley.

MEDWAY M.A.C.
J. Silver, 129, Featherby Road, Gillingham.

***NORTH KENT M.A.S.**
T. W. Wickens, 73, Burness Avenue, Welling.

***SHORT'S A.T.C. M.A.C.**
D. G. Turley, 38, Lancelot Avenue, Strood, Rochester.

SPELDHURST (KENT) M.A.C.
D. S. Saunders, Lodgefields, Withyham, Tunbridge Wells.

WHITSTABLE, TANKERTON & DISTRICT M.A.C.
A. E. Souch, 69, Douglas Avenue, Whitstable.

LANCASHIRE

*ALLERTON & DISTRICT M.F.C.
P. D. Kelly, 25, Cleverley Road, Allerton, Liverpool, 18.

BISPHAM M.A.C.
B. Crossley, 30, Cavendish Road, Bispham, Blackpool.

*BLACKPOOL & FYLDE M.A.S.
C. Hedges, 13, Birchway Avenue, Blackpool.

*FURNESS M.A.S.
Mrs. E. D. Booth; 43, Lyndale Avenue, Barrow-in-Furness.

*HEYWOOD M.A.C.
H. D. Mason, 5, Rose Hill Street, Heywood.

LANCASTER & MORECAMBE M.A.C.
J. P. Swindlehurst, 6, Whitby Road, Morecambe.

RUNCORN A.F.C.
S. Green, 11, Halebank Road, Halebank, near Widnes.

*ST. HELENS M.A.C.
E. L. Ball, 2, City Gardens, Windle City, St. Helens.

*WHITEFIELD M.F.C.
K. J. S. Donaldson, "The Firs," Polefield, Prestwich, Manchester.

LEICESTERSHIRE

*AYLESTONE M.F.C.
P. Williams, 365, Aylestone Road, Leicester.

*GOLDEN WINGS M.F.C.
R. A. Kimber, 16, Somerset Avenue, Leicester.

HINCKLEY CONGREGATIONAL AERO-MODELLERS ASSOCIATION
A. Taylor, 33, Teign Bank Road, Hinckley.

*LEICESTER M.A.C.
B. A. Germany, 39, Stretton Road, Leicester.

LINCOLNSHIRE

*CRANWELL M.A.C.
F./Sgt. S. W. Sarll, R.A.F., Cranwell, Sleaford.

GRANTHAM M.A.C.
H. F. C. Jacobs, 86, Houghton Road, Grantham.

*KIRKEWHITE M.A.C.
D. Lee, 18, Claremont Street, Lincoln.

*LINCOLN SCHOOL M.A.C.
G. R. Melson, 6, St. Giles Avenue, Lincoln.

*SCUNTHORPE M.A.C.
W. H. Sharman, 105, Diana Street, Scunthorpe.

LONDON

*BLACKHEATH M.F.C.
M. W. White, 75, Manor Avenue, Brockley, S.E.4.

BRENTWOOD & CHISWICK M.F.C.
F. J. Johnson, 140, Duke Road, Chiswick, W.4.

*CENTRAL (MUSWELL HILL) M.A.C.
F. P. Twigg, 25, Sutton Road, Muswell Hill, N.10.

*CHINGFORD M.F.C.
W. T. Chandler, 53, Hampton Road, S. Chingford, E.4.

*DULWICH M.A.C.
S. G. Coney, 10, Dunston Grove, Forest Hill Road, S.E.32.

*EALING & DISTRICT M.A.C.
L. B. Mawby, 55, Cedar Grove, Ealing, W.5.

KINGSBURY M.A.C.
J. W. Reed, 60, Ennerdale Drive, Kingsbury, N.W.9.

KING'S COLLEGE SCHOOL AERO SOCIETY
D. J. Rugg, 75, Home Park Road, Wimbledon Park, S.W.19.

MORNINGSIDE M.A.C.
W. J. Wheeler, 1, Elmar Court, 738, Fulham Road, Fulham, S.W.6.

*NORTHERN HEIGHTS M.F.C.
S. Ryde, 59, Exeter Road, Southgate, N.14.

PECKHAM & DISTRICT M.A.C.
A. H. Wilson, 17, Donnetts Road, New Cross, S.E.14.

PLAISTOW & DISTRICT M.A.C.
B. Cootes, 34, Prince Regents Lane, Plaistow, E.13.

*STREATHAM AEROMODELLERS
D. R. Taylor, 16, Grayscroft Road, S.W.16.

*WALTHAMSTOW M.A.S.
R. L. Sharp, 8, The Risings, Whipps Cross, E.17.

MIDDLESEX

*BUSHY PARK M.F.C.
S. A. Taylor, 57, Malvern Road, Hampton.

*CARLISLE PARK M.A.C.
J. R. Lewis, 94, Gloucester Road, Hampton.

*EDGWARE M.A.C.
A. J. Pizer, 81, Beverley Drive, Edgware.

*GENERAL AIRCRAFT M.A.C.
R. H. Seldon, 16, Manor Court, Twickenham.

*HARROW M.A.C.
A. S. Hands, 4, Hillcrest Avenue, Pinner.

*HAYES & DISTRICT M.A.C.
G. W. Lambert, 25, Crossland Avenue, Norwood Green, Southall.

*KODAK M.A.C.
F. W. Day, 63, Fernbrook Drive, N. Harrow.

*PHAROS (NORTH HILLINGDON) M.A.C.
J. P. Buckeridge, "Pharo," Blossom Way, Hillingdon.

*SUDBURY HEIGHTS M.F.C.
R. H. Woodhouse, 56, Horsenden Lane, S. Perivale, Greenford.

*779th FLIGHT A.T.C. (HABERDASHERS SCHOOL)
Cpl. B. Dawkins, 19, Woodfield Avenue, Wembley.

NORFOLK

NORWICH M.A.C.
C. Williment, 39, St. Benedicts, Norwich.

NORTHAMPTONSHIRE

*NORTHAMPTON M.A.C.
N. A. Pettitt, 1, Denmark Road, Northampton.

*PETERBOROUGH M.A.C.
F. G. Truss, 44, Shakespeare Avenue, Peterborough.

NORTHUMBERLAND

*ST. CUTHBERT'S GRAMMAR SCHOOL M.A.C.
E. Howlett, "Haverscroft," Wellfield Lane, Westerhope, Newcastle-on-Tyne.

NOTTINGHAMSHIRE

*WORKSOP M.A.C.
R. Holliday, 94, Rodesia Road, Worksop.

*WORKSOP MODEL AERO & BOAT CLUB
A. Roberts, 271, Gateford Road, Worksop.

OXFORDSHIRE

*OXFORD M.F.C.
A. A. Courtney, 9, Buckler Road, Summerstown.

*WITNEY & DISTRICT M.A.C.
V. C. Brooke, 40, Burford Road, Witney.

SOMERSETSHIRE

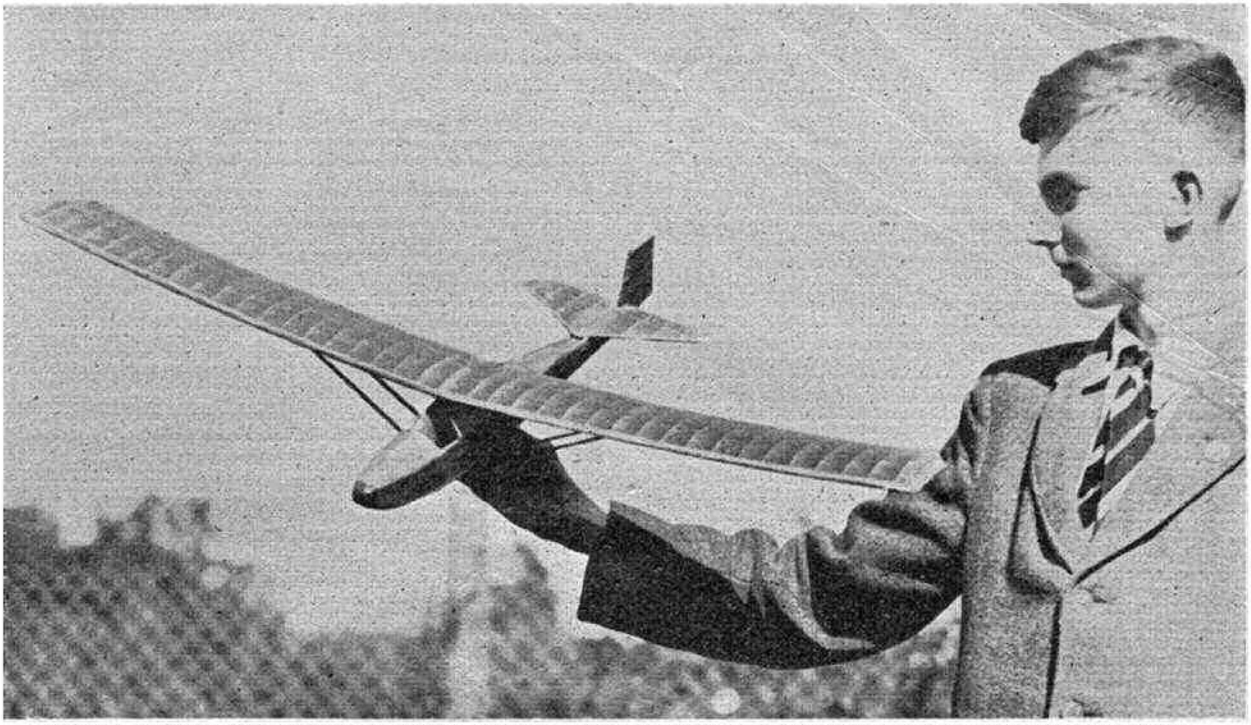
*BATH M.A.C.
J. Tolman, 30, Junction Road, Bath.

*BRITISH & OVERSEAS M.F.C.
H. Blower, 7, Royal Crescent, Bath.

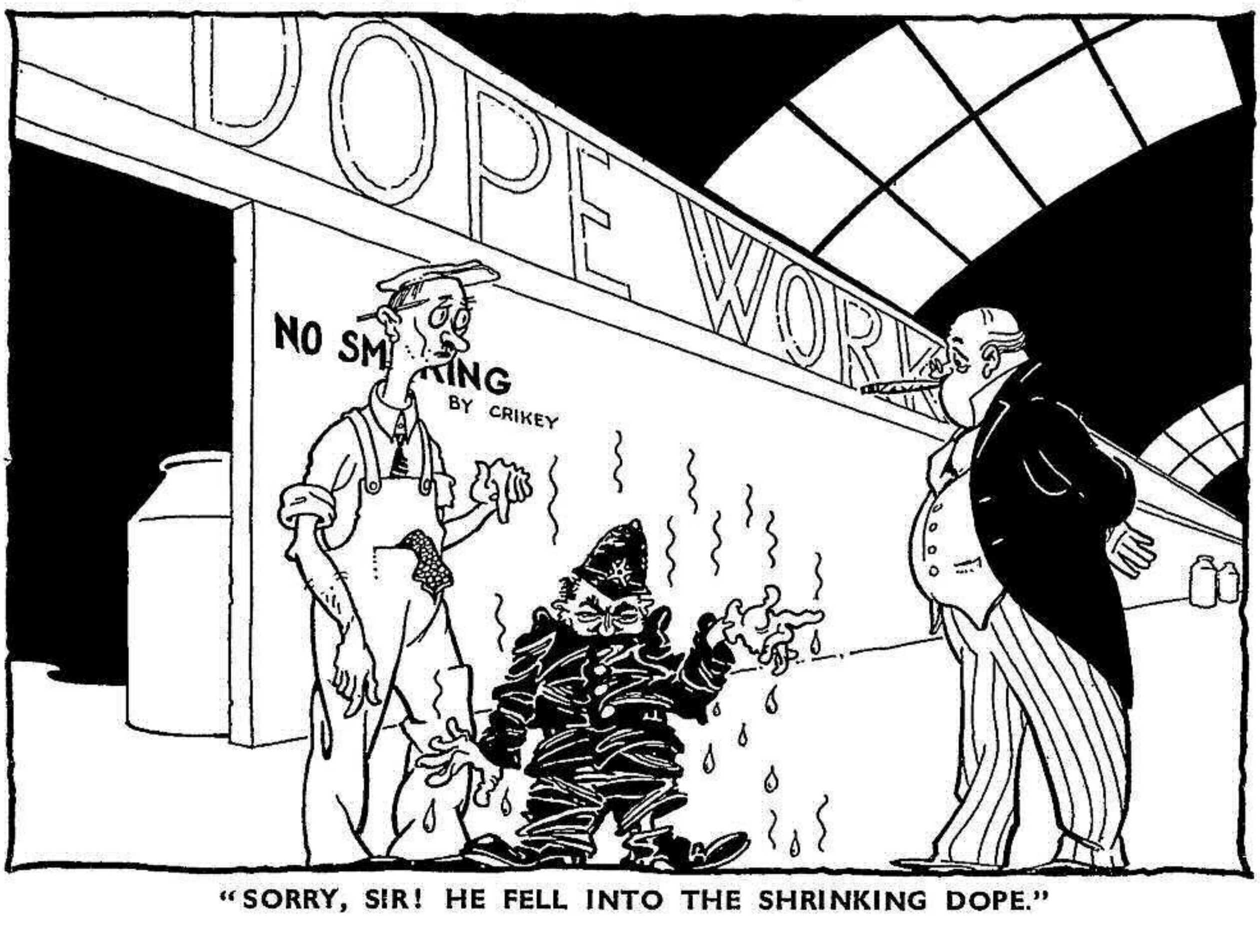
*TAUNTON & DISTRICT M.A.C.
C. L. Ranger, "Kildare," The Avenue, Taunton.

*YEOVIL & DISTRICT M.A.C.
S. Dunn, 21, Fielding Road, Yeovil.

(To be continued in the December issue).



Cadet B. Cosgrove with his "Kirby Cadet" Sailplane. Plans of which were published in last month's "Aeromodeller."



"SORRY, SIR! HE FELL INTO THE SHRINKING DOPE."

The SOCIETY of MODEL AERONAUTICAL ENGINEERS

We summarise here the latest news forthcoming from the Society.

THE S.M.A.E. "NEWS"

The newly formed Publicity Committee, on behalf of the Society, is going to produce a monthly broadsheet, with news and views of interest—including latest Competition Results. This will be duplicated, so that real "Stop Press" information can be included and distributed as quickly as possible.

It is not intended that this broadsheet will in any way take the place of the "S.M.A.E. Journal" which will continue to carry the official news of the Society, but it should assist clubs in all matters of publicity.

By the time this notice appears affiliated clubs will have received the first issues. Any club failing to receive their copy by the 7th of the month should notify the Secretary of the Publicity Committee immediately.

PRESS CUTTINGS

A Press Cutting Agency is being approached for terms, in order to cover all press notices of affiliated clubs, and watch progress of the publicity campaign.

PLUGGE CUP POINTS

It should be understood that the contests for the National Cup and M.E. No. 1, earn Plugge Cup Points, but are not eligible for Individual Championship Points.

GLIDER RECORD

Mr. A. E. Impey of the Luton and District M.A.S. has created a new British Gliding Record for Class A—time 10 min. 26.4 secs., length of line 150 feet, length of run 22 feet.

"WINGS" FINALISTS

It has been thought best, in view of the long time models have been "out", to settle the Final of the Wings for Victory Exhibitions as soon as possible. Those finalists wishing to compete, and who have not already sent their models in, should despatch them to Mr. S. Collins, 45, Chaseside, Southgate, London, N.14. Transport charges will be met by the Society. This policy has been adopted in preference to the delay involved in staging a Final Exhibition.

AFFILIATIONS

Coventry M.A.C. and N. Birmingham M.A.C. were affiliated to the Society. At this rate Birmingham will soon have as many clubs as the London District!

S.M.A.E. NATIONAL "SOLIDS" CHAMPIONSHIPS Nos. 1 & 2

This winter it is hoped that all over the country enthusiasts will be building for the National Solid Model Championships of Great Britain, competing for the two 25 guinea Trophies presented by the proprietors of "The Aero Modeller," and additional prizes provided from S.M.A.E. funds. It is not intended to burden would-be competitors with too many rules, and this preliminary announcement is published in order that intending entrants may get to work at once on entries, and have good time to produce that degree of super-finish that will get them amongst the prizewinners.

There will be two contests—No. 1 running from October to December; No. 2 from January to March. ENTRY FEES—fees only, that is to say, not the models—must be sent to the Hon. Competition Secretary, H. J. Towner, "Trencrom," King's Drive, Eastbourne, Sussex, by 31st December, for No. 1 Event, and 31st March, 1944, for the No. 2 Event. Preliminary judging will commence on 1st January, 1944, for the former, and 1st April for the latter contest, so that entrants have nearly three months to build for the first, and nearly six months for the second competition. Exact details as to where models are to be sent will be given later. It is proposed to organise on a Regional Basis, similar to "Wings for Victory" Exhibitions, with the difference that ONLY EXPERIENCED MODELLERS will handle entries from start to finish.

PRELIMINARY RULES FOR S.M.A.E. NATIONAL SOLIDS CONTESTS Nos. 1 & 2

1. Both Contests are open to any member of the S.M.A.E., including its Associate Members.
2. ANY SCALE or TYPE of solid scale model aircraft may be entered.
3. The Entrance Fees are: Seniors 1/- per Single, or First Entry, 6d. each additional entry. Juniors (under 16 years of age) 6d. per single, or first entry, 3d. each additional entry.
4. ENTRY FEES must be sent to the Hon. Comp. Sec. H. J. Towner, "Trencrom," King's Drive, Eastbourne, Sussex, by 31st December, 1943, for No. 1 Contest and 31st March, 1944, for the No. 2 Contest.
5. Preliminary judging will be carried out on 1st January, 1944, and 14th March, 1944, for the respective contests. Models must be sent or delivered to your Regional Headquarters (place and date to be announced). Entire handling will be by EXPERIENCED MODELLERS ONLY. This is guaranteed.
6. Winners will hold a Silver Trophy for One Year and receive a substantial cash prize. Further cash prizes will be awarded to Runners-up. Details of the Prize List will be announced later.

LONDON DISTRICT INTER-CLUB CHALLENGE CUP.

First Round. Flown off 15th August, 1943.

HOME					AWAY				
GENERAL AIRCRAFT M.A.C.					**SURBITON & DISTRICT M.A.C.**				
(G) J. Dunne	40	40.2	25.6	105.8	(G) N. Groves	42	32	62	136
(G) J. B. Lawrence	Scratched				(G) A. Wormald	Scratched			
(R) A. D. Roles	74	47.2	36.4	157.6	(R) D. Butler	32.6	39.6	6.8	78.8
(R) W. S. Warne	—	43	47	90	(R) N. S. Crow	Scratched			
				353.4					214.8
HARROW M.A.C.					**BRENTWOOD SCHOOL M.A.C.**				
(G) W. J. Prescott	39	31.5	—	70.5	(G) D. E. Chandler	Scratched			
(G) S. Bradshaw	47.5	23.5	—	71	(G) J. D. Anderson	Scratched			
(R) W. Waight	13.8	—	—	13.8	(R) A. Nuttall	9	—	—	9
(R) A. T. Gow	30.1	35.2	—	65.3	(R) J. Ridgwell	Scratched			
				220.6					9
BRENTFORD & CHISWICK M.F.C.					**CHEAM M.A.C.**				
(G) W. Porter	10	12	21	43	(G) F. H Briggs	33	12	75	120
(G) K. Scott	70	11.5	16.5	98	(G) J. O. Palmer	32.5	34.5	35	102
(R) J. Johnson	13	—	—	13	(R) K. Ballisat	70	38.5	—	108.5
(R) A. A. Baker	30.5	39.5	41	111	(R) F. H. Briggs	49	92.5	—	141.5
				265					472
WALTHAMSTOW M.A.S.					**NORTHERN HEIGHTS M.F.C.**				
(G) C. Mayes...	40	24	35.5	99.5	(G) R. Copland	42	64	60.25	166.52
(G) D. Hinstridge	6	25	15.5	46.5	(G) T. Wilson	39	34	25.5	98.5
(R) B. Alder	7	52	173	232	(R) D. Loits	165	101	—	266
(R) S. Sutherland	57	120.5	74	251.5	(R) J. Davall	52.5	85	101.5	239
				629.5					769.75
BLACKHEATH M.F.C.					**BUSHY PARK M.F.C.**				
(G) R. E. Galbreath	52.7	112	191.2	355.9	(G) A. T. Taylor	42.6	50.6	52.8	146
(G) C. H. Saunders	61.6	51.5	46.6	159.7	(G) M. A. Wright	30.4	37	61	108.4
(R) R. H. Warring	66.8	139.25	103.2	309.2	(R) A. T. Taylor	194	41	192.9	427.9
(R) R. E. Galbreath	53.6	54.5	32.2	150.9	(R) A. H. Taylor	30.5	43.5	75.4	149.4
				975.7					821.7
PHAROS M.A.C.					**CHINGFORD M.F.C.**				
(G) G. P. Tebb	29.4	36	35	100.4	(G) – Barkwith	Scratched			
(G) P. D. Hume	20.5	55	204	279	(G) – Ford	20	—	—	20
(R) F. T. Houchin	41	25.1	36	92.1	(R) – Menkenick	33	42.5	58	133.5
(R) J. P. Buckeridge	68	72	60	200	(R) – Seabright	34	52	35.6	121.6
				671.5					275.1

Second Round. Flown off 29th August, 1943

HOME					AWAY				
GENERAL AIRCRAFT M.A.C.					**BLACKHEATH M.F.C.**				
(G) D. B. Phillips	11.4	21.4	36.2	69	(G) R. E. Galbreath	34.2	36	24.6	94.8
(G) J. Dunne	23.8	56.8	11.4	92	(G) C. H. Saunders	61	10.4	68.2	139.6
(R) A. D. Roles	—	44	34	78	(R) R. H. Warring	67	111.8	—	178.8
(R) W. S. Warne	44.2	34.8	47	125.8	(R) M. W. White	—	67.8	12.8	80.6
				364.8					493.8
CHEAM M.A.C.					**PHAROS M.A.C.**				
(G) R. Birch	58	43.2	17	118.2	(G) K. J. Jenkins	17	94	43.6	154.6
(G) J. Palmer	33.6	8.2	52.9	94.7	(G) P. D. Hume	74	22.4	54.2	150.6
(R) F. H. Briggs	65	51	18	134	(R) F. T. Houchin	14.2	49	21	84.2
(R) K. Ballisat	59	—	29	88	(R) I. P. Buckeridge	77	63	85.8	146.8
				434.9					536

HARROW M.A.C.
NORTHERN HEIGHTS M.F.C. } Drew BYES into Semi-Final.

ROUND BY ROUND BEST AGGREGATE PRIZE-WINNERS:—

First Round—**BLACKHEATH M.F.C.** Second Round—**PHAROS M.A.C.**

S.M.A.E. COMPETITION RESULTS

K. & M.A.A. (Biplane) Cup

August 22nd, 1943

F. J. Houchin	Pharos	306.4
J. P. Buckeridge	Pharos	304.3
Mrs. Buckeridge	Pharos	222.8
W. Jones	Aylestone	215.9
E. Brixton	Croydon	205
W. T. Coe	Pharos	
K. C. Jenkins	Pharos	202.4
A. H. Lee	Bristol	177.9
M. A. Wright	Bushy Park	175.9
F. Ivory	Aylestone	170
J. Partington	Pharos	
D. Lofts	Northern Heights	164.5

(51 entries from 14 clubs)

Women's Challenge Cup

August 22nd, 1943

Mrs. Buckeridge	Pharos	442.1
Mrs. M. Morgan	Cardiff	130
Mrs. G. Clark	Luton	128.5
Miss G. Germany	Leicester	127.4

Thurston Cup

September 5th, 1943

J. Wassell	Hayes	514.7
J. P. Buckeridge	Pharos	463.1
Mrs. Buckeridge	Pharos	403.7
J. Marshall	Hayes	365.4
P. A. Lewis	Cardiff	323
F. J. Houchin	Pharos	320.7
D. Butler	Surbiton	303.7
W. Jones	Aylestone	291.9
R. Sharpe	Walthamstow	261.1
E. Barrett	Luton	239.5
F. H. Briggs	Cheam	230.4
P. Bradford	Sale	224.7

(102 entries from 25 clubs)

LONDON DISTRICT INTER-CLUB CHALLENGE CUP

Six clubs remained in the competition at the beginning of the Second Round, so it was necessary for two of them to draw byes into the Semi-final. Draw and results were as follows :

2nd Round August 29th.

Home		*Away*	
Cheam	434.9 lost to	**Pharos**	536.0
General Aircraft	364.8 lost to	**Blackheath**	493.8
Northern Heights	BYE		
Harrow	BYE		

SEMI-FINAL Sept. 12th.

Northern Heights	474.8 lost to	**Harrow**	706.25
Pharos	613.1 lost to	**Blackheath**	713.35

The Finalists therefore were Blackheath and Harrow.

The final of the London District Inter Club Challenge Cup took place on September 26th on Epsom Downs, in cold but splendid flying weather. This coincided with the Streatham Aero modellists' First Annual Open Day, and the organisers of that function kindly agreed to run it in conjunction with their Open Events.

In a hard-fought battle Blackheath secured a close victory over Harrow. The beautifully consistent rubber-driven flights of the winning club proved the deciding factor. Bill White, incidentally, picked up Streatham's 3rd Prize with his aggregate of 348.6 secs. With R. Warring he was very lucky to get away on nearly every flight, both planes turning and skimming the ground inches only above the grass, before picking up speed and getting up into the blue. A. T. Gow of Harrow suffered from the same trouble, but was unfortunate in his first flight that it just did not get away. N. Gregory flew a novel plane—a club developed design—with a smart parasol arrangement and a wheel-less peg leg attached to the *nose-block*. His best flight of 150 secs. proves the soundness of the somewhat unusual design.

Gliding times—in view of figures put up in the Streatham Open Event—were rather disappointing—but as usual Blackheath's Club Glider made a good average showing.

The organisers would like to place on record their appreciation of the Aero Modellers' gesture in providing a trophy for this event, and their thanks to the many clubs who, at short notice, rallied to support the competitions.

RESULTS

Blackheath

Glider				
1. R. Galbreath	44.1	21.7	61.5	127.3
2. C. H. Saunders	69.1	46.2	45.0	160.3
Rubber				
3. R. H. Warring	109.2	113.0	116.0	338.2
4. M. W. White	100.0	100.5	148.1	348.6
			Grand Total	974.4

Harrow

Glider				
1. W. Prescott	38.4	29.0	45.0	112.4
2. W. Waight	36.2	46.4	29.2	111.8
Rubber				
3. N. Gregory	67.5	94.0	150.0	311.5
4. A. T. Gow	25.0	84.1	92.4	201.5
			Grand Total	737.2

Made and printed in Great Britain by Alabaster, Passmore & Sons, Ltd., London and Maidstone, for the Proprietors and Publishers, The Model Aeronautical Press, Ltd. Allen House, Newarke Street, Leicester. Trade Distributors: Horace Marshall & Son, Ltd., Temple House, Tallis Street, London, E.C.4—C1601. Sole Agents for Australia and New Zealand: Gordon & Gotch (Australasia), Ltd. Registered at the G.P.O. for transmission by Canadian Magazine Post.

Ⓢ